CAUTI Prevention and Appropriate Use of Indwelling Urinary Catheters in the Hospital Setting

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Objectives

- Describe the epidemiology of inappropriate use of indwelling urethral catheters
- Understand complications of urinary catheterization including CAUTI
- Clarify appropriate use of indwelling urinary catheters
- Consider alternatives to inappropriate use of indwelling urinary catheters
### Urinary Catheter Use: ICU > General Units

<table>
<thead>
<tr>
<th>Unit</th>
<th>2006-8 Urinary Catheter Utilization Ratio</th>
<th>2009 Urinary Catheter Utilization Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICU (med-surg)</td>
<td>0.79</td>
<td>0.72</td>
</tr>
<tr>
<td>General Wards (med-surg)</td>
<td>0.22</td>
<td>0.19</td>
</tr>
</tbody>
</table>
Where should we focus?

- Let's examine this example:
  - A hospital has 500 beds
  - Total beds used: 20% (100 beds) for ICU and 80% (400 beds) for non-ICU
- Urinary catheter use in non-ICU is 20% and ICU is 80%.
- Total UC-days per year:
  1. For ICU = 100 * 0.8 * 365 = 29,200 catheter-days
  2. For non-ICU = 400 * 0.2 * 365 = 29,200 catheter-days
- Non-ICU at least as important as ICU related to number of catheter-days
Epidemiology of Urinary Catheterization

- Over 30 million Foley catheters placed annually
- 15-25% of hospitalized patients
- Most are placed either in the emergency department, intensive care unit, or the operating room

Schaeffer, AJ et al UpToDate 2012; placement and management of urinary bladder catheters.

Epidemiology of Urinary Catheterization

- Physicians often neglected this aspect of care
- In pre-2009 surveys in U.S. hospitals
  - > 50% did not monitor which patients catheterized
  - 75% did not monitor duration and/or discontinuation
- Typically inserted and managed by nurses

Schaeffer, AJ et al UpToDate 2012; placement and management of urinary bladder catheters.

Urinary Catheters Are Not Harmless

- Mechanical trauma and chemical irritation to urethra and bladder
- Immobility ("one point restraint")
  - Functional impairment
  - Discomfort
  - Pressure ulcers
- CAUTI

Catheter-Associated UTIs (CAUTIs)

- 70-80% of UTIs are catheter-associated
- Hospital-acquired bacteriuria and candiduria in 25% of those with urinary catheters placed for a week
- Risk per day of bacteriuria is about 3-5%
- Symptomatic UTI: 16-32% of those bacteriuric

Catheter-Associated UTIs (CAUTIs)

- Bacteremia: 3.6% of those with bacteriuria
- CAUTI: 2-8 cases of CAUTI per 1000 catheter days, symptomatic CAUTI 1-2 per 1000 catheter days
- Direct costs per episode of bacteriuria added to hospitalization: $500- $1,000
- Provokes antibiotic misuse by physicians for asymptomatic bacteriuria
- Antibiotic stewardship

Background: Pathogenesis of CAUTI

- Formation of biofilms by urinary pathogens common on the surfaces of catheters and collecting systems
- Bacteria within biofilms resistant to antimicrobials and host defenses
- Some novel strategies in CAUTI prevention have targeted biofilms

Photograph from CDC Public Health Image Library: http://phil.cdc.gov/phil/details.asp

Scanning electron micrograph of S. aureus bacteria on the luminal surface of an indwelling catheter with interwoven complex matrix of extracellular polymeric substances known as a biofilm
Background: Pathogenesis of CAUTI

* Source of microorganisms may be endogenous (meatal, rectal, or vaginal colonization) or exogenous, usually via contaminated hands of healthcare personnel during catheter insertion or manipulation of the collecting system.

Figure from: Maki DG, Tambyah PA. Emerg Infect Dis 2001;7:1-6
Prevalence of CAUTI leads to large cumulative burden

- Rates improving but still most common healthcare-associated infection
  - 40% of HAIs reported to NHSN
  - CDC 2007 estimates 139,000 CAUTIs
  - Still leading source of bacteremia
  - Case fatality rates 10 - 33% for bacteremia from urinary tract source
- Each CAUTI costs at least $600
- Each urinary-tract-related BSI costs at least $2,800
- Increased costs by $131 million per year

NHSN Data: Intensive Care vs. General Wards

- CAUTI: General Units > ICU

<table>
<thead>
<tr>
<th>Unit</th>
<th>NHSN CAUTI Rate* (per 1,000 catheter days)</th>
<th>NHSN S-CAUTI Rate (per 1,000 catheter days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICU (med-surg)</td>
<td>3.4</td>
<td>1.3</td>
</tr>
<tr>
<td>General wards (med-surg)</td>
<td>5.9</td>
<td>1.6</td>
</tr>
</tbody>
</table>

*Prior to the new SUTI definition
New definition for S-CAUTI

- A urinary tract infection that occurs in a patient who had an indwelling urinary catheter in place within the 48 hour period before the onset of the UTI.
- The symptoms may include fever, urgency, frequency, suprapubic tenderness.
- Positive urine culture with no more than 2 pathogens.

Inappropriate Catheterization Widely Prevalent

- 40% - 50% of patients from non-intensive medical and surgical units may not have a valid indication for urinary catheter placement

- This can occur:
  
  1. At the time of placement
  2. With continued use
Use of Indwelling Urinary Catheters in Hospitalized Patients
(Jain, Arch Intern Med 1995; 155: 1425-29)

- Intensive and non-intensive care units
- Initially, 21% of urinary catheters placed were unjustified (13% in intensive care, 34% in non-intensive care)
- Continued catheterization was unjustified in 47% of the patient-days studied
- Uncomplicated urinary incontinence was a major reason for unjustified use
Very Elderly Women Are at High Risk for Unnecessary Utilization
(Fakah et al, Am J Infect Control 2010;38:683-8)

- Evaluated urinary catheter (UC) placement for all admissions from the emergency department (ED).
- 532 (11.8%) of 4521 patients had a UC placed. Of those, 69.7% were indicated, and 58.6% had a physician order documented.
- Inappropriate placement: older (mean age 71.3±18.8 years vs. those with indication 60.0±22.4 years, p<0.0001, and patients with no UC placed 56.2±22.6 years, p<0.0001)
- Half of women ≥80 years with a UC placed did not have an indication.
- Independent factors: women were twice more likely than men, and very elderly (≥80 years) were 3 times more likely than those 50 or younger, to have UC placed without indication.
Risk for CAUTI
(Saint, Arch Intern Med 1999;159:800-808; Gould, HICPAC 2009)

- **Patient** factors (usually non-modifiable): female sex, impaired immunity, azotemia, diabetes mellitus, meatal colonization, incontinence, advanced age, urological problems

- **Modifiable** factors: duration of urinary catheterization, insertion of the urinary catheter, care of the indwelling urinary catheter
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Appropriate use of indwelling urinary catheters

- Limit the use to indications
- Use proper insertion technique
- Take appropriate care of catheter
# 2009 Prevention of CAUTI HICPAC Guidelines

## Table 2.

### A. Examples of Appropriate Indications for Indwelling Urethral Catheter Use

<table>
<thead>
<tr>
<th>Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient has acute urinary retention or bladder outlet obstruction</td>
</tr>
<tr>
<td>Need for accurate measurements of urinary output in critically ill patients</td>
</tr>
<tr>
<td>Perioperative use for selected surgical procedures:</td>
</tr>
<tr>
<td>• Patients undergoing urologic surgery or other surgery on contiguous structures of the genitourinary tract</td>
</tr>
<tr>
<td>• Anticipated prolonged duration of surgery (catheters inserted for this reason should be removed in PACU)</td>
</tr>
<tr>
<td>• Patients anticipated to receive large-volume infusions or diuretics during surgery</td>
</tr>
<tr>
<td>• Need for intraoperative monitoring of urinary output</td>
</tr>
<tr>
<td>To assist in healing of open sacral or perineal wounds in incontinent patients</td>
</tr>
<tr>
<td>Patient requires prolonged immobilization (e.g., potentially unstable thoracic or lumbar spine, multiple traumatic injuries such as pelvic fractures)</td>
</tr>
<tr>
<td>To improve comfort for end of life care if needed</td>
</tr>
</tbody>
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### B. Examples of Inappropriate Uses of Indwelling Catheters

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<td>As a substitute for nursing care of the patient or resident with incontinence</td>
</tr>
<tr>
<td>As a means of obtaining urine for culture or other diagnostic tests when the patient can voluntarily void</td>
</tr>
<tr>
<td>For prolonged postoperative duration without appropriate indications (e.g., structural repair of urethra or contiguous structures, prolonged effect of epidural anaesthesia, etc.)</td>
</tr>
</tbody>
</table>

Note: These indications are based primarily on expert consensus.
Proper Insertion Technique

- Hand hygiene before and after placement
- Aseptic technique and use of sterile equipment
- Sterile gloves, drape, an antiseptic solution for periurethral cleaning, and a single packet of lubricant for insertion
- Use the appropriate catheter size
Maintenance of Urinary Catheters

- Keep a closed system for the urinary drainage system

- Make sure urinary flow is not obstructed:
  1. No kinks of the catheter
  2. Urinary bag should always be lower than the bladder
  3. Regular emptying of urinary bag
“ABCDE”

- Adherence to infection control principles (e.g., aseptic insertion, proper maintenance, education) is important
- Bladder ultrasound may avoid indwelling catheterization
- Condom or intermittent catheterization in appropriate patients
- Do not use the indwelling catheter unless you must
- Early removal of the catheter using reminders or stop-orders appears warranted
Limit Use to Indications

- Prompt removal of catheter when no longer indicated
- Avoid use unless appropriate indication
Avoiding Inappropriate Placement

- May have a substantial effect on utilization rates and CAUTI rates
- May consider in areas of high placement (e.g., emergency department, intensive care units)
ED Compliance with Institutional Guidelines

- Established institutional guidelines for UC placement in ED
- Compared the rate of placement before and after guidelines
- ED physician champion involved

Removal of No-Longer Indicated Catheters

- Nurse-driven removal of no longer needed catheters
  - Pilot study: 45% reduction in unnecessary catheter utilization (Fakih et al, Infect Control Hosp Epidemiol 2008; 29: 815-9)

- Educate staff on appropriate indications based on HICPAC guidelines (Gould et al, Infect Control Hosp Epidemiol 2010; 31: 319-326)
Alternatives to Indwelling Urinary Catheterization

- Bladder scanners may be used in cases where urinary retention is suspected, or when the patient did not have any witnessed urine output and the clinician needs to evaluate for obstruction. Consider having bladder scanners available.

- Condom catheters may be considered in men that require fluid monitoring. Their use reduces the risk of urethral trauma (compared to indwelling urinary catheter). Condom catheters are not used in cases of urinary retention.
Alternatives to Indwelling Urinary Catheterization

Intermittent catheterization may be considered in patients with non-obstructive urinary retention (e.g., patients with neurogenic bladder).
Summary

- Indwelling urinary catheters should only be placed with appropriate clinical indication.
- Risk of CAUTI and related complications increases directly in proportion to duration of catheterization.
- Minimizing catheter days is the best evidence based strategy for reducing CAUTI.
Both nurses and physicians should evaluate the indications for urinary catheter utilization.

Physicians should promptly discontinue catheters when no longer needed.

Nurses evaluating catheters and finding no indication should contact the physician to promptly discontinue the catheter.

Necessary urinary catheters should be placed, used and maintained in accordance with evidence-based best practices.