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## SUPPLEMENT ARTICLE: SHEA/IDSA PRACTICE RECOMMENDATION

## Strategies to Prevent Catheter-Associated Urinary Tract Infections in Acute Care Hospitals

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### PURPOSE

Previously published guidelines are available that provide comprehensive recommendations for detecting and preventing healthcare-associated infections. The intent of this document is to highlight practical recommendations in a concise format designed to assist acute care hospitals in implementing and prioritizing their catheter-associated urinary tract infection (CAUTI) prevention efforts. Refer to the Society for Healthcare Epidemiology of America/Infectious Diseases Society of America "Compendium of Strategies to Prevent Healthcare-Associated Infections" Executive Summary and Introduction and accompanying editorial for additional discussion.

### SECTION 1: RATIONALE AND STATEMENTS OF CONCERN

#### 1. Burden of CAUTIs

a. Urinary tract infection is the most common hospital-acquired infection; 80% of these infections are attributable to an indwelling urethral catheter.<sup>1</sup>

b. Twelve to sixteen percent of hospital inpatients will have a urinary catheter at some time during their hospital stay.<sup>2</sup>

c. The daily risk of acquisition of urinary infection varies from 3% to 7% when an indwelling urethral catheter remains in situ.

#### 2. Outcomes associated with CAUTI

a. Urinary tract infection is the most important adverse outcome of urinary catheter use. Bacteremia and sepsis may occur in a small proportion of infected patients.<sup>3,4</sup>

b. Morbidity attributable to any single episode of catheterization is limited,<sup>3</sup> but the high frequency of catheter use in hospitalized patients means that the cumulative burden of CAUTI is substantial.<sup>1,5,6</sup>

c. Catheter use is also associated with negative outcomes other than infection, including nonbacterial urethral inflammation,<sup>7</sup> urethral strictures,<sup>8</sup> and mechanical trauma.

#### 3. Risk factors for development of CAUTI

a. The duration of catheterization is the most important risk factor for development of infection.<sup>1,9-11</sup> Limiting catheter use and, when a catheter is indicated, minimizing the duration the catheter remains in situ are primary strategies for CAUTI prevention.

b. Additional risk factors include female sex, older age, and not maintaining a closed drainage system.

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TABLE 1. Summary of Recommendations From Published Guidelines for Prevention of Infections Associated With Short-Term Indwelling Urethral Catheters

Recommendation	CDC (1981) [19]	NHS Epic 1 Project (2001) [20]	NHS Epic 2 Project (2007) [21]
Ensure documentation of catheter insertion	ND	Y	Y
Ensure that trained personnel insert catheter	Y	Y	Y
Train patients and family	ND	ND	Y
Practice hand hygiene	Y	Y	Y
Evaluate necessity of catheterization	Y	Y	Y
Evaluate alternative methods	Y	Y	Y
Review ongoing need regularly	ND	Y	Y
Select catheter material	ND	U	U
Use smallest-gauge catheter possible	Y	Y	Y
Use aseptic technique/sterile equipment	Y	Y	Y
Use barrier precautions for insertion	Y	ND	ND
Perform antiseptic cleaning of meatus	Y	N	N
Use closed drainage system	Y	Y	Y
Obtain urine samples aseptically	Y	Y	Y
Replace system if a break in asepsis occurs	Y	ND	ND
Do not change catheter routinely	Y	Y	Y
Perform routine hygiene for meatal care	Y	Y	Y
Avoid irrigation	Y	Y	Y
Cohort patients	Y	ND	ND
Ensure compliance with training	ND	ND	ND
Ensure compliance with control measures	ND	ND	ND
Ensure compliance with catheter removal	ND	ND	ND
Monitor rates of CAUTI and bacteremia	ND	ND	ND

NOTE. CAUTI, catheter-associated urinary tract infection; CDC, US Centers for Disease Control and Prevention; N, no (not recommended); ND, not discussed; NHS, UK National Health Service; U, unresolved (choice left to clinical experience and patient factors); Y, yes (recommended).

#### 4. Reservoir for transmission

a. The drainage bag of the bacteriuric patient is a reservoir for organisms that may contaminate the environment and be transmitted to other patients.<sup>12</sup>

b. Outbreaks of infection with resistant gram-negative organisms attributable to bacteriuria in catheterized patients have been reported.<sup>12-15</sup>

### SECTION 2: STRATEGIES TO DETECT CAUTI

#### 1. Surveillance definitions

a. The National Healthcare Safety Network definition of symptomatic nosocomial urinary tract infection<sup>16,17</sup> is commonly used but can be difficult to apply to patients with indwelling catheters. Localizing signs and symptoms may not be present with a catheter in situ or may not be recognized because of patient comorbidity.<sup>3,18</sup>

b. The most common clinical presentation is fever with positive urine culture results, without other localizing findings. However, given the high prevalence of bacteriuria in patients with an indwelling catheter, this definition lacks specificity.

#### 2. Methods for surveillance of CAUTI

a. Surveillance programs that monitor urine culture results through the microbiology laboratory are generally

used to detect patients with potential urinary tract infections. Patients with positive urine culture results are then evaluated for the presence of an indwelling urinary catheter and a CAUTI defined using surveillance criteria.

i. Infection in patients with an indwelling urinary catheter is usually asymptomatic.<sup>3</sup>

ii. Microbiological diagnosis usually requires the growth of at least  $10^5$  cfu/mL of an organism from a urine specimen collected aseptically from the catheter. Lower quantitative counts may be consistent with bacteriuria in some patients or may predict subsequent development of higher quantitative counts.<sup>18</sup>

### SECTION 3: STRATEGIES TO PREVENT CAUTI

#### 1. Existing guidelines and recommendations (see Table 1)

a. In 1981, the Centers for Disease Control and Prevention published guidelines for the prevention of catheter-associated urinary tract infections.<sup>19</sup> These guidelines provide recommendations for catheter use, catheter insertion, catheter care, placement of catheterized patients, and bacteriologic monitoring. The guidelines are currently being updated for the first time since 1981.

b. In 2001, the Department of Health in Great Britain

published guidelines for preventing infections associated with the insertion and maintenance of short-term indwelling urinary catheters in acute care;<sup>20</sup> these guidelines were updated in 2006.<sup>21</sup>

## 2. Updated relevant literature

### a. Cochrane reviews

*i.* Comprehensive Cochrane reviews with meta-analysis evaluating interventions to prevent complications of the use of short-term indwelling urinary catheters have recently been published.<sup>22-27</sup> Consistent observations include the limited number of studies addressing any specific question, small study numbers, low quality of most studies, and heterogeneity in results, particularly when morbidity is addressed.

### b. Alternatives to an indwelling urethral catheter

*i.* A prospective, randomized comparative trial reported that the use of external condom catheter drainage for men compared with a short-term indwelling urethral catheter reduced acquisition of bacteriuria and adverse outcomes and was more acceptable to the patient.<sup>28</sup>

*ii.* A randomized study reported that in-and-out catheterization was as effective as the use of an indwelling catheter for management of postoperative retention.<sup>29</sup>

*iii.* Some studies have reported fewer complications with use of a suprapubic catheter, but the surgical procedure required to insert the suprapubic catheter is associated with additional risks. A randomized, controlled trial comparing suprapubic and urethral catheterization for men undergoing elective laparotomy reported a similar incidence of urinary infection in the 2 groups.<sup>30</sup> Current evidence is not sufficient to support the routine use of a suprapubic catheter for short-term catheterization to prevent symptomatic urinary infection or other complications.<sup>22,23</sup>

### c. Catheter materials

*i.* Reviews and meta-analyses of silver-coated and other antibacterial urinary catheters consistently conclude that evidence does not support a recommendation for the uniform use of such devices.<sup>26,31,32</sup>

*ii.* Silver-alloy catheters may decrease bacteriuria but have not been shown to decrease symptomatic infection or other undesirable outcomes.<sup>31,32</sup>

(a) Some of the variability in outcomes reported in trials of silver catheters may be related to whether the comparator catheter is silicone or latex.<sup>33</sup>

(b) A recent prospective crossover study comparing a silver-alloy, silicone-based hydrogel-coated catheter with a silicone-based hydrogel-coated catheter reported no difference in symptomatic or asymptomatic infection or in bloodstream infections attributable to a urinary source.<sup>34</sup>

### d. Limiting the duration of catheterization

*i.* Indwelling urethral catheters are frequently used

when not indicated or, if indicated, remain in situ longer than necessary.<sup>35-37</sup>

*ii.* Optimal approaches to limit catheter use and duration may be dependent on facility characteristics. Approaches reported to be effective include the following:

(a) Implementing procedure-specific guidelines for postoperative catheter removal<sup>38</sup>

(b) Providing guidelines to manage postoperative retention, which may include the use of bladder scanners<sup>39</sup>

(c) Providing reminders to physicians to review the need for continued catheterization and to remove catheters promptly when they are no longer indicated<sup>40-42</sup>

(d) Development of care plans directing nurse removal of catheters for patients who meet prespecified criteria<sup>43</sup>

### e. Surveillance

*i.* Providing feedback on unit-specific urinary infection rates to nursing and healthcare staff has been effective in decreasing infection rates.<sup>44,45</sup>

## SECTION 4: RECOMMENDATIONS FOR IMPLEMENTING PREVENTION AND MONITORING STRATEGIES

Recommendations for preventing and monitoring CAUTI<sup>19-21</sup> are summarized in the following section. They are designed to assist acute care hospitals in prioritizing and implementing their CAUTI prevention efforts. Criteria for grading the strength of recommendation and quality of evidence are described in Table 2.

### I. Basic practices for prevention and monitoring of CAUTI: recommended for all acute care hospitals

#### A. Appropriate infrastructure for preventing CAUTI

1. Provide and implement written guidelines for catheter use, insertion, and maintenance (A-II).

a. Develop and implement facility criteria for acceptable indications for the use of indwelling urinary catheters.

b. Indications for the use of indwelling urethral catheters are limited and include the following:<sup>35,47</sup>

*i.* Perioperative use for selected surgical procedures

*ii.* Urine output monitoring in critically ill patients

*iii.* Management of acute urinary retention and urinary obstruction

*iv.* Assistance in pressure ulcer healing for incontinent residents

*v.* As an exception, at patient request to improve comfort

2. Ensure that only trained, dedicated personnel insert urinary catheters (B-III).

TABLE 2. Strength of Recommendation and Quality of Evidence

Category/grade	Definition
Strength of recommendation	
A	Good evidence to support a recommendation for use
B	Moderate evidence to support a recommendation for use
C	Poor evidence to support a recommendation
Quality of evidence	
I	Evidence from $\geq 1$ properly randomized, controlled trial
II	Evidence from $\geq 1$ well-designed clinical trial, without randomization; from cohort or case-control analytic studies (preferably from $>1$ center); from multiple time series; or from dramatic results from uncontrolled experiments
III	Evidence from opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees

NOTE. Adapted from the Canadian Task Force on the Periodic Health Examination.<sup>46</sup>

3. Ensure that supplies necessary for aseptic-technique catheter insertion are available (A-III).

4. Implement a system for documenting the following information in the patient record: indications for catheter insertion, date and time of catheter insertion, individual who inserted catheter, and date and time of catheter removal (A-III).

a. Include documentation in nursing flow sheet, nursing notes, or physician orders.

i. Documentation should be accessible in the patient record and recorded in a standard format for data collection and quality improvement purposes.

b. Electronic documentation that is searchable is preferred, if available.

5. Ensure that there are sufficient trained personnel and technology resources to support surveillance of catheter use and outcomes (A-III).

#### B. Surveillance of CAUTI

1. Identify the patient groups or units in which to conduct surveillance, on the basis of risk assessment, considering the frequency of catheter use and the potential risk factors (eg, types of surgery, obstetrics, and critical care) (B-III).

2. Use standardized criteria to identify patients who have a CAUTI (numerator data) (A-II).

3. Collect information on catheter-days (denominator data) for all patients in the patient groups or units being monitored (A-II).

4. Calculate CAUTI rates for target populations (A-II).

5. Measure the use of indwelling urinary catheters (B-II), including the following:

a. The percentage of patients with an indwelling urinary catheter inserted during hospitalization

b. The percentage of catheter use with accepted indications

c. Duration of indwelling catheter use

6. Use surveillance methods for case finding that are appropriate for the institution and are documented to be valid (A-III).

#### C. Education and training

1. Educate healthcare personnel involved in the insertion, care, and maintenance of urinary catheters about CAUTI prevention, including alternatives to indwelling catheters and procedures for catheter insertion, management, and removal (A-III).

#### D. Appropriate technique for catheter insertion

1. Insert urinary catheters only when necessary for patient care and leave them in place only as long as indications persist (A-II).

2. Consider other methods for management, including condom catheters or in-and-out catheterization, when appropriate (A-I).

3. Practice hand hygiene (in accordance with Centers for Disease Control and Prevention or World Health Organization guidelines) immediately before insertion of the catheter and before and after any manipulation of the catheter site or apparatus (A-III).

4. Insert catheters by use of aseptic technique and sterile equipment (A-III).

5. Use gloves, a drape, and sponges; a sterile or antiseptic

solution for cleaning the urethral meatus; and a single-use packet of sterile lubricant jelly for insertion (A-III).

6. Use as small a catheter as possible that is consistent with proper drainage, to minimize urethral trauma (B-III).

#### E. Appropriate management of indwelling catheters

1. Properly secure indwelling catheters after insertion to prevent movement and urethral traction (A-III).

2. Maintain a sterile, continuously closed drainage system (A-I).

3. Do not disconnect the catheter and drainage tube unless the catheter must be irrigated (A-I).

4. Replace the collecting system by use of aseptic technique and after disinfecting the catheter-tubing junction when breaks in aseptic technique, disconnection, or leakage occur (B-III).

5. For examination of fresh urine, collect a small sample by aspirating urine from the sampling port with a sterile needle and syringe after cleansing the port with disinfectant (A-III).

a. Promptly transport urine specimens to the laboratory for culture.

6. Obtain larger volumes of urine for special analyses aseptically from the drainage bag (A-III).

7. Maintain unobstructed urine flow (A-II).

8. Empty the collecting bag regularly, using a separate collecting container for each patient, and avoid allowing the draining spigot to touch the collecting container (A-II).

9. Keep the collecting bag below the level of the bladder at all times (A-III).

10. Cleaning the meatal area with antiseptic solutions is unnecessary; routine hygiene is appropriate (A-I).

#### F. Accountability

1. The hospital's chief executive officer and senior management are responsible for ensuring that the healthcare system supports an infection prevention and control program that effectively prevents CAUTIs and the transmission of epidemiologically significant pathogens.

2. Senior management is accountable for ensuring that an adequate number of trained personnel are assigned to the infection prevention and control program.

3. Senior management is accountable for ensuring that healthcare personnel, including licensed and nonlicensed personnel, are competent to perform their job responsibilities.

4. Direct healthcare providers (such as physicians, nurses, aides, and therapists) and ancillary personnel (such as house-keeping and equipment-processing personnel) are responsible for ensuring that appropriate infection prevention and control practices are used at all times (including hand hygiene, standard and isolation precautions, cleaning and disinfection of equipment and the environment, aseptic technique when inserting and caring for urinary catheters, and daily assessment of whether an indwelling urinary catheter is medically indicated).

5. Hospital and unit leaders are responsible for holding their personnel accountable for their actions.

6. The person who manages the infection prevention and control program is responsible for ensuring that an active program to identify CAUTIs is implemented, that data on CAUTIs are analyzed and regularly provided to those who can use the information to improve the quality of care (eg, unit staff, clinicians, and hospital administrators), and that evidence-based practices are incorporated into the program.

7. Personnel responsible for healthcare personnel and patient education are accountable for ensuring that appropriate training and educational programs to prevent CAUTI are developed and provided to personnel, patients, and families.

8. Personnel from the infection prevention and control program, the laboratory, and information technology departments are responsible for ensuring that systems are in place to support the surveillance program.

#### II. Special approaches for the prevention of CAUTI

Perform a CAUTI risk assessment. These special approaches are recommended for use in locations and/or populations within the hospital with unacceptably high CAUTI rates despite implementation of the basic CAUTI prevention strategies listed above.

1. Implement an organization-wide program to identify and remove catheters that are no longer necessary, using 1 or more methods documented to be effective (A-II).

a. Develop and implement institutional policy requiring continual, usually daily, review of the necessity of continued catheterization.

b. Electronic or other types of reminders (see the Appendix) may be useful. Some examples include the following:

*i.* Automatic stop orders requiring renewal of the order for continuation of the indwelling catheter

*ii.* Standardized reminders placed into patient charts (Appendix) or the electronic patient record

c. Implement daily ward rounds by nursing and physician staff to review all patients with urinary catheters and to ascertain continuing necessity.

2. Develop a protocol for management of postoperative urinary retention, including nurse-directed use of intermittent catheterization and use of bladder scanners (B-I).

a. If bladder scanners are used, indications must be clearly stated, and nursing staff must be trained in their use.

3. Establish a system for analyzing and reporting data on catheter use and adverse events from catheter use (B-III).

a. Define and monitor adverse outcomes in addition to CAUTI, including catheter obstruction, unintended removal, catheter trauma, or reinsertion within 24 hours after removal.

b. For analysis, stratify measurements of catheter use and adverse outcomes by relevant risk factors (eg, sex, age, ward, and duration). Review data in a timely fashion and report them to the appropriate stakeholders.

### III. Approaches that should not be considered a routine part of CAUTI prevention

1. Do not routinely use silver-coated or other antibacterial catheters (A-I).

2. Do not screen for asymptomatic bacteruria in catheterized patients (A-II).

3. Do not treat asymptomatic bacteruria in catheterized patients except before invasive urologic procedures (A-I).

4. Avoid catheter irrigation (A-I).

a. Do not perform continuous irrigation of the bladder with antimicrobials as a routine infection prevention measure.

b. If obstruction is anticipated, closed continuous irrigation may be used to prevent it.

c. To relieve obstruction due to clots, mucus, or other causes, an intermittent method of irrigation may be used.

5. Do not use systemic antimicrobials routinely as prophylaxis (A-II).

6. Do not change catheters routinely (A-III).

### IV. Unresolved issues

1. Use of antiseptic solution versus sterile saline for meatal cleaning before catheter insertion

2. Use of antimicrobial-coated catheters for selected patients at high risk for infection

## SECTION 5: PERFORMANCE MEASURES

### I. Internal reporting

These performance measures are intended to support internal hospital quality improvement efforts and do not necessarily address external reporting needs.

The process and outcome measures suggested here are derived from published guidelines, other relevant literature, and the opinions of the authors. Report both process and outcome measures to senior hospital leadership, nursing leadership, and clinicians who care for patients at risk for CAUTI.

#### A. Process measures

1. Compliance with documentation of catheter insertion and removal dates

a. Conduct random audits of selected units and calculate compliance rate.

i. Numerator: number of patients with urinary catheters on the unit with proper documentation of insertion and removal dates.

ii. Denominator: number of patients on the unit with a urinary catheter in place.

iii. Multiply by 100 so that the measure is expressed as a percentage.

2. Compliance with documentation of indication for catheter placement

a. Conduct random audits of selected units and calculate compliance rate.

i. Numerator: number of patients with urinary catheters on the unit with proper documentation of indication.

ii. Denominator: number of patients on the unit with a urinary catheter in place.

iii. Multiply by 100 so that the measure is expressed as a percentage.

#### B. Outcome measures

1. Rates of symptomatic CAUTI, stratified by risk factors (age, sex, ward, indication, and catheter-days)

a. Although the validity of the current Centers for Disease Control and Prevention/National Healthcare Safety Network definition of symptomatic CAUTI for comparison of facility-to-facility outcomes is not established, measurement of rates allows an individual facility to gauge the longitudinal impact of implementation of prevention strategies.

i. Numerator: number of symptomatic CAUTIs in each location monitored.

ii. Denominator: total number of urinary catheter-days for all patients in each location monitored who have an indwelling urinary catheter.

*iii.* Multiply by 1,000 so that the measure is expressed as cases per 1,000 catheter-days.

2. Rates of bacteremia attributable to CAUTI

a. Use National Healthcare Safety Network definitions of laboratory-confirmed bloodstream infection.<sup>17</sup>

*i.* Numerator: number of episodes of bloodstream infections attributable to CAUTI.

*ii.* Denominator: total number of urinary catheter-days for all patients in each location monitored who have an indwelling urinary catheter.

*iii.* Multiply by 1,000 so that the measure is expressed as cases per 1,000 catheter-days.

## II. External reporting

There are many challenges in providing useful information to consumers and other stakeholders while preventing unintended adverse consequences of public reporting of healthcare-associated infections.<sup>48</sup> Recommendations for public reporting of healthcare-associated infections have been provided by the Hospital Infection Control Practices Advisory Committee,<sup>49</sup> the Healthcare-Associated Infection Working Group of the Joint Public Policy Committee,<sup>50</sup> and the National Quality Forum.<sup>51</sup>

Because the validity of the current Centers for Disease Control and Prevention/National Healthcare Safety Network definition of CAUTI for comparison of facility-to-facility outcomes is not established, external reporting of CAUTI rates is not recommended.

### A. State and local requirements

1. Hospitals in states that have mandatory reporting requirements must collect and report the data required by the state. For information on state and federal requirements, check with your state or local health department.

### B. External quality initiatives

1. Hospitals that participate in external quality initiatives must collect and report the data required by the initiative.

## ACKNOWLEDGMENTS

For Potential Conflicts of Interest statements and information on financial support, please see the Acknowledgments in the Executive Summary, on page S20 of this supplement.



**\*\*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 of urinary collection strategy
- Patient had recent surgery
- Management of urinary incontinence on patient's request
- Other—please specify

FIGURE. Example of a urinary catheter reminder form (reprinted, with permission, from Saint et al.<sup>41</sup>)

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