Overview of Catheter-Associated Urinary Tract Infection (CAUTI) Prevention

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

HRET
HEALTH RESEARCH & EDUCATIONAL TRUST

STRIVE
States Targeting Reduction in Infections via Engagement

Presenter

Sanjay Saint, MD, MPH
Chief of Medicine, VA Ann Arbor Healthcare System
George Dock Professor, University of Michigan

Contributions by
Kristi Felix, RN, BSN, CRRN, CIC, FAPIC
Madonna Rehabilitation Hospital

Linda Greene, RN, MPS, CIC, FAPIC
University of Rochester, Highland Hospital

Karen Fowler, MPH
University of Michigan

Milisa Manojlovich, PhD, RN, CCRN
University of Michigan

Jennifer Meddings, MD, MSc
University of Michigan

Barbara W. Trautner, MD, PhD
Baylor College of Medicine

Learning Objectives

- Outline the impact, cost, morbidity and mortality of catheter-associated urinary tract infection (CAUTI)
- Recognize the routes and risk of developing CAUTI
- Describe a tiered approach to CAUTI prevention

What is CAUTI?

- A common hospital infection
- 75% of healthcare-associated urinary tract infections are CAUTIs
- For surveillance purposes, CAUTI occurs when:
  - A patient develops a urinary tract infection (UTI) when an indwelling urinary catheter is in place for more than two days before the event date

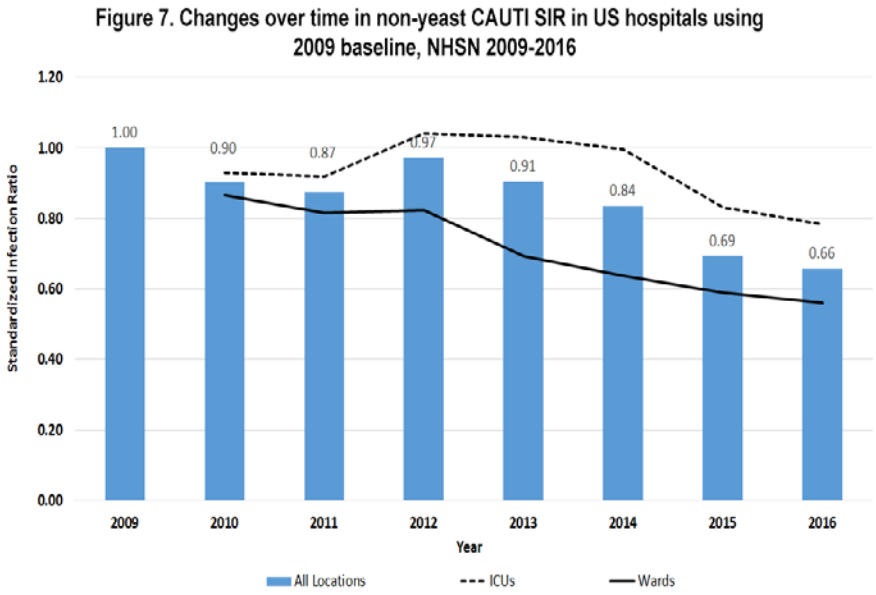
(Catheter-associated Urinary Tract Infections (CAUTI) Healthcare-associated Infections, CDC, 2015)

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

Burden of CAUTI

- Decline in non-yeast CAUTIs from 2012 to 2016
- Increases hospital costs
  - ~$1,000 per CAUTI
- Increases morbidity and mortality
  - Up to 13,000 attributable deaths annually

Changes over time in CAUTI SIR in US hospitals using 2009 baseline, NHSN 2009-2016



Healthcare-associated Infections (HAI) Winnable Battles 2010-2015; Progress Report 2014, CDC, 2015; Klevens RM, Pub Health Rep, 2007; Scott RD, CDC, 2009; Healthcare-associated Infections Data and Statistics, CDC, 2016)

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

Unnecessary Indwelling Urinary Catheters Put Patients at Risk

- One out of four inpatients receive catheters
- One out of three catheter days are unnecessary
- One out of three physicians are unaware their patient has a catheter
- One third of catheters have no order

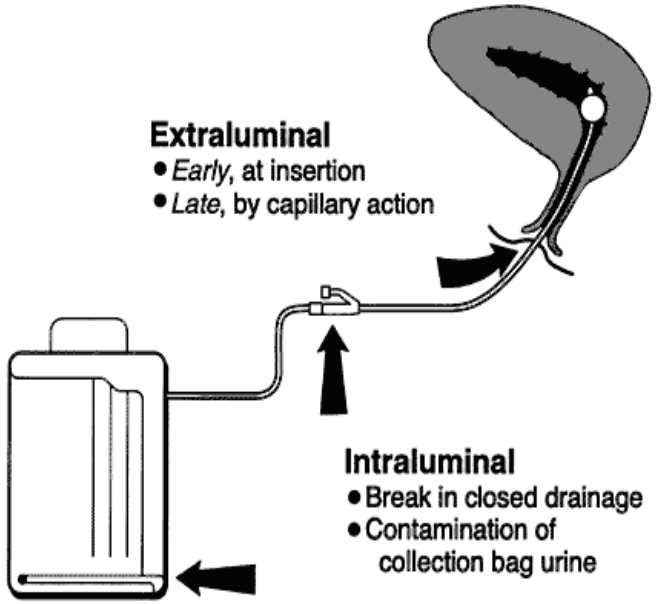
Note: This may not apply to all patients e.g. spinal cord injuries.

(Saint S, Preventing Hospital Infections, 2015; Saint S, Am J Med, 2000)

Urinary Catheter-Related Infection: Pathophysiology

Organisms enter the bladder by three ways:

1. At time of catheter insertion
2. Through the catheter lumen (from a colonized drainage bag)
3. Along external surface of the catheter (migrate along the catheter-mucosal interface)



Tambyah PA. Engineering out the risk of infection with urinary catheters. Emerg Infect Dis. 2001 Mar-Apr; 7(2):342-7.

Noninfectious Complications

Annals of Internal Medicine

ESTABLISHED IN 1927 BY THE AMERICAN COLLEGE OF PHYSICIANS

Determining the Noninfectious Complications of Indwelling Urethral Catheters

A Systematic Review and Meta-analysis

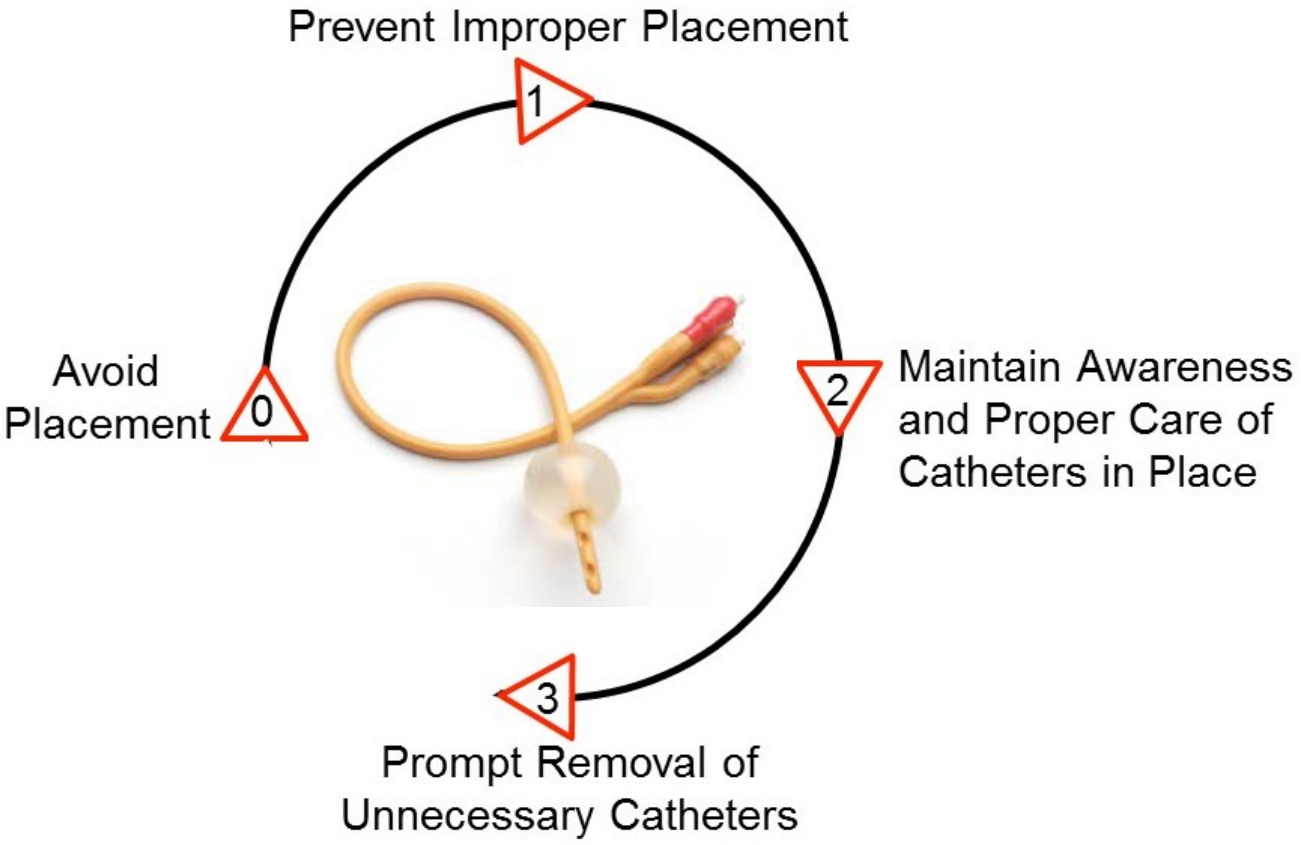
John M. Hollingsworth, MD, MS; Mary A.M. Rogers, PhD; Sarah L. Krein, PhD, RN; Andrew Hickner, MSI; Latoya Kuhn, MPH; Alex Cheng, MD; Robert Chang, MD; and Sanjay Saint, MD, MPH

"Many noninfectious catheter-associated complications are at least as common as clinically significant urinary tract infections"

(Hollingsworth JM, Ann Intern Med, 2013)

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

How Can We Reduce Catheter Use and Prevent CAUTI?



(Meddings J, Saint S. Disrupting the life cycle of the urinary catheter. Clin Infect Dis. 2011;52(11):1291-3. PMID: 21596672)

Tiered Approach to CAUTI Prevention

Tier 1 Standardize Supplies, Procedures and Process (complete all interventions: review and audit compliance with Tier 1 measures prior to moving to Tier 2)				
Place indwelling urinary catheter only for appropriate reasons	Encourage use of alternatives to indwelling urinary catheters	Ensure proper aseptic insertion technique and maintenance procedures	Optimize prompt removal of unneeded catheters	Urine culture stewardship: culture only if symptoms of UTI are present
(If CAUTI rates remain elevated, start with CAUTI Guide to Patient Safety (GPS) and Target Assessment for Prevention (TAP) Strategy and then proceed with additional interventions)				

Perform needs assessment with CAUTI GPS and TAP Strategy

Tier 2 Enhanced Practices			
Conduct catheter rounds with targeted education to optimize appropriate use	Feed back infection and catheter use to frontline staff in "real time"	Observe and document competency of catheter insertion: education and observed behavior	Perform root-cause analysis or focused review of infections

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

Tier 1: First Steps to CAUTI Prevention

- Place indwelling urinary catheter only for appropriate reasons
  - The emergency department is the most common venue for indwelling urinary catheter placement
- Encourage use of alternatives to indwelling urinary catheters, when appropriate.
- Ensure proper aseptic insertion technique and maintenance procedures

(Manojlovich M, Infect Control Hosp Epidemiol, 2015)

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

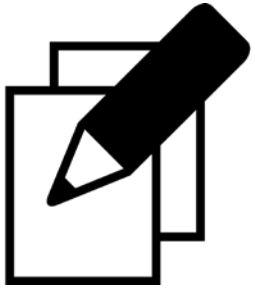
Tier 1 (continued)

- Optimize prompt removal of unneeded catheters
  - Daily catheter rounds
  - Urinary catheter reminders and stop-orders
  - Assess catheter need at key points, such as transfer

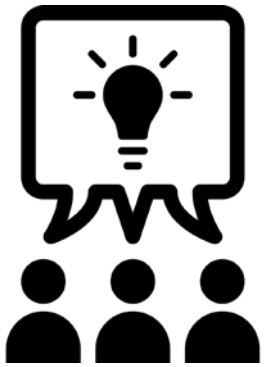
- Urine culture stewardship
  - Culture only if symptoms of UTI are present

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

Tier 2: Enhanced Practices



- Perform CAUTI needs assessment with the Guide to Patient Safety (GPS)* and Targeted Assessment for Prevention (TAP) Strategy
  - CAUTI GPS is a brief, troubleshooting guide available at www.catheterout.org
  - TAP Strategy is a quality improvement strategy to use data for action available at https://www.cdc.gov/hai/prevent/tap.html



- Conduct catheter rounds with targeted education to optimize appropriate use
- Feed back infection and catheter use to frontline staff in "real time"

**This tool was developed by faculty and staff from the Department of Veterans Affairs and the University of Michigan using funding support from the Department of Veterans Affairs, the University of Michigan, and the National Institutes of Health (NIH). This tool was validated and disseminated using funding support from the Agency for Healthcare Research and Quality (AHRQ), the Department of Veterans Affairs, and the University of Michigan.*

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

Tier 2 (continued)

- Observe and document competency of catheter insertion

  - Education and observed behavior
  - Provide education and assess competency
  - Empower staff to stop an insertion if aseptic technique is broken

- Perform full root cause analysis or focused review of infections

Conclusions

- Indwelling urinary catheters can be hazardous to your patient's health as they cause both infectious and non-infectious harm
- Several practices decrease CAUTI, avoiding the catheter should be prioritized, when appropriate.
- CAUTI prevention should include Both technical and behavioral components.

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

References

- Catheter-associated Urinary Tract Infections (CAUTI). Healthcare-associated infections. Centers for Disease Control and Prevention, CDC. Published October 16, 2015. Accessed on December 16, 2017. Available at https://www.cdc.gov/hai/ca_uti/uti.html
- Healthcare-associated Infections (HAI). Winnable Battles 2010-2015. Progress Report 2014. Centers for Disease Control and Prevention, CDC. 2015. Available at https://www.cdc.gov/winnablebattles/targets/pdf/winnablebattles2010-2015_progressreport2014.pdf
- Healthcare-associated Infections Data and Statistics. Content last updated March 2016. Centers for Disease Control and Prevention, CDC. Accessed September 19, 2016. http://www.cdc.gov/HAI/surveillance/
- Hollingsworth JM, Rogers MAM, Krein SL, et al. Determining the non-infectious complications of indwelling urethral catheters: a systematic review and meta-analysis. *Ann Intern Med*. 2013; 159(6):401-410.
- Klevens RM, Edwards JR, Richards CL, Jr., et al. Estimating health care-associated infections and deaths in U.S. hospitals, 2002. *Public Health Rep.* 2007; 122:160-6.

References (cont.)

- Maki DG, Tambyah PA. Engineering out the risk of infection with urinary catheters. *Emerg Infect Dis*. 2001 Mar-Apr; 7(2):342-7.
- Meddings J, Saint S. Disrupting the lifecycle of the urinary catheter. *Clin Infect Dis*. 2011; 52(11): 1291-3. PMID: 21596672.
- Saint S, Wiese J, Amory JK, et al. Are physicians aware of which patients have indwelling urinary catheters? *Am J Med*. 2000; 109(6): 476-480.
- Saint S, Krein SL, Stock RW. *Preventing Hospital Infections*. New York, NY: Oxford University Press. 2015.
- Scott RD, 2nd. The direct medical costs of healthcare-associated infections in U.S. hospitals and the benefits of prevention. Atlanta, GA: Centers for Disease Control and Prevention; 2009 March. Available from: http://www.cdc.gov/HAI/pdfs/hai/Scott_CostPaper.pdf. Accessed Jan 9, 2017.
- Tambyah PA, Halvorson KT, Maki DG. A prospective study of pathogenesis of catheter-associated urinary tract infections. *Mayo Clin Proc*. 1999; 74(2): 131-6.

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

Speaker Notes

Speaker Notes: Slide 1

Welcome to the first module of the Catheter-Associated Urinary Tract Infection (CAUTI) Prevention course. This module, titled "Overview of Catheter-Associated Urinary Tract Infection Prevention," will provide background information on what constitutes a CAUTI, the burden of CAUTI and strategies for preventing this Infection.

Speaker Notes: Slide 2

This module was developed by national infection prevention experts devoted to improving patient safety and infection prevention efforts.

Speaker Notes: Slide 3

This module will outline the impact, cost, morbidity and mortality of CAUTI; recognize the routes and risks of developing a CAUTI; and describe a tiered approach to CAUTI prevention.

Speaker Notes: Slide 4

CAUTI, or catheter-associated urinary tract infection, is a common hospital infection. Seventy five percent of healthcare-associated urinary tract infections are actually catheter related, and are therefore CAUTIs. And CAUTI is defined as when a patient develops a urinary tract infection when an indwelling urinary catheter is in place for more than two days before the event date.

Speaker Notes: Slide 5

In 2015, the NHSN definition for CAUTI was changed to be more clinically-relevant and so no longer includes yeast. Given this change if we examine SIR for non-yeast CAUTIs we see a consistent year-to-year declines in CAUTIs.

Despite these declines, CAUTI remains an important HAI. Every time a patient has a CAUTI it increases hospital costs by about $1,000 and increases patient morbidity and even mortality. In fact, CAUTI causes up to 13,000 attributable deaths in the United States annually.

Speaker Notes: Slide 6

Part of the reason CAUTIs are so common is because urinary catheters are so often used. In fact, one out of every four inpatients receive a urinary catheter sometime during their hospital stay. And approximately one out of every three catheter days is unnecessary. Similarly, approximately one third of physicians who are taking care of patients who have urinary catheters are unaware that the patient has a urinary catheter. And about a third of the time there's no documentation that the catheter exists; there's no order for one even though one is required given that it's an invasive device nor is it included in the medical record from the physician or nursing notes. **Note: This may not apply to all patients e.g. spinal cord injuries.**

Speaker Notes: Slide 7

Indwelling urinary catheters can introduce organisms into the bladder through one of three ways. First is during catheter insertion, underscoring the importance of aseptic insertion technique. Second, once the catheter is in place, bacteria can travel through the catheter lumen from a colonized drainage bag. Drainage bags most often become contaminated from poor hand hygiene during drainage bag emptying. Third, bacteria can migrate along the external surface of the catheter along the catheter mucosal interface and can end up in the bladder, leading to an infection.

Speaker Notes: Slide 8

But importantly, there can also be noninfectious complications from indwelling catheters. In fact, this meta-analysis by Hollingsworth and colleagues published in the Annals of Internal Medicine concluded that many noninfectious catheter-associated complications are at least as common as clinically significant urinary tract infections. These noninfectious complications are things like inadvertent removal of the indwelling urinary catheter even though the balloon is inflated, false passageway creation by a traumatic insertion, urethral strictures that may occur after the catheter is removed and then, of course, pain and discomfort due to the catheter.

Speaker Notes: Slide 9

Given the clinical and economic problems associated with indwelling urinary catheter use, how do we reduce catheter use and prevent CAUTI? One approach is to think about the indwelling urinary catheter as having a life cycle, we have to know at what points along that life cycle it makes sense to intervene to prevent problems. These would include actions like avoiding the initial placement, and if the patient does need the catheter, preventing improper placement. And once the catheter is in place, making sure that situational awareness is maintained and properly caring for the catheters and removing them promptly as soon as they are no longer medically indicated.

Speaker Notes: Slide 10

A tiered approach organizes suggested CAUTI reduction efforts. Tier 1 focuses on standardizing both products and procedures to reduce infection rates. If rates remain elevated, teams should proceed to Tier 2 interventions, which are more time consuming and resource intensive. All aspects of Tier 1 should be implemented before implementing Tier 2 strategies. Tier 1 strategies include placing urinary catheters only for appropriate reasons, encouraging the use of alternatives to indwelling urinary catheters, ensuring proper aseptic insertion occurs along with proper maintenance, prompt removal of catheters that are no longer needed and only culturing urine when the patient has symptoms of a urinary tract infection.

Speaker Notes: Slide 10 Continued

If, after all of these strategies are in place, your hospital or unit is still struggling with elevated CAUTI rates, then you should move to Tier 2 strategies, the enhanced practices. These interventions should be conducted one at a time starting from the left and moving rightward as indicated by the arrows.

The first step in Tier 2 is to evaluate your improvement efforts using the CAUTI Guide to Patient Safety or CAUTI GPS. Then you should move on to conducting catheter specific multidisciplinary rounds, providing feedback to staff, documenting competency of catheter insertion and then finally conduct a full or at least a mini root cause analysis of each infection.

Speaker Notes: Slide 11

This slide reviews the Tier 1 steps in a bit more detail. First you want to make sure indwelling urinary catheters are only used for appropriate reasons. Start by identifying where most catheters are inserted and make sure those insertions are done appropriately. In most hospitals indwelling urinary catheters are frequently placed in the emergency department or operating room. You should make sure to involve your emergency department and/or your surgical department in efforts to reduce the use of indwelling urinary catheters.

Speaker Notes: Slide 11 Continued

Next, you want to encourage the use of alternatives to indwelling urinary catheters. Some of these to consider include accurate daily weights for those patients who are being diuresed because of congestive heart failure exacerbation, using a urinal, commode or bed pan, using intermittent straight catheterization with bladder scanning or using condom catheters for men who do not have bladder output obstruction.

You should also ensure that proper aseptic insertion technique and maintenance procedures are used. Using proper aseptic technique is not always easy. For example, one study prospectively observed 81 catheter insertions in a level one trauma center emergency department, and they found that 59 percent of the attempts had at least one major break in aseptic insertion technique.

Speaker Notes: Slide 12

Another key strategy to reduce urinary catheter use and catheter-associated urinary tract infection is to promptly remove unneeded catheters. Strategies to facilitate prompt catheter removal include: discussing urinary catheter need during daily rounds with the bedside nurse, using urinary catheter reminders and staff orders, and/or creating a policy to assess catheter need at key points during patient care, such as when a patient is transferred from the intensive care unit onto the floor.

Speaker Notes: Slide 12 Continued

The final step of Tier 1 is to promote urine culture stewardship. Urine cultures should only be done if there are symptoms of a urinary tract infection. Ordering urine cultures for asymptomatic patients can increase the use of antibiotics which could increase the development of resistant organisms, all of which can lead to increased hospital costs, and more importantly, to patient harm. To prevent this, clinicians should be educated about when it is appropriate to obtain a urine culture and the risks associated with over culturing. It is also important to make sure to avoid ordering cultures without a clinical assessment of the patient's condition.

Speaker Notes: Slide 13

If after you've implemented all of Tier 1 and you still find an elevated CAUTI rate, you should then proceed to Tier 2. The first step is to perform a needs assessment using the CAUTI Guide to Patient Safety, or GPS, and Centers for Disease Control and Prevention ‘s Targeted Assessment for Prevention, or TAP, Strategy. The CAUTI GPS is a brief troubleshooting guide. It involves only ten yes or no questions that can help you identify some key reasons why your hospital or unit may not be successful in preventing CAUTI. The TAP Strategy is a quality improvement strategy to use data for action.

Speaker Notes: Slide 13 Continued

Once you've identified the barriers, the GPS and TAP Strategy provide possible strategies that can be used to address and ideally overcome those barriers. Once you've completed the GPS and used TAP Strategy to assess for any local barriers to CAUTI prevention, you should then proceed with the rest of Tier 2 sequentially from left to right. Some of these strategies may be more labor or time intensive, which is why you should implement the strategies in Tier 1 first and only proceed through Tier 2 if your rates remain high.

Speaker Notes: Slide 13 Continued

If you're not already doing so, you should conduct catheter rounds with targeted education to optimize appropriate catheter use and discuss as a team why that patient still has a urinary catheter and if it can now be removed.

Next you should provide feedback on infection rates and catheter use to frontline staff in real time. For example, one facility had CAUTI rates posted, which was great, but the data were six months old. The data ideally should be timely if it's going to help motivate staff and change behavior to reduce infection rates.

Speaker Notes: Slide 14

The next step is to observe and document competency of staff performing urinary catheter insertions. As mentioned earlier, it is not uncommon for there to be a breach in aseptic technique during catheter insertions. Education should be provided to promote proper aseptic insertion technique. Staff should feel empowered to stop an insertion if aseptic technique is broken. And if your rates are still elevated after implementing all of the prior strategies, we recommend you perform a full root cause analysis or focused review of infections to try to identify any contributing factors. You might find that something unexpected is contributing to CAUTI risk. Identify contributing factors such as a change in supply availability or staff turnover. It is important that during these reviews the focus remains on continuous quality improvement, not on assigning blame.

Speaker Notes: Slide 15

To conclude, unnecessary indwelling urinary catheters can cause both infectious and non-infectious patient harms. And while there are several practices that can be used to decrease CAUTI, avoiding catheter placement should be prioritized. Finally, both technical and behavioral issues should be considered at the outset of your initiative.

Speaker Notes: Slide 16

No notes.

Speaker Notes: Slide 17

No notes.