Reducing Catheter-associated Urinary Tract Infections

HIMSS Enterprise Davies Award Site Visit

Shelley Knowlson, MS, RN, CCRN, ACCNS-AG
Michelle Doll, MD, MPH

August 21, 2018
Introduction

• Why CAUTI
• VCU baseline (pre-intervention)
• IT collaboration
• Interventions
• Current projects
• Results
• Impact
• Lessons learned
Local Problem
Reducing Catheter-associated Urinary Tract Infections (CAUTI)

• Why CAUTI
• VCU baseline (pre-intervention)
• IT collaboration
• Interventions
• Current projects
• Results
• Impact
• Lessons learned
Why CAUTI?

Patient impact
• Most common healthcare-associated infection (HAI)
• Accounts for more than 30% of all HAIs
• Most catheters inserted are unnecessary
• 13,000 deaths associated with UTIs each year
• Leading cause of secondary blood stream infections
• Antibiotic resistance

National focus
• One of the first HAI selected for non-payment by Medicare
• 2016 HHS national goal to reduce CAUTI by 25% by 2020
Why CAUTI?

Financial impact

- CDC national economic burden of $340 million annually
- $1,000 is average cost associated with CAUTI
- 2018 study put national cost closer to $1.7 billion\(^1\)
- AHRQ has additional cost for hospital-onset CAUTI at $13,793\(^2\) per event
- Increased length of stay
- 2-4 extra hospital days\(^3\) per CAUTI event
- Mortality: attributed to 36 deaths per 1,000 CAUTI\(^4\)

Design and Implementation
Reducing Catheter-associated Urinary Tract Infections

- Why CAUTI
- VCU baseline (pre-intervention)
- IT collaboration
- Interventions
- Current projects
- Results
- Impact
- Lessons learned
CAUTI Baseline Data – Adult ICUs 2012

- 74 CAUTIs in 2012
- 68% (74/108) device associated HAI due to CAUTI
- CAUTI rate 3.1 per 1000 device days
How Health IT Was Used
Reducing Catheter-associated Urinary Tract Infections

• Why CAUTI
• VCU baseline (pre-intervention)
• **IT collaboration**
• Interventions
• Current projects
• Results
• Impact
• Lessons learned
Collaboration with IT

- Department-based IT liaison
- Information and Documentation Technology Committee (IDTC)
- Enterprise analytics team
Reducing Catheter-associated Urinary Tract Infections

- Why CAUTI
- VCU baseline (pre-intervention)
- IT collaboration
- **Interventions**
- Current projects
- Results
- Impact
- Lessons learned
Timeline of Interventions for CAUTI Reduction

2013
- Creation of hospital policy to address insertion, maintenance, indications for use, and nurse-driven protocol for removal of unnecessary catheters
- EMR documentation section added in iView for nursing to document daily assessment of need for urinary catheter

2014
- Infection prevention begins monthly audit and feedback of urinary catheter daily assessment of need compliance

2015
- EMR documentation in iView revised for Nursing documentation - new drop-down fields for urinary catheter necessity criteria
- Reference hyperlink added into iView for end-users to review policy indications for appropriate criteria

2016
- EMR order set created for providers – must enter order for catheter, include indication for need, order for continuation of catheter after 72-hour removal
- EMR generated automatic order for nurses to discontinue urinary catheter 72 hours after insertion

2017
- Urine test stewardship beings in adult ICUs (assisted with Enterprise Analytic report)
- ICU Panculture Power Orders adjusted to remove UA with reflex as preselected item
- Updated intermittent catheterization algorithm hyperlinked into iView

2018
- EMR decision support for urine culture testing to align practice with IDSA/SCCM guidelines (in progress)
- Care Compass task to fire to remind nurses to remove urinary catheter at 72-hour mark (in progress)
CAUTI Bundle

2013
- Maintenance
  - Review for necessity
  - Maintain a closed system
  - Unobstructed flow
  - Hand hygiene

2015 & 2016
- Insertion
  - Only for appropriate indications
  - Only properly trained personnel to insert/maintain
  - Aseptic technique and sterile equipment
  - Consider alternatives

2016
- Removal
  - Leave in place only as long as needed

Clinician Awareness

- Safety dashboard – lines and tubes
- Provider sign-out tool includes lines and tubes
Daily Assessment of Need – Nursing Documentation

2013 – Policy development for indwelling urinary catheters (UC)
- Insertion criteria
- Daily RN documentation of need
- Intermittent catherization algorithm
Daily Review for Necessity

Point prevalence surveillance

- IT support daily through Enterprise Analytics Report

### UC Daily Review for Medical Necessity ICUs

<table>
<thead>
<tr>
<th>Year</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>98%</td>
<td>82%</td>
<td>84%</td>
<td>86%</td>
<td>88%</td>
</tr>
<tr>
<td>96%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>94%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>92%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>88%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>86%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>84%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>82%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
iView Urinary Catheter Documentation

- Added drop-down menu of approved indications for UC
- Policy hyperlinked

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td></td>
</tr>
</tbody>
</table>

![Image of Urinary Catheter Documentation]
Provider Order Entry

Provider must enter order for insertion

With an approved indication

Detail statement maintains independent RN removal, per policy
Automated Removal Order

When nurses create the Foley catheter band, an automated removal order is generated for 72 hours after insertion.
Provider Alerts

24 hours after UC has been inserted, providers receive an alert
• Remove catheter as ordered (72 hours)
• Remove catheter immediately (*new order fires to remove*)
• Continue use after 72 hours
Alert will fire every 24 hours if details are not entered for continuation.
Provider Continuation Order

Order details:
- **Continuation Indication**: [Hemodynamically unstable]
- Reason for Chronic Foley: type-in
- Special instructions
- Special instructions: type-in [Continue Foley ...]
- Continue Foley another
- Continue Foley until?
- Requested Start Date/Time: 10/15/15 8:12:00

Detail values:
- Anatomically unstable
- Chemically paralyzed or heavily sedated
- Hemodynamically unstable
- Incontinent associated dermatitis
- Patient comfort end of life care
- Required for medical condition
- St 3/4 press ulcer worse by incontinence
- Strict I and O active fluid management
- Urinary obstruction
- Urinary Retention

- **Continuation Indication**: [Hemodynamically unstable]
- Reason for Chronic Foley: type-in
- Special instructions
- Special instructions: type-in [Continue Foley ...]
- Continue Foley another
- Continue Foley until?
- Requested Start Date/Time: 10/15/15 8:12:00

Detail values:
- (None)
- 24 hours
- 48 hours
- 72 hours
- Indefinite

2013

2014

2015

2016

2017

2018
Updated Intermittent Catheterization Algorithm Embedded into iView

**Assessment for Adequate Bladder Emptying - ADULTS**

**Does patient meet criteria for indwelling urinary catheter?**

(See section 1.1 of hospital policy for appropriate indications)

- Yes: Maintain urinary catheter & assess daily
- No: Remove Catheter
  - Monitor for new onset tachycardia, tachypnea, diaphoresis & restlessness
  - Offer toileting every 2 hours

**Document urinary catheter necessity daily**

**CONFIRM BLADDER EMPTYING for 2 consecutive voids. Is BS PVR <200mL?**

- Yes: BS/PVR every 4 hours for 24 hours
- No: BS/PVR >400mL
  - If pt requires intermittent catheterization for a second time, notify provider
  - Intermittent catheterization every 4 hours
  - BS/PVR >400mL
    - Repeat BS in 2-4 hours (consider intake volume) & initiate prompted voiding
    - BS/PVR <400mL
      - BS/PVR >400mL
        - BS/PVR <400mL

**KEY**

SC = Straight Cath
BS = Bladder Scan
PVR = Post void Residual
UO = Urine Output
UR = Urinary Retention

**WARNING:**

1. Notify the provider prior to discontinuation for any patient whose urinary catheter placement was difficult or surgically placed.
2. Renal patients or patients on hemodialysis may not be appropriate for this algorithm. Please consult with provider for appropriate PVR and time to SC.
3. Ensure provider is notified if the patient requires more than one intermittent catheterization.
4. Use caution with patients in a hypercoagulable state.
5. This algorithm should not replace Clinical Judgment. If there is a question regarding a specific patient scenario please discuss with provider team.
6. This is an adult algorithm only.

**A single high BS volume is not a reason to reinsert an indwelling catheter. Early reinsertion will further decondition the bladder.**

Consider patient's daily intake volume, discuss with provider medications to assist with retention/flow (e.g., Flomax)

**Repeat BS and intermittent catheterization every 4 hours until:**

- Patient voids spontaneously
- After 48hrs at which time reinset indwelling catheter for 24hurs & restart algorithm. Consider Urology consultation.

---

**VCU Health**

August 21, 2018
Urine Test Stewardship – Adult ICUs

- Reduce unnecessary urine testing
- Test only patients at high risk for invasive infection
  - Kidney transplant
  - Neutropenic
  - Recent GU surgery
  - History or evidence of urinary obstruction

Urine Test Stewardship – Adult ICUs

ICU pan culture order set

ICU: Pan Culture Labs (Initiated Pending)

- Blood Culture (Culture, Blood)
- Blood Culture (Culture, Blood)

- Select the following UA with reflex order if patient meets one of the following criteria:
  - Kidney transplant recipient
  - Neutropenia
  - Recent GU surgery
  - Evidence of urinary obstruction

- UA Stat w/ mic on Pos reflex Ur Culture
- Respiratory Culture
# Dashboard for Adult ICU Urine Cultures

## March 2018

<table>
<thead>
<tr>
<th>2017 Baseline Urine Culture rates p/100 device days</th>
<th>CICU</th>
<th>CSICU</th>
<th>MRICU</th>
<th>NSICU</th>
<th>STICU</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017 Baseline</td>
<td>23.0</td>
<td>10.4</td>
<td>21.4</td>
<td>23.0</td>
<td>17.8</td>
<td>19.6</td>
</tr>
<tr>
<td>2018 Goal 20% reduction</td>
<td>18.4</td>
<td>8.6</td>
<td>17.1</td>
<td>18.4</td>
<td>14.2</td>
<td>15.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2018 Urine Culture rates p/100 device days</th>
<th>CICU</th>
<th>CSICU</th>
<th>MRICU</th>
<th>NSICU</th>
<th>STICU</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>25.7</td>
<td>11.8</td>
<td>15.1</td>
<td>29.7</td>
<td>15.4</td>
<td>19.5</td>
</tr>
<tr>
<td>February</td>
<td>27.3</td>
<td>15.4</td>
<td>17.8</td>
<td>24.1</td>
<td>14.6</td>
<td>19.8</td>
</tr>
<tr>
<td>March</td>
<td>24.2 ▼</td>
<td>8.0 ▼</td>
<td>18.0 □</td>
<td>28.4 ▲</td>
<td>17.5 ▲</td>
<td>19.2 □</td>
</tr>
<tr>
<td>April</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>June</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>July</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aug</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Recommendation:** use ACCCM/IDSA Guidelines for new fever work-up.

**Obtain urine cultures only in patients at high risk for invasive infection:**
- Kidney transplant recipients
- Neutropenia
- Recent GU surgery
- Patients with evidence of Urinary obstruction

---

August 21, 2018
Reducing Catheter-associated Urinary Tract Infections

- Why CAUTI
- VCU baseline (pre-intervention)
- IT collaboration
- Interventions
- Current projects
- Results
- Impact
- Lessons learned
Urine Test Stewardship - EMR decision support

- Urine culture (UA with reflex) should NOT routinely be ordered 48 hours AFTER admission, unless there is a valid indication
  - **DO NOT ORDER culture**
    - Pregnancy
    - Fever in neutropenia
    - Fever with kidney transplant
    - Fever with known urinary obstruction/indwelling stent
    - Fever with recent urological procedure
    - Fever with classic UTI signs
      - Unexplained flank/suprapubic pain
      - Dysuria
    - Spinal cord injury with **new** or **worsening** urinary symptoms
    - Order culture for another reason not listed
Care Compass – Task for Removal
Value Derived
Reducing Catheter-associated Urinary Tract Infections

- Why CAUTI
- VCU baseline (pre-intervention)
- IT collaboration
- Interventions
- Current projects
- **Results**
- Impact
- Lessons learned
UC Standardized Utilization Ratio (SUR)  
2015-present

- Prevented **5,160 catheter days**
- Average **191 catheter days per month** prevented since automated removal orders

2015 RN documentation  
2016 provider orders & automatic removal  
2017 UCX test stewardship  
2018
### Automatic 72-hour Removal Orders

![Graph showing CAUTI rates pre- and post-implementation](image)

**CAUTI Rates Pre- & Post-implementation of EMR-generated Automatic Discontinuation**

<table>
<thead>
<tr>
<th></th>
<th>CAUTI Rate*</th>
<th>Standardized Infection Ratio</th>
<th>P-Value**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-implementation</td>
<td>1.34</td>
<td>0.77</td>
<td></td>
</tr>
<tr>
<td>Post-implementation</td>
<td>0.81</td>
<td>0.47</td>
<td>0.0083</td>
</tr>
</tbody>
</table>

Table 1: Mean CAUTI rates and standardized infection ratios for pre- (15 months) and post (15 months)-implementation

*Rates per 1,000 catheter days

**Two-proportion Z-test comparing CAUTI rate means
CAUTI Results – Adult ICUs

- 74 CAUTIs
- 68% (74/108) device-associated HAI due to CAUTI
- CAUTI rate=3.1 per 1,000 device days

- 24 CAUTIs
- 26% (24/93) device-associated HAI due to CAUTI
- CAUTI rate=1.2 per 1,000 device days

61% reduction in CAUTI rate

* Definition change for VAE
### VCUHS CAUTI Rates 2013-2017

**57% reduction in CAUTI rate (2017 vs. 2013)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of CAUTI (n)</th>
<th>CAUTI Rate per 1,000 catheter days</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>100</td>
<td>2.11</td>
</tr>
<tr>
<td>2014</td>
<td>112</td>
<td>2.44</td>
</tr>
<tr>
<td>2015</td>
<td>59</td>
<td>1.34</td>
</tr>
<tr>
<td>2016</td>
<td>44</td>
<td>1.02</td>
</tr>
<tr>
<td>2017</td>
<td>40</td>
<td>0.90</td>
</tr>
</tbody>
</table>

- **2013 EMR RN documentation**
- **2014 RN documentation audits**
- **2015 RN documentation**
- **2016 provider orders & automatic removal**
- **2017 UCX test stewardship**
Prevented 109 CAUTIs

VCUHS CAUTI Standardized Infection Ratio (SIR)
2013-2018 ytd

CAUTI SIR (Observed:Expected)

<table>
<thead>
<tr>
<th>Quarter</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIR</td>
<td>0.83</td>
<td>1.15</td>
<td>0.72</td>
<td>0.7</td>
<td>0.87</td>
<td>0.87</td>
</tr>
<tr>
<td>Benchmark</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

SIR = 1: Observed and expected infections are equal
SIR > 1: Observed infections exceed the number expected
SIR < 1: Observed infections are less than expected

August 21, 2018
Urine Test Stewardship – Adult ICUs

- Analysis of ICU pan culture order change
- 3 months pre-/post-intervention testing fidelity
- Significant improvement in test fidelity (P-value 0.0074)
- 18% reduction in testing in June

### 2017 Baseline Urine Culture rates p/100 device days

<table>
<thead>
<tr>
<th></th>
<th>CICU</th>
<th>CSICU</th>
<th>MRICU</th>
<th>NSICU</th>
<th>STICU</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017 Baseline</td>
<td>23.0</td>
<td>10.4</td>
<td>21.4</td>
<td>23.0</td>
<td>17.8</td>
<td>19.6</td>
</tr>
<tr>
<td>2018 Goal  20% reduction</td>
<td>18.4</td>
<td>8.6</td>
<td>17.1</td>
<td>18.4</td>
<td>14.2</td>
<td>15.7</td>
</tr>
</tbody>
</table>

### 2018 Urine Culture rates p/100 device days

<table>
<thead>
<tr>
<th></th>
<th>CICU</th>
<th>CSICU</th>
<th>MRICU</th>
<th>NSICU</th>
<th>STICU</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>25.7</td>
<td>11.8</td>
<td>15.1</td>
<td>29.7</td>
<td>15.4</td>
<td>19.5</td>
</tr>
<tr>
<td>February</td>
<td>27.3</td>
<td>15.4</td>
<td>17.8</td>
<td>24.1</td>
<td>14.6</td>
<td>19.8</td>
</tr>
<tr>
<td>March</td>
<td>24.2</td>
<td>8.0</td>
<td>18.0</td>
<td>28.4</td>
<td>17.5</td>
<td>19.2</td>
</tr>
<tr>
<td>April</td>
<td>31.8</td>
<td>7.5</td>
<td>14.9</td>
<td>23.5</td>
<td>12.0</td>
<td>17.9</td>
</tr>
<tr>
<td>May</td>
<td>25.3</td>
<td>11.1</td>
<td>16.5</td>
<td>18.2</td>
<td>12.8</td>
<td>16.8</td>
</tr>
<tr>
<td>June</td>
<td>22.1 ▼</td>
<td>10.2 ▼</td>
<td>16.8 ▼</td>
<td>14.9 ▼</td>
<td>15.9 ▲</td>
<td>16.0 ▼</td>
</tr>
<tr>
<td>July</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aug</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

One CAUTI in JUNE for these units!!!
Reducing Catheter-associated Urinary Tract Infections

• Why CAUTI
• VCU baseline (pre-intervention)
• IT collaboration
• Interventions
• Current projects
• Results
• Impact
• Lessons learned
Estimated Impact

- Currently a Top 10 Vizient performer for CAUTI
- 61% reduction in ICU CAUTI since 2012
- 50% reduction in non-ICU CAUTI since 2012

Since 2015
- Reduced catheter days: 5,160
- CAUTIs prevented: 109
- Prevented 4 deaths
- Cost savings estimate: $10,900-$1.5 million
- Reduction in number of beds used: 218
- Gained additional 36-72 hospital admissions
Reducing Catheter-associated Urinary Tract Infections

- Why CAUTI
- VCU baseline (pre-intervention)
- IT collaboration
- Interventions
- Current projects
- Results
- Impact
- Lessons learned
Lessons Learned

- Have all stakeholders at table in beginning
- Start with automated removal orders
- Data drives quality improvement
- Feedback and support essential
- Leveraging IT through EMR decision support impacts change
- Make it easy to do right thing
- Make decision support tools that help end user