Reducing Catheter-Associated Urinary Tract Infections

Session #299, February 15, 2019

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Conflict of Interest

Colin Banas, MD, MSHA
Shelley Knowlson, MS, RN, ACCNS-AG

No real or apparent conflicts of interest to report.
Agenda

• Why CAUTI
• VCUHS baseline (pre-intervention)
• Interventions
• Results
• Impact
• Lessons learned
Learning Objectives

• Recognize patient and organizational impacts associated with catheter-associated urinary tract infections (CAUTI)
• Identify evidence-based guidelines that have been shown to decrease incidence of CAUTI
• Understand the important role Information Technology has in reducing hospital acquired infections including CAUTI
Agenda

• Why CAUTI
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• 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 puts national cost closer to $1.7 billion\(^1\)
- AHRQ cost for hospital-onset CAUTI $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\(^4\)

Agenda

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- VCUHS baseline (pre-intervention)
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- 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
Agenda

• Why CAUTI
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Timeline of Interventions

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 begins 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
• Care Compass task to fire to remind nurses to remove urinary catheter at 72-hour mark
CAUTI Bundle

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

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

Removal
- Leave in place only as long as needed

Clinician Awareness

Safety Dashboard

<table>
<thead>
<tr>
<th>Line/Line</th>
<th>Inserted</th>
<th>Days Since Insertion</th>
<th>LAST WEIGHT</th>
<th>SKIN RISK</th>
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<tbody>
<tr>
<td>Arterial Line Right Radial artery</td>
<td>07/27/2018</td>
<td>4</td>
<td>0 days</td>
<td>![Icon]</td>
</tr>
<tr>
<td>Orogastric</td>
<td>Date Not Documented</td>
<td></td>
<td>0 days</td>
<td>![Icon]</td>
</tr>
<tr>
<td>Pulmonary artery catheter Right Neck</td>
<td>07/27/2018</td>
<td>4</td>
<td>0 days</td>
<td>![Icon]</td>
</tr>
<tr>
<td>Cordis Right Neck</td>
<td>07/27/2018</td>
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<td>0 days</td>
<td>![Icon]</td>
</tr>
<tr>
<td>Chest tube</td>
<td>Date Not Documented</td>
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<td>0 days</td>
<td>![Icon]</td>
</tr>
<tr>
<td>Foley catheter</td>
<td>07/27/2018</td>
<td>4</td>
<td>0 days</td>
<td>![Icon]</td>
</tr>
<tr>
<td>Peripheral access Left Forearm</td>
<td>07/26 Safety Dashboard</td>
<td>5</td>
<td>8 days</td>
<td>![Icon]</td>
</tr>
</tbody>
</table>

Provider sign-out tool
- includes lines and tubes
2013 – Policy development for urinary catheters (UC)

- Insertion criteria
- Daily RN documentation of need
- Intermittent catheterization algorithm
Point prevalence surveillance

- IT support daily through Enterprise Analytics Report

<table>
<thead>
<tr>
<th>Patient</th>
<th>MRN</th>
<th>Date</th>
<th>Med Svc</th>
<th>Unit Date</th>
<th>Bed Days</th>
<th>Central Line</th>
<th>PICC</th>
<th>Fem</th>
<th>UC</th>
<th>FOLEY</th>
<th>Vent</th>
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<tr>
<td>08/09/18</td>
<td>IP-Cardiac Surgery</td>
<td>08/09/2018</td>
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<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
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<tr>
<td>08/09/18</td>
<td>IP-Cardiac Surgery</td>
<td>07/24/2018</td>
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<td></td>
</tr>
<tr>
<td>08/09/18</td>
<td>IP-Thoracic</td>
<td>08/07/2018</td>
<td>3</td>
<td>1</td>
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<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td></td>
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<tr>
<td>08/09/18</td>
<td>IP-Cardiac Surgery</td>
<td>08/04/2018</td>
<td>6</td>
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<td>1</td>
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<td>1</td>
<td>1</td>
<td></td>
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</tr>
<tr>
<td>08/09/18</td>
<td>IP-Cardiac Surgery</td>
<td>08/09/2018</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sum: 5 0 1 0 4 5

UC Daily Review for Medical Necessity ICUs

- 2014: 82%
- 2015: 84%
- 2016: 86%
- 2017: 88%
- 2018: 90%
- 2019: 92%
- 2020: 94%
- 2021: 96%
- 2022: 98%
### iView Urinary Catheter Documentation

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

<table>
<thead>
<tr>
<th>Foley catheter 08/9/...</th>
<th>Meets criteria for Catheter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urine Color</td>
<td>Yellow</td>
</tr>
<tr>
<td>Urine Description</td>
<td>Clear</td>
</tr>
<tr>
<td>Urine Odor</td>
<td>Odorless</td>
</tr>
<tr>
<td>Voiding</td>
<td></td>
</tr>
<tr>
<td>Comment, Urine Out...</td>
<td></td>
</tr>
<tr>
<td>Catheter Reviewed F...</td>
<td></td>
</tr>
<tr>
<td><em>Meets Criteria for Catheter</em></td>
<td></td>
</tr>
<tr>
<td>Urinary Catheter Verify...</td>
<td></td>
</tr>
<tr>
<td>Urinary Catheter Comments...</td>
<td></td>
</tr>
<tr>
<td>Integumentary</td>
<td></td>
</tr>
<tr>
<td>Integumentary System Reasoning...</td>
<td>No change...</td>
</tr>
<tr>
<td>Skin Integrity Head</td>
<td></td>
</tr>
<tr>
<td>Skin Integrity Torso</td>
<td></td>
</tr>
<tr>
<td>Skin Integrity Pelvic Region</td>
<td></td>
</tr>
<tr>
<td>Skin Integrity Extremities</td>
<td></td>
</tr>
<tr>
<td>Nsg Comment, Integ</td>
<td></td>
</tr>
<tr>
<td>SCT Braden Assessment</td>
<td></td>
</tr>
</tbody>
</table>

- Stage III/IV pressure ulcers with incontinence
- Urinary obstruction
- Strict intake and output
- Surgical procedure
- Medical condition
- Patient comfort - end of life care
- Urinary retention
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
Provider Continuation Order

Alert will fire every 24 hours if details are not entered for continuation.
### Provider Continuation Order

**Foley Catheter Continuation**

**Details for Foley Catheter Continuation**

<table>
<thead>
<tr>
<th>Order details</th>
<th>Detail values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Continuation Indication</strong> [Hemodynamically unstable]</td>
<td>Anatomically unstable</td>
</tr>
<tr>
<td>Reason for Chronic Foley: type-in</td>
<td>Chemically paralyzed or heavily sedated</td>
</tr>
<tr>
<td>Special instructions</td>
<td><strong>Chronic Foley (add reason in type-in)</strong></td>
</tr>
<tr>
<td>Special instructions: type-in</td>
<td>Hemodynamically unstable</td>
</tr>
<tr>
<td><strong>Continue Foley until?</strong></td>
<td>Incont associated dermatitis</td>
</tr>
<tr>
<td>Requested Start Date/Time [10/15/15 8:12:00]</td>
<td>Patient comfort end of life care</td>
</tr>
<tr>
<td></td>
<td>Required for medical condition</td>
</tr>
<tr>
<td></td>
<td>St 3/4 press ulcer worse by incontinence</td>
</tr>
<tr>
<td></td>
<td>Strict I and O active fluid management</td>
</tr>
<tr>
<td></td>
<td>Urinary obstruction</td>
</tr>
<tr>
<td></td>
<td>Urinary Retention</td>
</tr>
</tbody>
</table>

**Order details**

- **Continue Foley until?**
- Requested Start Date/Time [10/15/15 8:12:00]
Updated Intermittent Catheterization Algorithm Embedded into iView

Assessment for Adequate Bladder Emptying - ADULTS

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 patients daily intake volume.
Discuss with provider medications to assist with retention/flow (ie: Foma)
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

- 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

## Urine Culture Stewardship Dashboard

**June 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>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25.7</td>
<td>27.3</td>
<td>24.2</td>
<td>31.8</td>
<td>25.3</td>
<td>22.1</td>
<td>10.2</td>
<td>16.8</td>
</tr>
</tbody>
</table>

*One CAUTI in JUNE for these units!!!*

**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

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* Updated

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[For additional information:]
- O’Grady NP et al. *Crit Care Med*; 2008 Jun; 36(4): 1330-1349 DOI: 10.1097/CCM.0b013e31816b0e49
Urine Culture Alert

Urine Culture (UA w/reflex) should NOT be routinely ordered 48 hours AFTER admission UNLESS there is a valid indication. Valid indications are listed below.

Select an appropriate indication to test, or action from the list below:

- DO NOT ORDER culture

Order Culture due to:

- Pregnancy
- Fever in neutropenia
- Fever with a kidney transplant
- Fever with known urinary obstruction/indwelling stent
- Fever with a 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 (Please enter reason)
Care Compass – RN Task for Removal

New Foley Removal Task for Nursing

Starting November 26, 2018 there will be a new task associated to the Foley removal order. This is to provide additional reminders for nursing to remove the Foley. The task will be generated when the Foley removal is ordered and will be dated/time based on the details in the order.

The tasks will be displayed on care compass under scheduled/unscheduled. To complete the task, nursing will select the task and document "Done" and the task will no longer appear on care compass.

The tasks will become overdue after 8 hours from the removal time indicated on the order.

The task will be retained for 24 hours, meaning after 24 hours, if not completed, the task will drop off of Care Compass.

*Updated*
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UC Standardized Utilization Ratio (SUR) 2015 - 2018

- Prevented 6,298 catheter days
- Average 191 catheter days p/month prevented since automated removal orders
Automated 72-hour Removal Orders

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

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

*Rates per 1,000 catheter days

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

### 2012
- 74 CAUTIs
- 68% (74/108) device-associated HAI due to CAUTI
- CAUTI rate = 3.1 per 1,000 device days

### 2018
- 20 CAUTIs
- 22% (20/90) device-associated HAI due to CAUTI
- CAUTI rate = 1.0 per 1,000 device days

*67% reduction in CAUTI rate*

**Definition change for VAE**

---

*updated*
VCUHS CAUTI Rates 2013-2018

60% reduction in CAUTI rate (2018 vs 2013)

<table>
<thead>
<tr>
<th>Year</th>
<th>CAUTI (n)</th>
<th>CAUTI Rate</th>
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</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>
<tr>
<td>2018</td>
<td>36</td>
<td>0.86</td>
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</tbody>
</table>

* updated
VCUHS CAUTI Standardized Infection Ratio (SIR) 2013 – 2018

Prevented 130 CAUTI infections

<table>
<thead>
<tr>
<th>Year</th>
<th>SIR</th>
<th>Benchmark</th>
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<td>Q1 2013</td>
<td>0.83</td>
<td>1.00</td>
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<tr>
<td>Q2 2013</td>
<td>1.15</td>
<td>1.00</td>
</tr>
<tr>
<td>Q3 2013</td>
<td>0.72</td>
<td>1.00</td>
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<td>Q4 2013</td>
<td>0.7</td>
<td>1.00</td>
</tr>
<tr>
<td>Q1 2014</td>
<td>0.87</td>
<td>1.00</td>
</tr>
<tr>
<td>Q2 2014</td>
<td>1.08</td>
<td>1.00</td>
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<td>Q3 2014</td>
<td>1.04</td>
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<tr>
<td>Q4 2014</td>
<td>1.01</td>
<td>1.00</td>
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<tr>
<td>Q1 2015</td>
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<td>0.55</td>
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<tr>
<td>Q2 2015</td>
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<td>Q3 2015</td>
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<td>0.55</td>
</tr>
<tr>
<td>Q4 2015</td>
<td>0.52</td>
<td>0.55</td>
</tr>
<tr>
<td>Q1 2016</td>
<td>0.64</td>
<td>0.55</td>
</tr>
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<td>Q2 2016</td>
<td>0.3</td>
<td>0.55</td>
</tr>
<tr>
<td>Q3 2016</td>
<td>0.58</td>
<td>0.55</td>
</tr>
<tr>
<td>Q4 2016</td>
<td>0.21</td>
<td>0.55</td>
</tr>
<tr>
<td>Q1 2017</td>
<td>0.55</td>
<td>0.27</td>
</tr>
<tr>
<td>Q2 2017</td>
<td>0.6</td>
<td>0.61</td>
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<td>0.75</td>
<td>0.75</td>
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<td>0.5</td>
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<td>Q1 2018</td>
<td>0.57</td>
<td>0.57</td>
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<tr>
<td>Q2 2018</td>
<td>0.33</td>
<td>0.57</td>
</tr>
<tr>
<td>Q3 2018</td>
<td>0.57</td>
<td>0.57</td>
</tr>
</tbody>
</table>

*updated
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)
- Met 20% reduction goal last 4 months

| 2017 Baseline Urine Culture rates p/100 device days |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| CICU  | CSICU  | MRICU  | NSICU  | STICU  | Average  |
| 2017 Baseline | 23    | 10.4   | 21.4   | 23    | 17.8   | 19.6   |
| 2018 Goal     | 18.4  | 8.6    | 17.1   | 18.4  | 14.2   | 15.7   |

| 2018 Urine Culture rates p/100 device days |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| January  | February | March | April | May | June | July | August | September | October | November | December |
| 25.7     | 27.3     | 24.2  | 31.8  | 25.3  | 22.1  | 33.8  | 23.6    | 22.2    | 20.9    | 23.2    | 20.6    |
| 11.8     | 15.4     | 8     | 7.5   | 11.1  | 10.2  | 8.9   | 9.5     | 11.2    | 7.8     | 4.0     | 6.5     |
| 15.1     | 17.8     | 18    | 14.9  | 16.5  | 16.8  | 14.5  | 16.7    | 11.8    | 12.6    | 11.6    | 12.4    |
| 29.7     | 24.1     | 28.4  | 23.5  | 18.2  | 14.9  | 19.2  | 17.6    | 16      | 13.1    | 14.6    | 17.0    |
| 15.4     | 14.6     | 17.5  | 12    | 12.8  | 15.9  | 13.5  | 13.6    | 14.8    | 11.2    | 12.7    | 13.5    |
| 19.5     | 19.8     | 19.2  | 17.9  | 16.8  | 16    | 18.0  | 16.2    | 15.2    | 13.1    | 13.2    | 14.0    |

* Updated
Agenda

- Why CAUTI
- VCUHS baseline (pre-intervention)
- Interventions
- Results
- Impact
- Lessons learned
Estimated Impact

- Top 10 Vizient performer for CAUTI
- 72% reduction in ICU CAUTI since 2012
- 62% reduction in non-ICU CAUTI since 2012

Since 2015
- Reduced catheter days: 6,298
- CAUTIs prevented: 130
  - Prevented 5 deaths
- Cost savings estimate: $130,000 - $1.8 million
- Reduction in number of beds used: 260–520
  - Gained additional 43-87 hospital admissions
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• Results
• Impact
• Lessons learned
Lessons Learned

• Have all stakeholders at table in beginning
• Start with automated removal orders
• Leveraging IT through EMR decision support impacts change
• Make decision support tools that make it easy to do the right thing
Questions

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