PROJECT NAME: A Systems Approach to CAUTI Elimination

Institution: UT Southwestern

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Project Category: General Quality Improvement
BACKGROUND

The Centers for Medicare and Medicaid Services (CMS) stopped reimbursing hospitals for additional costs associated with treating patients for Catheter Associated Urinary Tract Infections (CAUTIs) that are hospital acquired. The Centers for Disease Control and Prevention (CDC) describes a urinary tract infection (UTI) as “an infection involving any part of the urinary system including urethra, bladder, ureters, and kidney”. The National Healthcare Safety Network (NHSN) asserts that UTIs are the most common type of healthcare associated infection reported and that among UTIs acquired in the hospital, approximately 75% are associated with a urinary catheter. NHSN estimates that between 15-25% of all hospitalized patients receive urinary catheters during their hospital stay1. The US Department of Health and Human Services set a national target of a 25% reduction in CAUTI for 2013. One of the UT Southwestern’s Organizational priorities is to reduce the incidence of CAUTI by 50% each year. This target was set in FY2011, and was not achieved. Figure 1 shows CAUTIs at University Hospitals prior to project initiation.

AIM

We believe that many catheter-associated urinary tract infections (CAUTIs) are preventable. Our aim is to reduce the overall incidence of CAUTIs by 50% from our 2012 baseline of 135 by June 30, 2013, and continue to reduce CAUTIs by 50% each subsequent year. Figure 1 shows the CAUTI count at UT Southwestern University Hospitals prior to project initiation.

Figure 1: Pareto Chart of Baseline CAUTI Count
TOOLS

We convened a multidisciplinary improvement team in June 2012 consisting of front-line staff, managers, Physician Subject Matter Experts, students, managers, staff the Office of Quality Improvement & Safety, and other ad hoc members. We used the DMAIC process improvement methodology, and several quality improvement tools which guided our approach to improving patient outcomes. The DMAIC steps and the quality improvement tools will be summarized in the abstract.

Define

We defined the project, its purpose and scope using a project charter (Figure 2). We also collected background and evidence-based practice guidelines using the Healthcare Infection Control Practice Advisory Committee (HICPAC) Guidelines for Prevention of Catheter-Associated Urinary Tract Infections 2009 as our source for interventions.

Figure 2: Excerpt of project charter
In the project charter, the team identified all the possible stakeholders, including: patients and their caregivers, bedside nurses, patient care technicians, infection control practitioners, physicians, the CAUTI Committee members, lab staff, transporters, and others. We created a stakeholder analysis based on the stakeholders that the project team identified in the project charter to clarify what the interest was of the stakeholder, what the project team needed from the stakeholder group, our perceived attitudes and risks, and our actions to take to address these issues. Figure 3 shows our stakeholder analysis. These groups and individuals would all have varying degrees of contact with the improvement project, and were our customers; some served as members of the core project team. We gained perspective by understanding the needs of the stakeholders...we listened to the voice of the customer, which guided our interventions.

**Figure 3: Excerpt of Stakeholder Analysis**

<table>
<thead>
<tr>
<th>STAKEHOLDER</th>
<th>INTEREST OR REQUIREMENT FOR PROJECT</th>
<th>WHAT PROJECT NEEDS FROM STAKEHOLDER</th>
<th>PERCEIVED ATTITUDES AND RISKS</th>
<th>ACTIONS TO TAKE</th>
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</thead>
<tbody>
<tr>
<td>Patients</td>
<td>Patients deserve to be admitted into a safe environment free of device-related infections</td>
<td>Agreement to receive proper Foley care and removal during hospital stay</td>
<td>Some patients ask for Foley placement to prevent having to get out of bed Patients refuse Foley care at times during hospital stay</td>
<td>Educate patients on Foley necessity and importance of Foley care</td>
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<tr>
<td>Bedside nurse</td>
<td>Highest impact on proper Foley insertion and maintenance</td>
<td>Provide honest feedback on current practice for Foley insertion and maintenance. Willingness to change current practice. Willingness to address physicians for Foley necessity</td>
<td>Nurses may think Foley maintenance is the job of the PCT. Not open to change in practice. Differences in Foley insertion, maintenance. Non-adherence to current policy. No accountability for prevention of HAI.</td>
<td>Interview nurses to map out current process for insertion/maintenance of Foleys.</td>
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<tr>
<td>Infection Control</td>
<td>Confirm and report all HAI</td>
<td>Provide detail and guidelines used for reporting of CAUTI. Discrepancies in HAI. Incorrect report of HAI</td>
<td>Do not currently discuss each HAI with nurses manager to evaluate preventative measures or possible incorrect count of HAI. Could become defensive if current collection process and data reporting is challenged.</td>
<td>Interview Infection control for current HAI collection procedure and guidelines used.</td>
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</table>

**Measure**

Our next phase was to measure our current situation, and relied heavily on customer inputs. We created process maps and reviewed the processes with the appropriate stakeholders. Figures 4-6 show examples of our process maps.
Figure 4, Basic CAUTI Prevention Process

Figure 5, Urinary catheter insertion process map
Analyze

In the Analysis step, the project team reviewed the process maps and had several brainstorming sessions to attempt to determine what we believed to be the causes of our high CAUTI incidence. We also did some retrospective analyses to look for common causes and common contributing factors. We also performed root-cause analyses on selected cases to improve our understanding of contributing factors and created affinity diagrams and cause and effect diagrams. Figure 7 shows an example of our cause and effect (fishbone) diagram.
We validated these assumptions against actual practice by using trained observers. We tested the inter-rater reliability of the observers by creating a check list of the evidence based best practices, and asked the observers to watch videos of insertions, maintenance, and specimen collection. Figure 8 is an example of one of our check lists. Wanted to assure that our observations were reliable and standardized, so we trained and tested our observers, and measured their degree of agreement using the kappa calculation to indicate a good degree of agreement beyond chance in 5 observations. Figure 9a shows our inter-rater agreement exercises, with low reliability, (poor agreement), and figure 9b with high reliability.

Without the knowledge of the observers, we instructed the staff in the videos to perform a mistake in a critical task. We learned the through the exercise, the elements in the questionnaire were not clearly understood, so we explained each question and each desired outcome that constituted a “yes” response, which meant that the clinical person performing the task performed. This exercise demonstrated to the project team the value in creating clear check lists, and explicitly clear expected performance outcomes.
Figure 8, Trained Observer check list

<table>
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<tr>
<th>Indications for Use (use letters N, Y, or N/A)</th>
<th>No/Correct</th>
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<tr>
<td>CDC appropriate indications for insertion</td>
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<td>A. Acute Urinary retention or obstruction</td>
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<td>B. Postoperative use (ductal care)</td>
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<td>C. Postoperative use (ductal care)</td>
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<td>D. Female patient smoker or incontinence pts.</td>
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<td>E. Female patient smoker or incontinence pts.</td>
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<td>F. Female patient smoker or incontinence pts.</td>
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<td>G. Chronic indwelling urinary catheter PCA</td>
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<td>X. Chronic indwelling urinary catheter PCA</td>
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<td>Y. Chronic indwelling urinary catheter PCA</td>
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<td>Z. Chronic indwelling urinary catheter PCA</td>
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2) Hand hygiene immediately before insertion

3) Observed Technique

a) Place sterile gloves

b) Sterile Gloves

c) Sterile applicator for forearms, cotton balls, gauze pads

d) Sterile applicator for forearms, cotton balls, gauze pads

e) Sterile applicator for forearms, cotton balls, gauze pads

4) Preparatory cleaning performed: superficially

5) If breaks in aseptic techniques, disconnection, or leakage occurs, replace the catheter and collecting system using aseptic technique and sterile equipment

6) Hand hygiene immediately after insertion

Unit: __________________ Date: __________

Comments or additional observations:


Figure 9a, observer agreement testing; unacceptable level of agreement

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<th>Step</th>
<th>M1 (Trainee)</th>
<th>M2 (Trainee)</th>
<th>M3 (Trainee)</th>
<th>M4 (Trainee)</th>
<th>M5 (Trainee)</th>
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We examined device days and compared them to numbers of infections using line and bar graphs to help the team visualize relationships as shown in figure 10. We found that run charts did not easily show improvements in device utilization, so we used control charts, as shown in figures 11 & 12.
Figure 10, CAUTI count and utilization ratios

![CAUTI Count vs Utilization Ratio](image)

**CAUTI Count vs Utilization Ratio**
June 1, 2012-May 31, 2013

Device Utilization Ratio = device days/pt. days × 100

Figure 11, run chart of urinary catheter utilization ratios

![Urinary Catheter Utilization Ratios](image)

**Urinary Catheter Utilization Ratios**
MS/7W ICU

Device Utilization = device days/pt. days × 100
We analyzed our posted policies, procedures, and EMR documentation against the HICPAC level 1a and 1b best practices and found very poor alignment, and in some cases, we found conflicting language within the body of the document itself. We found consistency in 5 out of 17 (29.4%) elements critical to quality.

**Improve**

We used all the Level I interventions from Guideline for prevention of Catheter-Associated Urinary Tract Infections[^4], and the information gathered from our Define, Measure, and Analyze phases to develop our interventions. We grouped the interventions into broad categories:

1. An EMR-based clinical decision support system to identify all patients with urinary catheters and assess the need for continued catheterization embedded in the care provider's workflow
   a. Implement an improved system for documenting the following in the patient record:
      i. indications for catheter insertion,
      ii. date and time of catheter insertion,
      iii. individual who inserted catheter,
      iv. indications for continuation
      v. Date and time of catheter removal.

2. Adapt current EMR/electronic documentation in order to assure data is accessible in the patient record and recorded in a standard format for data collection and quality improvement purposes
   a. Provide support and direction for current activities involved in the creation, review, and updating of current protocols, policies, procedures, and other pertinent documents to support elimination of CAUTI protocols for nurse-directed removal of unnecessary urinary catheters
   b. Explicit guidelines and algorithms for appropriate peri-operative catheter management, catheter maintenance, bathing, specimen collection.
   c. Procedure-specific guidelines for catheter placement

[^4]: Guideline for prevention of Catheter-Associated Urinary Tract Infections
d. Postoperative catheter removal  
e. Protocols addressing management of postoperative urinary retention, i.e. Nurse-directed use of intermittent catheterization and use of bladder ultrasound scanners  

3. Development of administrative infrastructure  
   a. Provide and support implementation of evidence-based guidelines that address catheter use, insertion, and maintenance. (Category IB)  
   b. Provide tools, structure, and support for monitoring adherence to facility-based criteria for acceptable indications for indwelling urinary catheter use.  

4. Education and Training  
   a. Produce asynchronous “video on demand” education embedded in the EMR and easily accessible to nurses, technicians, physicians. Educational videos for patients and providers with the purpose of providing education about indwelling urinary catheters, CAUTI, other complications of urinary catheterization, and alternatives to indwelling catheters. (Category IB)  
   b. When feasible, consider providing performance feedback to these personnel on what proportion of catheters they have placed meet facility-based criteria and other aspects related to catheter care and maintenance.  

5. Supplies  
   a. Standardize equipment in order to ensure that supplies necessary for aseptic technique for catheter insertion are readily available. (Category IB)  
   b. Other supplies and materials TBD  

We are currently in the process of producing our video education modules, but all interventions are being implemented currently.
INTERVENTION RESULTS:

**UT Southwestern CAUTI c Chart**

### Pre-CS & E
4. Dec. 2011:
   - Nursing research project: Nurse-driven protocol.
   - Project to standardize RC system-wide.
5. New CAUTI Prevention Policy:
   - BPA alerts in EPIC EMR.
   - Added new documentation requirements.
   - Rolled out new nurse-driven protocol.
   - Updated debriefing tool.

### Post-CS & E
1. Grant was awarded in June 2012. Implementation team consistently applied CS & E principles.
2. September-November 2012:
   - Created new policy based on CDC Level 1 guidelines.
   - Created decision tree: Dr. Reindl in ME.
   - Launched trained observers, tested them to assure interrater reliability.
3. January 1-15, 2013:
   - Staff education on new policy and documentation.
   - Refined old policy. Rolled out new policy with indications for insertion and daily necessity embedded in EPIC to match the policy.
CAUTI Count
Project Year 1

Baseline

Non-ICU CAUTI
74

ICU CUTI
61

Project Year 1

Non-ICU CAUTI
40

ICU CUTI
34

45.2% Reduction in CAUTI Incidence

Baseline

0 20 40 60 80 100 120 140 160

6/1/11-5/31/12 6/1/12-5/31/13

Non-ICU CAUTI
74

ICU CUTI
61

Non-ICU CAUTI
40

ICU CUTI
34

6/1/11-5/31/12 6/1/12-5/31/13

45.2% Reduction in CAUTI Incidence
Next steps:

We plan to test the CAUTI prevention video modules in October 2013 to a focus group and perform usability studies with questionnaires, interviews, and on-line chat venues. We also hope to test the patient education videos with a patient focus group. We will then send our trained observers to gather information regarding the effectiveness of our package of interventions on provider training. We will base on these findings we will refine our control plan, and make any corrective or preventive improvements.

We believe that this project is generalizable and we plan to apply these steps to Central Line Associated Blood Stream Infection (CLABSI) elimination in September 2013.
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