Evidence on Prevention of Catheter-Associated Urinary Tract Infections (CA-UTIs)

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Today’s Objectives

- Describe the prevalence and impact of CA-UTI events.

- Review UTI definitions and provide new insights on surveillance.

- Review regulatory and quality initiatives associated with the prevention of CA-UTI.

- Describe the life cycle of the urinary catheter and areas for prevention improvement.

- Provide evidence on CA-UTI prevention.
The Source of Troubles
Background on CA-UTIs
Epidemiology

- 4 million Americans per year undergo urinary catheterization.¹
- >500,000 remain indwelling for some time.¹
- About 25% of patients in hospitals² and 4.5% of long-term care patients³ will have an indwelling catheter.
- CA-UTI occurs at a rate of 3% to 10% per day.⁴
- CA-UTI incidence approaches 100% within 30 days.⁵
- CA-UTI is the leading cause of secondary hospital-acquired bloodstream infection ⁶
- Annually, an estimated 561,677 CA-UTIs with 8,250 associated deaths occur per year in the United States.⁷

It has long been acknowledged that CAUTI is the most frequent type of infection in acute care settings. In a study that provided a national estimate of healthcare-associated infections, urinary tract infections comprised 36% of the total HAI estimate. (See figure 2.1 below.)

Figure 2.1. Infection types in acute care settings.

80% of all UTIs are catheter related


### CA-UTI Rates, CDC NHSN, 2012

<table>
<thead>
<tr>
<th>Type of location</th>
<th>No. of locations</th>
<th>No. of CAUTI</th>
<th>Catheter days</th>
<th>Pooled Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CRITICAL CARE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical-Major teaching</td>
<td>230</td>
<td>2181</td>
<td>741,268</td>
<td>2.9</td>
</tr>
<tr>
<td>Medical-All others</td>
<td>460</td>
<td>1438</td>
<td>852,627</td>
<td>1.7</td>
</tr>
<tr>
<td>Medical cardiac</td>
<td>405</td>
<td>1517</td>
<td>703,734</td>
<td>2.2</td>
</tr>
<tr>
<td>Medical/surgical – major teaching</td>
<td>328</td>
<td>2280</td>
<td>935,001</td>
<td>2.4</td>
</tr>
<tr>
<td>Neurosurgical</td>
<td>173</td>
<td>2464</td>
<td>489,391</td>
<td>5.0</td>
</tr>
<tr>
<td>Pediatric medical/surgical</td>
<td>297</td>
<td>452</td>
<td>166,710</td>
<td>2.7</td>
</tr>
<tr>
<td>Surgical – major teaching</td>
<td>176</td>
<td>1800</td>
<td>558,102</td>
<td>3.2</td>
</tr>
<tr>
<td>Surgical – cardiothoracic</td>
<td>456</td>
<td>1657</td>
<td>939,044</td>
<td>1.8</td>
</tr>
<tr>
<td><strong>INPATIENT WARDS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical</td>
<td>813</td>
<td>1334</td>
<td>882,392</td>
<td>1.5</td>
</tr>
<tr>
<td>Medical/surgical</td>
<td>1825</td>
<td>2752</td>
<td>2,038,073</td>
<td>1.4</td>
</tr>
<tr>
<td>Neurosurgical</td>
<td>48</td>
<td>175</td>
<td>61,879</td>
<td>2.8</td>
</tr>
<tr>
<td>Surgical</td>
<td>458</td>
<td>1099</td>
<td>647,041</td>
<td>1.7</td>
</tr>
</tbody>
</table>

Cost of CA-UTIs

- The CDC has estimated that up to 139,000 hospital onset, symptomatic CA-UTIs occurred in 2007, resulting in as much as $131 million in excess direct medical costs.\(^1\)
- Each episode of UTI costs between US$600-$3800.\(^3\)\(^-\)\(^4\)
- UT-related bacteremia cost an average of US$2800.\(^5\)

National & Regulatory CA-UTI Prevention Initiatives
Starting in October 1, 2008, the CMS under a revised Acute Care Hospital Inpatient Prospective Payment System (IPPS), no longer reimburses hospitals for costs attributable to CA-UTIs.

Starting in 2014, CMS began publically reporting rates of CA-UTI for hospitals participating in the Hospital Inpatient Quality Reporting Program.

Starting in 2015, required reporting of CA-UTIs in all settings, including adult and pediatric medical, and surgical wards.

CMS will base penalties on Center for Disease Control and Prevention (CDC) National Healthcare Safety Network (HSHN) CA-UTI data.

CDC NHSN Definitions of CA-UTI: Preventing the Preventable
Effective January 2015

- The Urinary Tract Infections (UTI) definitions will no longer include:
  - Symptomatic UTI (SUTI) criteria 2 and 4 due to removal of the following elements:
    - Colony counts of less than 100,000 CFU/ml
    - Urinalysis results
  - Urine cultures that are positive only for yeast, mold, dimorphic fungi, or parasites.
  - Uropathogen list for Asymptomatic Bacteremic UTI (ABUTI) – ABUTI criteria will use the same pathogen list as Symptomatic UTI (SUTI)
CDC NHSN, SUTI and ABUTI Definitions, 2015

Identifying Symptomatic Urinary Tract Infections (SUTI) and Asymptomatic Bacteremic Urinary Tract Infections (ABUTI)

Positive urine culture with no more than 2 species of organisms, at least one of which is a bacteria of ≥10⁵ CFU/ml. All elements of the UTI criterion must occur during the infection window period (Note: If none of the organisms present at ≥10⁵ CFU/ml are bacteria, answer = No)

No

Yes

Does not meet UTI criteria

Had an indwelling urinary catheter that had been in place for > 2 days, AND was either:
1. Still present on date of event, OR
2. Removed day before date of event?

No

Yes

At least one of the following signs or symptoms?
1. If catheter in place the entire day of event:
   a. Any age patient: Suprapubic tenderness, costovertebral angle pain, fever (>38.0°C)
   b. Patients ≤ 1 year of age: Suprapubic tenderness, costovertebral angle pain, fever (>38.0°C), hypothermia (<36.0°C), spina, bradycardia, lethargy, or vomiting
2. If catheter removed on day of or day before event:
   a. Any age patient: Suprapubic tenderness, costovertebral angle pain, fever (>38.0°C), urgency, dysuria, frequency
   b. Patients ≤ 1 year of age: Suprapubic tenderness, costovertebral angle pain, fever (>38.0°C), hypothermia (<36.0°C), spina, bradycardia, lethargy, or vomiting

Yes

No

At least one of the following signs or symptoms?

Blood culture positive with at least one matching bacteria to bacteria in the urine at ≤100,000 CFU/ml?

Yes

No

Blood culture positive with at least one matching bacteria to bacteria in the urine at ≥2,100,000 CFU/ml?

Yes

No

Meets criteria for non-catheter associated SUTI (CAUTI)

Meets criteria for non-catheter associated ABUTI

Does not meet UTI criteria

Meets criteria for catheter-associated CAUTI

Meets criteria for catheter-associated ABUTI

Does not meet UTI criteria
Pathogenesis of CA-UTI
Pathogenesis

66% of CAUTI acquired by the extraluminal route: Staph, Enterococcus, yeast

34% acquired by intraluminal route: Gram negatives

Pathogenesis

- Extraluminal acquisition of organisms is usually associated with endogenous organisms, i.e., bacteria that colonize the patient’s own perineum.

- Intraluminal acquisition is most often associated with exogenous organisms and result from cross-contamination from the hands of healthcare workers.

- Approx. 15% of episodes of healthcare-associated bacteruria occur in clusters from intrahospital transmission.

Biofilms are composed of clusters of microorganisms in a polysaccharide matrix. They form on intraluminal and extraluminal surfaces.

Organisms in biofilms may ascend the catheter in 1-3 days. Biofilms form a protective environment for organisms with poor penetration by antimicrobials.

Pathogens Associated with CAUTIs

## Table 5.
Distribution of Rank Order of Selected Pathogens Associated with Healthcare-Associated Infections (HAIs) Reported to the National Healthcare Safety Network, by Type of HAI, 2009–2010

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Overall No. (%) of pathogens</th>
<th>CLABSI No. (%) of pathogens</th>
<th>CAUTI No. (%) of pathogens</th>
<th>VAP No. (%) of pathogens</th>
<th>SSI No. (%) of pathogens</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rank</td>
<td>Rank</td>
<td>Rank</td>
<td>Rank</td>
<td>Rank</td>
</tr>
<tr>
<td><strong>Staphylococcus aureus</strong></td>
<td>12,635 (15.6)</td>
<td>3,735 (12.3)</td>
<td>442 (2.1)</td>
<td>2,043 (24.1)</td>
<td>6,415 (30.4)</td>
</tr>
<tr>
<td><strong>Escherichia coli</strong></td>
<td>9,351 (11.5)</td>
<td>1,206 (4.0)</td>
<td>5,660 (26.8)</td>
<td>504 (5.9)</td>
<td>1,981 (9.4)</td>
</tr>
<tr>
<td><strong>Coagulase-negative staphylococci</strong></td>
<td>9,261 (11.4)</td>
<td>6,245 (20.5)</td>
<td>467 (2.2)</td>
<td>72 (0.9)</td>
<td>2,477 (11.7)</td>
</tr>
<tr>
<td><strong>Klebsiella (pneumoniae/oxytoca)</strong></td>
<td>6,470 (8.0)</td>
<td>2,407 (7.9)</td>
<td>2,365 (11.2)</td>
<td>854 (10.1)</td>
<td>844 (4.0)</td>
</tr>
<tr>
<td><strong>Pseudomonas aeruginosa</strong></td>
<td>6,111 (7.5)</td>
<td>1,166 (3.8)</td>
<td>2,381 (11.3)</td>
<td>1,408 (16.6)</td>
<td>1,156 (5.5)</td>
</tr>
<tr>
<td><strong>Enterococcus faecalis</strong></td>
<td>5,484 (6.8)</td>
<td>2,680 (8.8)</td>
<td>1,519 (7.2)</td>
<td>45 (0.5)</td>
<td>1,240 (5.9)</td>
</tr>
<tr>
<td><strong>Candida albicans</strong></td>
<td>4,275 (5.3)</td>
<td>1,974 (6.5)</td>
<td>1,887 (8.9)</td>
<td>147 (1.7)</td>
<td>267 (1.3)</td>
</tr>
<tr>
<td><strong>Enterobacter spp.</strong></td>
<td>3,821 (4.7)</td>
<td>1,365 (4.5)</td>
<td>880 (4.2)</td>
<td>727 (8.6)</td>
<td>849 (4.0)</td>
</tr>
<tr>
<td><strong>Other Candida spp. or NOS</strong></td>
<td>3,408 (4.2)</td>
<td>2,465 (8.1)</td>
<td>811 (3.8)</td>
<td>36 (0.4)</td>
<td>96 (0.5)</td>
</tr>
<tr>
<td><strong>Enterococcus faecium</strong></td>
<td>3,314 (4.1)</td>
<td>2,118 (7.0)</td>
<td>654 (3.1)</td>
<td>25 (0.3)</td>
<td>517 (2.5)</td>
</tr>
<tr>
<td><strong>Enterococcus spp.</strong></td>
<td>2,409 (3.0)</td>
<td>703 (2.3)</td>
<td>1,010 (4.8)</td>
<td>11 (0.1)</td>
<td>685 (3.2)</td>
</tr>
<tr>
<td><strong>Proteus spp.</strong></td>
<td>2,031 (2.5)</td>
<td>232 (0.8)</td>
<td>1,013 (4.8)</td>
<td>119 (1.4)</td>
<td>667 (3.2)</td>
</tr>
<tr>
<td><strong>Serratia spp.</strong></td>
<td>1,737 (2.1)</td>
<td>762 (2.5)</td>
<td>204 (1.0)</td>
<td>386 (4.6)</td>
<td>385 (1.8)</td>
</tr>
<tr>
<td><strong>Acinetobacter baumannii</strong></td>
<td>1,490 (1.8)</td>
<td>629 (2.1)</td>
<td>185 (0.9)</td>
<td>557 (6.6)</td>
<td>119 (0.6)</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>9,304 (11.5)</td>
<td>2,762 (9.1)</td>
<td>1,633 (7.7)</td>
<td>1,510 (17.8)</td>
<td>3,399 (16.1)</td>
</tr>
<tr>
<td>Total</td>
<td>81,139 (100)</td>
<td>30,454 (100)</td>
<td>21,111 (100)</td>
<td>8,474 (100)</td>
<td>21,100 (100)</td>
</tr>
</tbody>
</table>

Note. CAUTI, catheter-associated urinary tract infection; CLABSI, central line–associated bloodstream infection; NOS, not otherwise specified; SSI, surgical site infection; VAP, ventilator-associated pneumonia.

* A rank is not given if pathogen is not in the top 14 reported for the specific HAI type listed in Table 3 of the supplemental report on the CDC website (http://www.cdc.gov/nhsn/dataStat.html).
## Antibiotic Resistant Organisms & CAUTIs

### Table 7: Percentage of Pathogenic Isolates Resistant to Selected Antimicrobial Agents, National Healthcare Safety Network, 2009–2010

| Pathogen, antimicrobial | CLABSI | | | CAUTI | | | | VAP | | | | SSI | |
|-------------------------|--------|---|---|--------|---|---|---|--------|---|---|---|--------|---|---|---|
|                         | No. of isolates reported | No. (%) of isolates tested | % | | | | | No. of isolates reported | No. (%) of isolates tested | % | | | | No. of isolates reported | No. (%) of isolates tested | % | | | | No. of isolates reported | No. (%) of isolates tested | % | |
| Staphylococcus aureus | 3,735 | 3,611 (96.7) | 54.6 | | | | | 442 | 438 (99.1) | 58.7 | | | | 2,043 | 1,974 (96.6) | 48.4 | | | | 6,415 | 6,304 (98.3) | 43.7 |
| Enterococcus spp. | 2,118 | 2,069 (97.7) | 82.6 | | | | | 654 | 639 (97.7) | 82.5 | | | | 25 | 23 (92) | 82.6 | | | | 517 | 509 (98.5) | 62.3 |
| Klebsiella (pneumoniae/oxytoca) | 2,407 | 2,109 (87.6) | 28.8 | | | | | 1,519 | 1,446 (95.2) | 8.4 | | | | 45 | 41 (91.1) | 9.8 | | | | 1,240 | 1,187 (95.7) | 6.2 |
| Enterobacter spp. | 1,390 | 1,206 (95.9) | 37.4 | | | | | 5,660 | 5,046 (87.3) | 12.3 | | | | 1,047 | 1,028 (99.1) | 16.3 | | | | 1,981 | 1,948 (99.2) | 16.3 |
| Pseudomonas aeruginosa | 1,166 | 1,014 (96.3) | 4.0 | | | | | 1,213 | 1,123 (92.8) | 3.7 | | | | 573 | 550 (96.8) | 3.6 | | | | 849 | 816 (96.1) | 27.7 |
| Acinetobacter baumannii | 629 | 522 (83) | 62.6 | | | | | 185 | 128 (69.2) | 74.2 | | | | 557 | 459 (80.6) | 61.2 | | | | 119 | 102 (85.7) | 37.3 |

**Note:** CAUTI, catheter-associated urinary tract infection; CLABSI, central line-associated bloodstream infection; SSI, surgical site infection; VAP, ventilator-associated pneumonia.

* AMINOS, aminoglycosides (amikacin, gentamicin, tobramycin). Carbapenems are imipenem and meropenem. ESC2, extended-spectrum (ES) cephalosporins (cefpodoxime, ceftriaxone); ESC4, ES cephalosporins (cefpodoxime, ceftriaxone, cefixime, cefpodoxime); FQ2, fluoroquinolones (ciprofloxacin, levofloxacin); FQ3, fluoroquinolones (ciprofloxacin, levofloxacin, moxifloxacin). MDRI, pathogens test as R (resistant) to at least 1 drug in 3 of the 5 following classes; ESC4, FQ3, aminoglycosides, carbapenems, and piperacillin or piperacillin/tazobactam; MDRI2, pathogens must test as R to at least 1 drug in 3 of the 5 following classes; ESC2, FQ2, aminoglycosides, carbapenems, and piperacillin or piperacillin/tazobactam; MDRI3, pathogens must test as R to at least 1 drug in 3 of the 6 following classes: ESC2, FQ2, aminoglycosides, carbapenems, piperacillin or piperacillin/tazobactam, and ampicillin/sulbactam. OX/MET, oxacillin/metincillin; PIP, piperacillin; PIP/TAZ, piperacillin/tazobactam; VAP, ventilator-associated pneumonia.
Urine Specimen Collection
Area of Improvement:
Collection of Urine for Microbiology Culture

- Protocol is nearly universally overlooked in improvement plans
- Major points to address when obtaining urine cultures from urinary catheters:
  - In a patient who is symptomatic, replace the catheter and obtain specimen from the new catheter.
  - Collect sample in an aseptic manner (wash hands, wear gloves).
  - Use a disinfectant to wipe the collection port (*scrub the hub?*).
  - Use a 20ml syringe to collect urine from the sampling port.
  - If facility method is to place the sample in a sterile container, then transport to lab: analysis should take place within 2 hours of collection; if not, place in refrigerator (2-8°C), max 24 hrs.
  - *There is a preferred method of collection!*
- Educate all staff who collect samples for urine culture.
How should we collect urine specimens?

- “If a small volume of fresh urine is needed for examination (i.e. urinalysis or culture), aspirate the urine from the needleless sampling port with a sterile syringe/cannula adaptor after cleansing the port with a disinfectant.” (Category IB)

Unlike intravascular catheters, there is no replaceable connector.

Education on Proper Urine Collection

Available at:
http://www.bd.com/vacutainer/pdfs/urine_wallchart_processingsamples_VS5991.pdf
Preferred Method of Urine Collection

- Use a kit containing a vacutainer tube with preservative (buffered boric acid).

- Viable at room temp up to 48 hrs.

- In order to optimize the yield of bacteria, collect approx. 15ml of urine (to “Min Fill”).

CA-UTI Prevention Recommendations
National Survey on Prevention of UTIs

- Random sample of hospitals with ICUs and >50 beds to determine the extent of prevention practices.
- 119 VA hospitals, 2671 Non-VA hospitals.

Results:
- ~56% of hospitals did not have system for monitoring which patients had urinary catheters.
- ~74% did not monitor catheter duration.
- ~70% did not have established system for monitoring UTI rates.
- Only ~10% used either catheter reminders or stop orders.

Conclusion: no single strategy was widely used for the prevention of nosocomial UTI

What Can We Prevent?

• An estimated **17% to 69% of CA-UTI may be preventable** with recommended infection control measures, which means that up to 380,000 infections and 9000 deaths related to CA-UTI per year could be prevented.¹

• The best quality studies suggest that as many as **70% of all CA-UTIs are preventable** with current evidence-based strategies. CA-UTI may be the most preventable HAI; the number of avoidable infections ranges from 95,483 to 387,550 per year.²

Evidence-based Strategies to Prevent CA-UTI

1. Educate all relevant staff on proper urinary catheter insertion/maintenance.
2. Insert urinary catheters only when necessary.
3. Ensure CA-UTI surveillance is accurate—use standardized definitions and methods.
4. Educate staff on proper urine collection, including the best urine collection products and methods.
5. Consider alternate type urinary catheters.
6. Practice clean procedures for meatal care.
7. Conduct competency to ensure staff are implementing policy components correctly.
8. Implement daily reminders/alerts/stop orders/nurse protocols to initiate catheter removal.
9. Provide feedback to staff on all units.
Lifecycle of the Urinary Catheter

Lifecycle 1: Catheter Placement

1. Use the smallest bore catheter possible.
2. Assure that all staff understand the indications for appropriate insertion.
3. Only trained personnel to insert catheters.
4. Use alternate devices if possible (condom catheters, intermittent catheterization).
When is Urinary Catheterization Appropriate?

- Patient has acute urinary retention or bladder outlet obstruction.
- Need for accurate measurements of urinary output in critically ill patients.
- Peri-operative use for selected surgical procedures:
  - 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 be removed in the PACU).
  - Patients anticipated to receive large-volume infusions or diuretics during surgery.
  - Need for intraoperative monitoring of urinary output.
- To assist in healing of open sacral or perineal wounds in incontinent patients.
- Patient requires prolonged immobilization (e.g., potentially unstable thoracic or lumbar spine, multiple traumatic injuries such as pelvic fractures).
- To improve comfort for end of life care, if needed.

When is Urinary Catheterization Inappropriate?

- 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.
- For prolonged postoperative duration without appropriate indications (e.g., structural repair of urethra or contiguous structures, prolonged effect of epidural anesthesia, etc.).

Area of Improvement: Catheter Use in Emergency Departments

- Analysis of National Hospital Ambulatory Medical Care Survey (NHAMCS) data, ED visits, 1995-2010.
- Examined use of urinary catheters and appropriateness of use based on CDC criteria.
- Results:
  - Urinary catheter use: 2.2 to 3.3 per 100 ED visits.
  - Among admitted patients, 8.5% received urinary catheters.
  - 64.9% of catheters were potentially avoidable.
  - Reasons:
    - Catheters sometimes placed to collect specimens
    - To monitor output
    - Determine residual bladder volume
    - Patient or staff convenience

Recommendations on Urinary Catheter Insertion

- “Perform hand hygiene immediately before and after insertion or any manipulation of the catheter device or site” (Category IB)
- “Ensure that properly trained persons (e.g., hospital personnel, family members, or patients themselves) who know the correct technique of aseptic catheter insertion and maintenance are given this responsibility” (Category IB)
- “In the acute care hospital setting, insert urinary catheters using aseptic technique and sterile equipment” (Category IB)
  - “Use sterile gloves, drape, sponges, an appropriate antiseptic or sterile solution for periurethral cleaning, and a single-use packet of lubricant jelly for insertion” (Category IB)
  - “Routine use of antiseptic lubricants is not necessary” (Category II)
  - “Further research is needed on the use of antiseptic solutions vs. sterile water or saline for periurethral cleaning before catheter insertion” (No recomm.)

“Tips to reduce catheter-associated urinary tract infection”

- Cleanse hands before and after any manipulation of the catheter or site.
- **Do Not** touch anything which is non-sterile once you put on sterile gloves.
- Make sure the tip of the catheter is well lubricated for easy insertion and to help prevent damage to the urethra.
- **Do not** reinsert catheter if first insertion was unsuccessful.
  - If the catheter is inserted into the female patient’s vagina by mistake, leave it there as a marker until a new catheter is properly placed in the urethra.
- Whenever possible, maintain a closed sterile drainage system after insertion.
- Make sure the catheter drains. Verify that tubing is not kinked or twisted.”
Education

“Instruction should never be the endpoint, *Competency* in practice is what matters”
Antimicrobial/Antiseptic Catheters

- “If the CA-UTI rate is not decreasing after implementing a comprehensive strategy to reduce rates of CA-UTI, consider using antimicrobial/antiseptic-impregnated catheters. The comprehensive strategy should include, at a minimum, the high priority recommendations for urinary catheter use, aseptic insertion, and maintenance.” (Category IB)

  - “Further research is needed on the effect of antimicrobial/antiseptic-impregnated catheters in reducing rates the risk of symptomatic UTI, their inclusion among the primary interventions, and the patient population most likely to benefit from these catheters.” (No recommendation/unresolved issue)
Results of 2 Meta-Analysis of Antimicrobial Urinary Catheters

- Review of 12 trials; 13,392 patients.
- No trials addressed symptomatic UTIs.
- Studies limited by number, size, quality of studies.
- These catheters may delay or prevent UTIs in select populations with short-term catheterization.

- Review of 23 trials; 5,236 patients in 22 parallel group trials and 27,878 patients in one large cluster-randomized cross-over trial.
- Silver oxide catheters were of no benefit.
- Silver alloy catheters were found to significantly reduce asymptomatic bacteriuria in short-term catheterized patients (<7d).
- Data was insufficient to determine effect on patients catheterized for longer periods.
Multicenter Study on Impact of Silver-alloy Hydrogel Impregnated Urinary Catheters

- Before/After study on effect of standard non-silver urinary catheters (STD) vs. Silver-alloy hydrogel catheters (SAH) on clinical and CDC NHSN CA-UTI.
- 7 acute care hospitals.
- 453 pre- vs. 450 post-intervention patients.
- No significant changes in indwelling catheter practices or overall catheter usage in the two study time periods.
- 1st study to compare outcomes of Clinical CA-UTI and NHSN-defined CA-UTI.
- Study conducted after NHSN definition revisions.

Results:

Lifecycle 2: Catheter Care

1. Practice routine hygiene of the meatal surface during daily bathing or showering; use of antiseptics is not necessary.
2. Properly secure indwelling catheters after insertion to prevent movement and urethral traction.
3. If breaks in aseptic technique, disconnection, or leakage occur, replace the catheter and collecting system.
4. Maintain unobstructed urine flow: Keep the bag below the level of the bladder, avoid kinking, empty bag regularly.
Meatal Cleansing

- **Emphasis should be to ensure separation of bathing or incontinence cleanup from meatal hygiene, i.e., change gloves and perform hand hygiene**

- **Joint Commission:**
  - “The HCW should take care to wash his or her hands and don a fresh pair of gloves before moving to cleanse the urinary catheter and periurethral area.”

- **CDC:**
  - “Do not clean the periurethral area with antiseptics to prevent CA-UTI while the catheter is in place. Routine hygiene (e.g., cleansing of the meatal surface during daily bathing or showering) is appropriate.”

- **APIC:**
  - “Provide routine hygiene for meatal care.”

- **SHEA:**
  - “Employ routine hygiene; cleaning the meatal area with antiseptic solutions is unnecessary.”

- **AHRQ:**
  - “Routine urethral meatus cleansing with soap and water during bath and after bowel movement.”

- **WOCN:**
  - “Routine perineal care is recommended.”
Secure the Catheter

- “Properly secure indwelling catheters after insertion to prevent movement and urethral traction” - CDC
- Consider using an alcohol impregnated cap on sampling port
Maintain Unobstructed Urine Flow

- "Keep the collecting bag below the level of the bladder at all times; do not place the bag on the floor" – CDC

- What do transporters do in your facility when transporting patients with urinary catheters?
Emptying the Collection Bag

- Some institutions are using mostly kits with urimeters to avoid breaking the seal.

- When do you empty a urine collection bag?

- What is used to empty the urine collection bag?
Emptying the Collection Bag
Lifecycle 3: Catheter Removal

- Implement quality improvement programs or strategies to enhance appropriate use of indwelling catheters and to reduce risk of CA-UTI; examples of programs:
  - Daily reviews of patients with indwelling catheters.
  - Alerts or reminders to identify patients with catheters and assess need for continued catheterization.
  - Stop orders.
  - Guidelines and protocols for nurse-directed removal of unnecessary catheters.

- Replacement of urinary catheters.
Example of Intervention Using Daily Reviews (1)

- **Study Unit**: Med-Surg-Trauma ICU
- **Objective**: reduce CA-UTIs by decreasing use of urinary catheters.
- **Intervention period**: 12 months
- **Team**: Multidisciplinary including staff nurses
- **Methods**: Use of criteria-based urinary catheter guidelines, a decision-making algorithm, and a daily checklist.

- **Results**:
  - Usage – decreased from a mean cath device days of 4.72 vs. 2.98
  - Decrease of 408 catheter-days
  - **CA-UTI rates** – decreased 33%

Example of Intervention Using Daily Reviews (2)

- **Study Unit:** MICU
- **Objective:** reduce CA-UTI by decreasing use of urinary catheters.
- **Intervention period:** 11 months vs. 6 months
- **Methods:** daily evaluation using criteria for appropriate use.
- **Results:**
  - *Usage* – decreased from 311.7 d/mo to 238.6 d/mo
  - *CA-UTI rates* – decreased from 4.7/1000 CD to zero
  - 32% of device-days were considered inappropriate

Example of Intervention Using *Weekly* Reviews (3)

- **Study Unit**: 228-bed hospital
- **Objective**: reduce CA-UTI by decreasing use of urinary catheters.
- **Intervention period**: 6 months
- **Team**: infection control, education, nursing, performance, improvement, risk management, and pharmacy.
- **Methods**: weekly catheter patrols to identify patients with catheters and appropriateness of use.
- **Results**:
  - CA-UTI rates – decreased from 4 CAUTI/mo to zero.

**Examples of Interventions Using Reminders and/or Stop Orders (1)**

11 published studies (with online supp. figure), indicate that the rate of CA-UTI was reduced by 53% with the use of a reminder or a stop order.

Example of Interventions Using a Reminder (2)

- **Study Unit:** 4 hospital wards (2 control, 2 intervention)
- **Objective:** decrease use of urinary catheters.
- **Methods:** A simple written reminder provided to the patient’s clinical team that the patient has a urinary catheter.
- **Results:**
  - 5,678 patients evaluated
  - Control group – avg. proportion of time pts. catheterized increased by 15.1%
  - Intervention group - avg. proportion of time pts. catheterized decreased by 7.6%

Examples of Intervention Using a Reminder (3)

- **Study Unit:** Adult ICUs, Large hospital, Taiwan
- **Objective:** reduce CA-UTIs and decrease use of urinary catheters.
- **Study period:** Nov 2000-Dec 2002
- **Methods:** Nurse-generated daily reminders provided to the physicians to remove unnecessary urinary catheters 5 days after insertion.
- **Results:**
  - 6,297 patients evaluated
  - Avg. duration of catheterization decreased from 7.0d to 4.6d
  - CA-UTI rate – decreased from 11.5/1000 CD to 8.3/1000 CD
  - Monthly cost of antibiotics was reduced by 69%

Huang W-C. Catheter-associated urinary tract infections in intensive care units can be reduced by prompting physicians to remove unnecessary catheters. ICHE 2004;25:974-78.
A Systems (and Technical) Solution: Timely Removal of Indwelling Catheters

- 14 studies have evaluated urinary catheter reminders and stop-orders (written, computerized, nurse-initiated)
  - Significant reduction in catheter use (~2.5 days).
  - Significant reduction in infection (~50%).
  - No evidence of harm (i.e., re-insertion).

Example of a Physician and Nurse-Directed Protocol (1)

- **Study Unit**: 4 general medical units
- **Objective**: reduce CA-UTIs and decrease use of urinary catheters.
- **Intervention period**: 2 periods, one year each
- **Methods**: Computer Physician Online Entry (CPOE) system updating physician of urinary catheter insertion and prompting options for minimizing duration; nurse-directed protocol for removal; use of bladder scanners.

**Results**:
- 81% of catheters inserted in ED; only 22% had physician orders.
- Catheter days – decrease from 892 to 521 to 184.
- CA-UTI rate (per 1000 CD) – decreased from 36 to 19 to 11.
- CA-UTI reduced by 81%.

Example of Intervention Using a Bladder Bundle (1)

- **Study Unit**: 28-bed medical-surgical ICU
- **Objective**: reduce CA-UTIs
- **Intervention Period**: one year
- **Methods**: physician-led multidisciplinary rounds, use of prevention bundles, culture changes with focus on team decision making process.
- **UTI bundle**: regular assessment of continued need, sterile insertion technique, daily perineal care, drainage bag lower than patient’s bladder, secure all catheters, use silver-coated catheters in selected cases.
- **Results**:
  - *Urinary catheter days*: Baseline – 7,691 vs. Study – 5,780
  - *CA-UTI rate (per 1000 CD)*: Baseline – 3.8, Study – 2.4

Example of Intervention Using a Bladder Bundle (2)

- **Study Hospital**: 123-bed Veterans Affairs hospital
- **Objective**: decrease unnecessary urinary catheter use.
- **Intervention Period**: one year
- **Methods**: Soliciting leadership, physicians, and key players to address known intervention processes.
- **UTI bundle**: staff education, system redesign, feedback, dedicated urinary catheter nurse.
- **Results**:
  - Urinary catheter (UC) usage: Baseline – 15% vs. Study – 12%
  - Non-ordered UCs: Baseline – 17.0%, Study – 5.1%
  - Non-indicated UCs: Baseline – 15.0%, Study – 1.2%

Example of Intervention Using a Bladder Bundle (3)

- **Study Hospital**: 30-bed Neurosurgery ICU
- **Objective**: decrease CA-UTI
- **Intervention Period**: 32 months
- **UTI bundle**: avoidance of insertion, product standardization, maintenance of catheter sterility, timely removal of catheters, education.

**Results**:
- **Urinary catheter usage**: Baseline – 100% vs. Study – 73%
- **CA-UTI rate**: Baseline – 13.3%, Study – 4.0%

Lifecycle 4: Catheter Reinsertion

- Consider using a portable ultrasound device in patients undergoing intermittent catheterization to assess urine volume and reduce unnecessary catheter insertions.

- If ultrasound bladder scanners are used, ensure that indications for use are clearly stated, nursing staff are trained in their use, and equipment is adequately cleaned and disinfected in between patients.
“Consider using a portable ultrasound device to assess urine volume in patients undergoing intermittent catheterization to assess urine volume and reduce unnecessary catheter insertions” (Category II)

When do you use the device as an integral part of a CAUTI reduction program?
Integration of Bladder Scanning in Nurse-Driven Protocol

A CA-UTI Reduction Program with Integral Bladder Scanning Protocols

- Study conducted in an SICU
- Pre-study CAUTI rates:
  - Trauma: 10 CA-UTIs per 1000 device days
  - Neurosurgery: 32 CA-UTIs per 1000 device days
  - SICU device utilization rate: 89th percentile
- Intervention: Algorithm incorporating a scoring tool for insertion, daily assessment guide, and...
  - bladder scanner use to assess volume 4 hours after removal
  - use of intermittent catheterization if volume >300 cc
  - if <300cc, scan again in 2 hrs
  - Re-insert if needed to be intermittently cath 2 times
- Results:
  - Urinary catheter utilization rate: decreased from 0.89 to 0.81
  - CA-UTI rate: 10 to 5.4 per 1000 device days

Consensus Across all Guidelines

1. Catheterize only when necessary and only for as long as necessary

2. Insert catheters using aseptic techniques and sterile equipment

3. Maintain closed, sterile drainage system

Implementation Strategies
The “ABCDE Bladder Bundle”

- **A**dherence to general infection control principles (e.g., hand hygiene, surveillance and feedback, aseptic insertion, proper maintenance, education) is important.

- **B**ladder ultrasound may avoid indwelling catheterization.

- **C**ondom catheters or alternatives to indwelling catheter such as intermittent catheterization should be considered.

- **D**o not use the indwelling catheter unless absolutely necessary.

- **E**arly removal of the catheter using a reminder or nurse-initiated removal protocol appears to warranted.

Effectiveness of Bundles (1)

- 28-bed Med/Surg ICU
- 2 year study
- Implemented UTI Bundle:
  - Regular assessment of continued need for catheter.
  - Sterile technique at insertion.
  - Perineal care daily and after bowel movement.
  - Drainage bag lower than patient’s bladder at all times, including transport.
  - Secure all catheters.
  - Use silver coated catheter in selected cases.
- Result:
  - Decrease CA-UTI rate from 3.8 to 2.4 per 1000 catheter-days.

Effectiveness of Bundles (2)

- Minneapolis Veterans Admin. Medical Center
- 123-bed acute care bed facility
- 8 year study
- Implemented UTI Bundle:
  - Staff education including list of appropriate use of catheters
  - Regular assessment of continued need for catheter
  - System redesign including documentation and notices on EMR
  - 72-hr. stop date
  - Maintenance practices
  - Feedback
- Result:
  - Decrease in non-ordered urinary catheters (UC) from 17.0% to 5.1%
  - Decrease in non-indicated UCs from 15% to 1.2%

Rochester VA Medical Center
8 month study
Implemented UTI Bundle:
- Obtain provider order for insertion
- Use appropriate size catheter
- Strict hand hygiene
- Secure catheter
- Assess daily need for continued catheterization; consider alternatives
- Perform pericare daily and after bowel movements
- Keep drainage bag and tubing below level of bladder
- When sending C&S sample, cleanse the port vigorously with alcohol and allow to air dry

Result:
- Decrease of 71% in catheter days
- Decrease of 56% in catheter use

Effectiveness of Bundles (4)

- Shands Hospital, Univ of Florida
- Neuro ICU, 32 month study
- Implemented UTI Bundle:
  - Avoidance of catheter insertion
  - Maintenance of sterility
  - Product standardization
  - Early catheter removal
- Result:
  - Decrease in catheter utilization from 100% to 73.3%
  - Decrease in CA-UTI rate from 13.3 to 4.0 per 1000 CD

**URINARY CATHETER INSERTION AND MAINTENANCE FLOW CHART**

**Patient is admitted to the hospital - Urinary Catheter considered**

- Collaborate with physician criteria needed for urinary catheter insertion
- Discuss alternatives to urinary catheter use* (indicate need for appropriate documentation if urinary catheter still requested)

**Physician order for Urinary Catheter**

- **NO**
  - Does the patient meet criteria for urinary catheter use?
  - Does reason for insertion match clinical status?

**Indicated Criteria:**
- End of life: comfort care
- Epidural / Spinal
- Gross hematuria
- Hip fx & condom catheter can not be used
- Incontinence with possible harm to skin
- Multi-organ failure
- Per Urology order
- Requires continuous, accurate urine volume
- Severe neurologic impairment

**YES**

- Is urinary catheter already in place?

**YES**

- Refer to Chronic Foley Algorithm

**NO**

- Gather equipment needed (Urinary Catheter kit, C&S syringe & tubes as indicated)
  - **YES**
    - Obtain Urine C&S
  
- Select smallest appropriate size Urinary catheter for patient

- Insert Urinary under aseptic technique and appropriate hand hygiene

- Document on Urinary Catheter Insertion in EPR

**Foley Catheter Maintenance**

1. Maintain a sterile, continuous system
2. Maintain unobstructed flow
3. Place urine collection bag at foot of bed and below level of patient’s bladder
4. Education family/visitors to above information (2 & 3)
5. Use clean gloves and empty bag regularly; every 4-6 hours or when noted to be half full
   - Drain urine into separate container under aseptic technique - do not touch inner sides of container with drainage spout
   - When bag is empty, clamp spout and wipe with alcohol or CHG prior to inserting in spout holder
   - Use urine receptacle with cap (best practice)
   - Label urine receptacle with patient’s name and keep by bedside
6. Keep catheter secure with STAT Lock
7. Clean perineum, catheter junction and urinary meatus with soap and water once a day
8. Document maintenance care in EPR

*Alternative to Urinary Catheter Use:
1. External condom catheters for male patients without urinary retention or bladder obstruction
2. Intermittent catheterization several times a day
3. Assessing a patient for urinary retention with bedside bladder ultrasound
4. Assess patient and consider every two hours for:
   - Incontinence / offer the bed pan
   - Bladder distension
   - Turn and reposition
   - Skin turgor
   - Use of protective moisture barrier

**Practices to Avoid:**
1. Irrigating catheters, except in cases of obstruction
2. Disconnecting the catheter from the drainage tubing
3. Replacing catheters routinely in the absence of obstruction or infection
4. Clamping and unclamping of catheters for "bladder training"
5. Use of adult incontinence pads unless patient is ambulatory or up in a chair

**Begin Foley Maintenance Care**

- Discuss daily need to maintain or discontinue with physician

- Indicate physician of care (ID) when task fires to "discuss with MD"
Urinary Catheter Insertion for the Adult Patient

**Steps for Preparation**
1. Gather equipment
2. Check lighting source
3. Identify patient and explain procedure to patient & need to keep knees positioned during procedure
4. Provide privacy—fold linens to foot of bed and cover patient’s lower body with blanket drape
5. Perform hand hygiene
6. Place bed in HIGH position, and lower side rail on working side

**Equipment**
- Disposable urinary catheter kit with appropriate size catheter (size 14-18 Fr) and pre-connected closed-system with urinometer
- Clean gloves
- Blanket or turn sheet for privacy
- Towels, washcloth
- Basin with warm water
- Soap
- Bladder drainage device
- If indicated:
  - Label for urine specimen
  - Biohazard bag for specimen
  - Additional lighting

**Don clean gloves**
Fold linens to foot of bed and cover patient’s lower body with bath blanket drape. Provide perineal care, if necessary with soap and warm water. Dry perineum thoroughly and discard towels and water.

**Dispose of gloves & perform hand hygiene**
- Female patient: Bring knees up and out. Male patient: Knees slightly apart. May need assistance to keep knees in this position. Fold blanket drape to expose perineum. Adjust light source to ensure meatus is adequately visualized.
- Open sterile urinary catheter kit. Place plastic wrap at foot of bed for waste disposal. Open white outer wrap away from sterile package with last turn toward patient. Position pad by holding corners of pad only, creating a sterile field.

**Don sterile gloves**
Remove sterile absorbent pad. Female patient - position plastic side down under patient’s buttocks. Male patient - place first drape over thighs and under penis.

**Test catheter balloon**
- Female patient - place over patient’s perineum.
- Male patient - place over penis.
- Open package and pour antiseptic solution over cotton balls, open lubricant packet - pour onto prep tray. Pick up catheter tip and lubricate the tip of the catheter generously. Place catheter back into sterile tray and move catheter tray close to patient.
- Remove rubber protector and insert tip of prefilled sterile water syringe into catheter side arm to inflate balloon. Inject 10 mL sterile water to inflate balloon to test for integrity. If balloon malfunctions with testing, obtain a new sterile catheter kit. After testing balloon, pull back on plunger to remove fluid and deflate balloon.

**Female Patient**
- Prep meatus: Separate labia minora with non-dominant hand (maintain separation throughout prep). With dominant hand, use forceps to pick up an absorbent ball that has been saturated in antiseptic solution. Cleanse patient’s meatus with one downward stroke of forceps, from least contaminated to most contaminated area. Repeat 3-4 times.
- Using sterile gloved hand, pick up lubricated catheter keeping drainage end in collection container and insert 2 inches or until urine begins to flow.
- Inject entire contents of prefilled (10-30 mL sterile water) syringe into side arm of the catheter used for balloon inflation. Retract the catheter until you feel resistance.
- Attach drainage bag to bed frame
- Place securing device to anterior thigh. Ensure catheter is stabilized without torque or tension to urethra
- Remove all equipment, including gloves and discard.

**Male Patient**
- Hold penis upright with nondominant hand. With dominant hand, use forceps to pick up cotton ball saturated with antiseptic solution. Cleanse meatus with circular stroke using cotton ball. Discard cotton ball into plastic wrap. Repeat 3-4 times.
- Pick up catheter with sterile gloved hand about 8-10 cm (3-4 inches) from tip of catheter. Lift penis to a 90° angle and exert slight traction by pulling upward. Insert catheter about 24.5 cm (10-12 inches). If catheter meets resistance, decrease angle of penis to 45° or less, and ask patient to take a deep breath.
- Place securing device to anterior thigh. Ensure catheter is stabilized without torque or tension to urethra
- Remove all equipment, including gloves and discard.

**Perform hand hygiene**

**Record urine output and document procedure**

**Please Note:** No order, protocol, or guideline can anticipate every clinical circumstance, nor are they meant to substitute clinical assessment and judgment.

Created: 9/2/14
Urinary Catheter Maintenance

**Appropriate Indications for Urinary Catheter**
1. Acute urinary retention / obstruction
2. In the ICU setting: accurate measurement of urinary output of the critically ill patient – **NOTE:** Hemodynamically stable and cooperative patients in the ICU often do not require indwelling urinary catheters for accurate I/O's
3. Selected surgeries (to assess fluid status)
   - Expected prolonged surgery
   - Patient requiring large volume infusions during surgery
   - Necessary intra-operative urinary output monitoring
   - Urologic surgeries or other surgeries of the genitourinary tract or adjacent structures
4. Comfort Care / Palliative Care or Hospice
5. Required Immobilization for trauma or surgery
6. Continuous bladder irrigation
7. Management of hematuria associated with clots
8. Management of patients with neurogenic bladder
9. Assistance with healing of perineal and sacral wounds in incontinent patients. **NOTE:** Used in cases where skin integrity is already compromised and there is concern for worsening skin breakdown. Indwelling urinary catheters are NOT to be used in place of standard skin care treatments including but not limited to prescribed creams, lotions, sprays or dressings
10. Intravesical pharmacologic therapy

**Inappropriate Indications for Urinary Catheter**
1. Incontinence and immobility unless the patient meets criteria as stated above
2. Patient and healthcare worker inconvenience
3. Obtaining urine specimens
4. Dripping

**Alternatives to Indwelling Urinary Catheters**
1. External condom catheters
2. Suprapubic catheter
3. Bladder scanning prior to insertion to determine urinary retention
4. Intermittent catheterization
5. Every 2 hour patient toileting
6. Use of commodes, bedpans and urinals for aid in toileting.
   - **NOTE:** lying in the supine position causes difficulty when attempting to void.
7. When patient experiencing difficulty voiding consider running water.
8. Protective garments

**Use an indwelling catheter ONLY when clinically necessary**
- Address removal of the urinary catheter **DAILY** with the medical team
- Urinary catheter assessment and documentation to be conducted every 8 hours.
- Practice hand hygiene and don clean gloves before handling urinary catheter tubing or collection bag
- Perform meatal and catheter care with soap and water - daily and when needed.
- Ensure securement device is present, intact and applied correctly
- Ensure there are no kinks in the urinary catheter tubing, allowing urine to drain freely.
- Maintain a closed system whenever possible.
  - If the system needs to be separated for irrigation or for inserting medication it must be done under aseptic technique.
  - Maintain the urine collection bag below the level of the bladder at all times. The urine collection bag should not touch the floor
  - **Empty drainage device (bag and urimeter) regularly or at 400 mL**
    - (For the Pediatric patient: every 8 hours or when bag is ½ full)
    - Use a clean container with lid and labeled with patient ID when draining collection bag.
    - When emptying bag ensure spigot does not touch non-sterile container sides
    - Before transporting a patient to another area, empty the collection bag – **DO NOT** place the bag on the bed.

**After caring for urine collection system remove gloves, perform hand hygiene.**

Please Note: No order, protocol or guideline can anticipate every clinical circumstance, nor are they meant to substitute clinical assessment and judgment.

Created: 9/2/14
Is Your Hospital Safe?

Would you want a loved one to be a patient at your hospital? Your unit?

Would you want to be a patient in the unit where you work?

Can you say with 100 percent certainty that you believe that your hospital does everything it can to protect its patients?
Conclusion

“The bulk of the evidence is consistent with the view that multimodal strategies could prevent between 25% and 75% of CA-UTIs.”
Thank you!