Best Practices for Eliminating Catheter-Associated UTI: BEYOND THE CDC GUIDELINES

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Today’s Objectives
- Describe the prevalence and extent of CAUTI events in the United States
- Review Regulatory and quality initiatives associated with the prevention of CAUTI
- Review preventive recommendations as outlines from national quality organizations
- Describe a novel intervention which may affect the occurrence of CAUTIs

The Source of Troubles

Epidemiology
- 4 million Americans per year undergo urinary catheterization
- >500,000 remain indwelling for some time
- About 25% of patients in hospitals and 4.5% of LTC patients will be managed by an indwelling catheter
- CAUTI occurs at a rate of 3% to 10% per day
- Incidence approaches 100% within 30 days
- Approx. 25% of hospital inpatients will have a urinary catheter at some time

Cost of CAUTI
- The CDC has estimated that up to 139,000 hospital onset, symptomatic CAUTIs occurred in 2007, resulting in as much as $131 million in excess direct medical costs
- Each episode of UTI costs between $600-$3803
- UT-related bacteremia, $2800

References:

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Healthcare Acquired Infection Rates

80% of all UTIs are catheter related

CAUTI Rates, NHSN, Jan-Dec 2010

Urinary Catheter Utilization Ratios, NHSN, Jan-Dec 2010


Regulatory: Joint Commission

- New 2012 National Patient Safety Goal:
  - NPSG.07.06.01: Implement evidence-based practices to prevent indwelling catheter-associated urinary tract infections (CAUTI)
- Planning stage: 2012 for adult patients in hospitals
- Full Implementation: start 1/1/13
- EP 2: Insertion –
  - Limiting use and duration to situations necessary for patient care
  - Using aseptic technique for site preparation, equipment and supplies
- EP 3: Management –
  - Securing catheters for unobstructed urine flow and drainage
  - Maintaining the sterility of the urine collection system
  - Replacing the urine collection system when required
  - Collecting urine samples
- EP 4: Measure and Monitor –
  - Monitoring compliance with evidence-based guidelines in best practices
  - Evaluating the effectiveness of prevention efforts

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Initiative: Health and Human Services

Financial: CMS - Show Me the Money!
• In 2007, the Centers for Medicare and Medicaid Services (CMS) announced that under a revised Acute Care Hospital Inpatient Prospective Payment System (IPPS), beginning October 1, 2008, it would no longer reimburse hospitals for costs attributable to CAUTIs.
• Starting in 2014, CMS will publically report rates of CAUTI for hospitals participating in the Hospital Inpatient Quality Reporting Program.

Value-Based Purchasing
• “Value-based Purchasing” is a quality improvement strategy explicitly linking payment with health care outcomes by paying more for better health care and less for inferior care.
• The new regulations enacted by CMS holds institutions financially accountable for failing to prevent complications.

Definition by Duration of Catheterization
• Short-term catheterization
  o Remains indwelling ≤ 2 weeks
  o Commonly used in acute or critical care settings
• Indications
  o Continuous post-surgical bladder drainage
  o Management of acute urinary retention
  o Monitoring urinary output and/or core body temperature in critically ill patient
  o Bladder irrigation & decompression after surgery of urinary tract
  o Transient diversion in patients with non-healing perineal or sacral decubitus

Definition by Duration of Catheterization
• Long-term catheterization
  o Remains indwelling ≥ 4 weeks
  o Commonly used in LTC, chronic care centers, spinal cord injury care centers
• Indications
  o Urethral obstruction or urinary retention that cannot be managed by other means (ablation of obstruction, intermittent catheterization)
  o Urinary incontinence and urinary retention that cannot be managed by other means
  o Promote healing of Stage III-IV Pus owing to UI
  o Bladder management in palliative care setting

Initiative: Institute for Healthcare Improvement – The Improvement Map Campaign

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Asymptomatic Bacteriuria

- Urine is normally sterile
- Bacteriuria is defined by bacteria in the urine and is frequently present without associated UTI
- Colonization of urine occurs quickly after insertion and is nearly 100% affected after 30 days
- Consider bacteriuria as inevitable
- Asymptomatic bacteriuria (no associated symptoms of a UTI) should not be treated in any care setting

Progression of Bacteriuria to UTI

- 10%-25% of patients with bacteriuria will develop signs and symptoms of UTI
- Nearly all patients developing CA-UTI have had biofilm formation of the material surface
- 1%-4% will develop bacteremia

Pathogenesis

- 66% of CAUTI acquired by the extraluminal route: Staph, Enterococcus, yeast
- 34% acquired by the intraluminal route: Gram negatives

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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

Catheter Biofilms

- Biofilms are composed of clusters of microorganisms in a polysaccharide matrix (film 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 antibiotics

Organisms Causing CAUTIs

Antibiotic Resistant Organisms & CAUTIs

Key Questions Prior to Understanding Prevention of CAUTI

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### When is Urinary Catheterization Necessary?

- Patient has acute urinary retention or bladder outlet obstruction
- Need for accurate measurements of urinary output in critically ill patients
- Perioperative use for selected surgical procedures:
  - Patients undergoing urologic surgery or other surgery on contiguous structures of the genitourinary tract
  - Patients anticipated to receive large-volume infusions or diuresis 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

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### 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.)

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### Study on Inappropriate Use (1)

- Review of charts of all patients >65 years of age who were admitted through the Emergency Department during a one month period
- Of the 1,633 patients admitted to the hospital from the ED, urinary catheters were inserted in 379 (23%)
- Only 46% of these catheters were identified as appropriately placed

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### Study on Inappropriate Use (2)

- Prospective study of electronic medical records of 436 patients admitted to an adult medical-surgical unit
- Criteria for appropriate use: urinary retention, urine output monitoring, medication instillation, urinary tract obstruction, neurogenic bladder dysfunction, immediate post-operative management, decubitus ulcer or other wound needing urinary diversion, or comfort care for terminally ill
- Result: 144 patients, 557 catheter days, 31.4% of catheter days were inappropriate

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### What Are Risk Factors for CAUTI?

- **Non-Modifiable (!)**
  - Female sex
  - Age >50
  - Severe underlying disease
  - Nonsurgical disease
  - Diabetes mellitus
  - Serum creatinine >2 mg/dl

- **Modifiable (?)**
  - Duration of catheterization
  - Not maintaining a closed system

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### Prevention Recommendations

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Published Guidelines on Prevention of CAUTI


CDC-HICPAC Guideline Categories

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<thead>
<tr>
<th>Category</th>
<th>Recommendation</th>
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<tr>
<td>IA</td>
<td>A strong recommendation supported by high to moderate quality evidence suggesting net clinical benefits or harms</td>
</tr>
<tr>
<td>IB</td>
<td>A strong recommendation supported by low quality evidence suggesting net clinical benefits or harms or an accepted practice (e.g., aseptic technique) supported by low to very low quality evidence</td>
</tr>
<tr>
<td>IC</td>
<td>A strong recommendation required by state or federal regulation</td>
</tr>
<tr>
<td>II</td>
<td>A weak recommendation supported by any quality evidence suggesting a trade off between clinical benefits and harms</td>
</tr>
<tr>
<td>No rec.</td>
<td>Unresolved issue for which there is low to very low quality evidence with uncertain trade offs between benefits and harms</td>
</tr>
</tbody>
</table>

Appropriate Urinary Catheter Use

- "Insert catheters only for appropriate indications and leave in place as long as needed" (Category IB)
  - Minimize urinary catheter use and duration of use in all patients, particularly those at risk for CAUTI or mortality from catheterization such as women, the elderly, and patients with impaired immunity" (Category IB)

Proper Techniques for 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 III)
  - "Use sterile gloves, drapes, sponges, an appropriate antiseptic or sterile solution for perirethral 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 prior to catheter insertion" (No rec.)

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“Instruction should never be the endpoint, Competency in practice is what matters”

Clinicians Should Assist in Selecting Product

What to Look For in Catheter Products

Package Inserts (Instructions on Aseptic Techniques)

Sample Manufacturer Procedure Statements

- “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.”

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Proper Techniques for Maintenance

- “Following aseptic insertion of the urinary bladder, maintain a closed drainage system” (Category IB)
  - “If breaks in aseptic technique, disconnection, or leakage occur, replace the catheter and collecting system using aseptic technique and sterile equipment” (Category IB)
  - “Consider using urinary catheter systems with preconnected, sealed catheter-tubing junctions” (Category II)

- “Maintain unobstructed urine flow” (Category IB)
  - “Keep the catheter and collecting tube free from kinking” (Category IB)
  - “Keep the collecting bag below the level of the bladder at all times” (Category IB)
  - “Empty the collecting bag regularly using a separate, clean collecting container for each patient; avoid spashing, and prevent contact of the drainage spigot with the nonsterile collecting container” (Category IB)

Major Risk Factor: Level of Placement

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)

Results of 2 Meta-Analysis of Antimicrobial Urinary Catheters

- Review of 12 trials; 13,192 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; 5,336 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

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Implementation Strategies

Key Toolkit Questions

- **Engage**: How will this make the world a better place?
- **Educate**: How will we accomplish this?
- **Execute**: What do I need to do?
- **Evaluate**: How will we know we made a difference?
- **Endure**: How do I know it will last?
- **Expand**: Who else needs to know this?

The “ABCDE Bladder Bundle”

- Adherence to general infection control principles (e.g., hand hygiene, surveillance and feedback, aseptic insertion, proper maintenance, education) is important
- Bladder ultrasound may avoid indwelling catheterization
- Condom catheters or alternatives to indwelling catheter such as intermittent catheterization should be considered
- Do not use the indwelling catheter unless absolutely necessary
- Early removal of the catheter using a reminder or nurse-initiated removal protocol appears warranted


AACN CAUTI Practice Alert


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

- Daily reviews of patients with indwelling catheters
- Standardized reminders
- Automatic stop orders
- Nurse-directed protocols to discontinue catheters

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Examples of CAUTI Reduction Strategies (1)

- **Study Unit:** Med-Surg-Trauma ICU
- **Objective:** reduce CAUTI by decreasing use of urinary catheters
- **Intervention period:** 12 mos
- **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
  - CAUTI rates: decreased 33%


Examples of CAUTI Reduction Strategies (2)

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


Examples of CAUTI Reduction Strategies (3)

- **Study Unit:** 228-bed hospital
- **Objective:** reduce CAUTI by decreasing use of urinary catheters
- **Intervention period:** 6 mo
- **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:**
  - CAUTI rates: decreased from 4 CAUTI/mo to zero


Examples of CAUTI Reduction Strategies (4)

- **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 CAUTI Reduction Strategies (5)

- **Study Unit:** Adult ICUs, Large hospital, Taiwan
- **Objective:** reduce CAUTIs 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
  - CAUTI 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. JAMA 2004;291:57-59.

Examples of CAUTI Reduction Strategies (6)

- **Study Unit:** 4 general medical units
- **Objective:** reduce CAUTIs and decrease use of urinary catheters
- **Intervention period:** 2 periods, one year each
- **Methods:** 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 caths inserted in ED; only 22% had physician orders
  - Catheter days: decrease from 892 to 521 to 184
  - CAUTI rate (per 1000 CD): decreased from 36 to 19 to 11
  - CAUTI reduced by 81%

Examples of CAUTI Reduction Strategies (7)

- **Study Unit**: 2 units, medical-cardiology (VA med ctr)
- **Objective**: decrease use of urinary catheters
- **Intervention period**: 8 weeks each unit; cross-over study
- **Methods**: computer-based order for insertion, computer-generated reminders to remove catheters
- **Results**:
  - 29% of patients on control ward had orders vs. 92% in study group
  - Catheter days – Control: 8 vs. Study group: 3
  - No enough study power to detect CAUTI difference


Examples of CAUTI Reduction Strategies (8)

- **Study Unit**: 3 hospitals, Ontario, Canada
- **Objective**: reduce CAUTIs and decrease use of urinary catheters
- **Design**: patients with urinary catheters randomized to stop orders for removal of catheters if specified criteria were not present or to usual care
- **Results**:
  - 692 patients in the study
  - Inappropriate catheter days: Control – 3.89 vs. Study group – 2.20
  - Total catheter days: Control – 5.04 vs. Study group – 3.70
  - CAUTI rate: Control – 19%, Study – 20%


Examples of CAUTI Reduction Strategies (9)

- **Study Unit**: 28-bed medical-surgical ICU
- **Objective**: reduce CAUTIs
- **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
  - CAUTI rate (per 1000 CD): Baseline – 3.8, Study – 2.4


Conclusion

“The bulk of the evidence is consistent with the view that multimodal strategies could prevent between 25% and 75% of catheter-associated urinary tract infections”


National Survey on Prevention of UTIs

- **Ransom 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
  - 75% 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


Process Measures: Compliance with documentation of indication for catheter placement

- Conduct random audits of selected units and calculate compliance rate.
  - **Numerator**: number of patients with urinary catheters on the unit with proper documentation of indication.
  - **Denominator**: number of patients on the unit with a urinary catheter in place.
  - Multiply by 100 so that the measure is expressed as a percentage.

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Assessing the Need for a Catheter

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<th>UNIT</th>
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<th>Room/Bed</th>
<th>Patient #</th>
<th>Cath Present?</th>
<th>Need</th>
<th>Indication</th>
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*Note: Rem.: removed; 0=No; 1=Yes
**Indication: 1-urinary tract obstruction, 2-neurogenic bladder, 3-prenatal study/treatment, 4-stage 5 or 6 renal failure, 5-discharge related care/palliative, 6-urology, 7=ICU, 8=pediatric patient, 9=incidence not criterion, 10=other.

Novel Strategy

Is a Bath Basin a Source of Pathogens Implicated in Causing HAI’s?

Study on Bath Basin Removal and Effect on CAUTI

Background

- Study conducted at a non-profit, 370-bed facility in Suffern, NY, providing emergency, medical, surgical, obstetrical, gynecological and acute care services
- CA-UTI rates were at 6.35 per 1000 Foley-catheter days for the hospital in 2008
- Implemented bundle October 2008
- Decision made to remove bath basins in 2 med-surg units
- Replaced with pre-packaged wash cloths

Results

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Results

Summary of Strategies
- Insert catheters only when necessary
- Consider alternate type catheters
- Assess urinary catheter prevalence
- Establish evidence-based policy reflecting currently used products
- Educate all relevant staff on proper insertion/maintenance
- Conduct competency to ensure staff are implementing policy components
- Analyze data on rates and utilization based on established definitions; provide feedback to staff on all units
- Implement reminders/nurse protocols for catheter removal
- Consider limiting exposure to potentially contaminated environmental sources such as wash basins

Recommended Reading

Thank you!