How to use this guide
This guide gives actions and resources for creating and sustaining safe practices for CAUTI. In it, you’ll find:

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Executive Summary

The Problem
Urinary tract infections (UTI) account for 30% of all healthcare-associated infections (HAI) and 15-25% of patients receive a urinary catheter. Because 17%-69% of catheter-associated urinary tract infections (CAUTI) are preventable, including 380,000 cases and 9,000 deaths annually, and because the Centers for Medicare and Medicaid (CMS) defined CAUTI as a non-payment infection, heightened precautions should be allocated to the monitoring and prevention of cases (CDC, 2009; Peasah et al., 2013).

The Cost
It is estimated that CAUTI is directly associated with an annual death rate of between 9,000 to 13,000 (CDC, 2009; Klevens et al., 2007). Annually, CAUTI alone costs the healthcare system $450 million, with significant capacity for an increase in cost upon acquisition of directly-related complications, including urosepsis and septicemia (Peach et al., 2016; Klevens et al., 2007). Complications with CAUTIs are the leading cause of sepsis in adults over 65, which itself is the 10th leading cause of death in the US (Peach et al., 2016).

The Solution
Many healthcare organizations have successfully implemented and sustained improvements and reduced death from CAUTI. These organizations have focused on projects that included implementing a CAUTI “bundle”, with the additional effects of increasing patient satisfaction, improving clinician engagement, and growing the financial bottom line.

This document provides a blueprint that outlines the actionable steps organizations should take to successfully reduce CAUTI and summarizes the available evidence-based practice protocols. This document is revised annually and is always available free of charge on our website. Hospitals who make a formal commitment to improve CAUTI and share their successes on the PSMF website have access to an additional level of consulting services.
Leadership Checklist
On a monthly basis, or more frequently if a problem exists, the executive team should review all healthcare associated infection trends. Use this checklist as a guide to determine whether current evidence-based guidelines are being followed in your organization:

- Measure and report CAUTI incidence monthly (CAUTI based on [CDC NHSN definitions](https://www.cdc.gov/nhsn/pdfs/pscManual/11_nhsnDefinitions.pdf) for all inpatient units/total number of urinary catheter-days for all patients with a urinary catheter in all tracked units). Note trends in areas with high incidence and prevalence. Routinely reassess outcomes.
- If CAUTI rates indicate room for improvement, initiate a PI (performance improvement) project. If a problem is not indicated, routinely reassess to identify gaps, and ensure integrity of the data collected.
- Ensure frontline involvement in CAUTI improvement activities. Maintain their engagement and remove barriers to progress.
- If a PI plan is put in place, measure the associated process outcomes.
- Ensure that CAUTI protocols are embedded into [clinical workflows](https://www.cdc.gov/nhsn/pdfs/pscManual/11_nhsnDefinitions.pdf), whether electronic or paper.
- Ensure there are enough staff to effectively manage necessary preventive care.
- Ensure adequate training and documentation of CAUTI competencies and skills.
- Eliminate barriers to making rapid changes to documentation templates and order sets.
- Debrief on a regular basis to solicit team feedback about barriers to sustained compliance. Adjust the plan quickly and nimbly as needed.
- Hold staff accountable for providing the standard of care and reward success.
- Ensure that leaders have a simple process to oversee CAUTI improvement work while also considering how it aligns with other initiatives across the organization.
Catheters should only be inserted if appropriate. Appropriate indications include urinary retention or bladder obstruction, voiding difficulties, the need for measurements of output, use for long surgical procedures, and comfort for end of life care. See appendix 1 for the full list of indications.

Even when a catheter is necessary, its duration or frequency of use can be minimized. If inserted perioperatively, remove as soon as possible post-op. Consider the use of a bladder scanner to assist in determination of urine volumes.

Certain steps should be included in day to day care to avoid and monitor for presence of infection.

- Perform hand hygiene with soap and water.
- Assess for necessity and document.
- Ensure that the smallest catheter size is used unless contraindicated.
- Assess if alternative/external urine collection device can be implemented.
- Conduct hourly assessment of urine output for ICU patients.
- Adhere to aseptic technique.
- Perform meatal hygiene with unscented wash.
- Use sterile supplies/equipment.
  - Foley insertion kit (sterile gloves, drape, sponges)
  - Antiseptic or sterile solution to clean meatal area
  - Lubricant jelly
- Document necessity assessment.
- Verify intact tamper.
- Verify catheter securement device is in place.
- Ensure closed drainage system.
- Assess skin.
- Empty drain bag using a clean container.
- Verify unobstructed flow.
- Encourage fluid intake of at least 2 liters, if possible.
  - Determine continuation of catheter use using tools such as the Houdini Tool Catheter Removal Protocol

In addition to monitoring for signs of CAUTI, the patient should always be monitored for signs of sepsis in response to CAUTI to prompt early recognition and avoid deterioration (see APSS #9A).

If an indwelling urinary catheter is present on admission, it should be assessed immediately. Check for signs of infection and assess for necessity and document. Determine need for removal, insertion of new indwelling catheter, or use of alternative collection device. Adhere to aseptic technique.

If transfer, include indwelling urinary catheter information in report or handoff.

Upon discharge, special attention should be allocated to necessity and management of the catheter. Assess necessity and promptly remove indwelling urinary catheters if no longer necessary. Assess for signs/symptoms of infection. If the patient is going home with an indwelling catheter in place, preparation for discharge should begin as soon as possible while the patient is still in the hospital to allow for thorough education on maintenance, need, and next steps. Educate patient and family on CAUTI prevention, including hand hygiene and care and maintenance information.

- If transfer, include indwelling urinary catheter information in report or handoff.
Performance Improvement Plan

Follow this checklist if the leadership team has determined that a performance improvement project is necessary:

- **Gather the right project team.** Be sure to involve the right people on the team. You’ll want two teams: an oversight team that is broad in scope, has 10-15 members, and includes the executive sponsor to validate outcomes, remove barriers, and facilitate spread. The actual project team consists of 5-7 representatives who are most impacted by the process. Whether a discipline should be on the advisory team or the project team depends upon the needs of the organization. Patients and family members should be involved in all improvement projects, as there are many ways they can contribute to safer care.

<table>
<thead>
<tr>
<th>RECOMMENDED CAUTI IMPROVEMENT TEAM</th>
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<tbody>
<tr>
<td>Nurses</td>
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<td>Physicians</td>
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<td>Physical and occupational therapists</td>
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<tr>
<td>Environmental service staff</td>
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<td>Engineering staff</td>
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<td>Pharmacists</td>
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<td>Infection control specialists</td>
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<td>Clinical educators</td>
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<td>Information technology</td>
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<td>Patients and family members</td>
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<tr>
<td>Admitting and registration staff</td>
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<tr>
<td>Quality and safety specialists</td>
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*Table 1: Understanding the necessary disciplines for a CAUTI project improvement team*

- **Understand what is currently happening and why.** Reviewing objective data and trends is a good place to start to understand the current state, and teams should spend a good amount of time analyzing data (and validating the sources), but the most important action here is to go to the point of care and observe. Even if team members work in the area daily, examining existing processes from every angle is generally an eye-opening experience. The team should ask questions of the frontline during the observations that allow them to understand each step in the process and identify the people, supplies, or other resources needed to improve patient outcomes.

<table>
<thead>
<tr>
<th>CAUTI PROCESSES TO CONSIDER ASSESSING</th>
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<tr>
<td>Hand hygiene</td>
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<td>Environmental cleaning</td>
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<tr>
<td>Frequent and routine CAUTI evaluation and gap analysis (<a href="#">Ohio Hospital Association: CAUTI gap analysis worksheet</a>)</td>
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<tr>
<td>Urethral meatal hygiene</td>
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<tr>
<td>Documentation of catheter insertion</td>
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<tr>
<td>Ongoing evaluation of catheter necessity using Houdini Tool or other</td>
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<tr>
<td>Evaluation of alternative methods (<a href="#">Gray, Skinner &amp; Kaler, 2016</a>)</td>
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<tr>
<td>Use of barrier precautions</td>
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<td>Security of catheter</td>
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<tr>
<td>Closed drainage system</td>
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<tr>
<td>Hourly assessment of urine samples</td>
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<tr>
<td>Size of catheter used</td>
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<tr>
<td>Equipment disinfection</td>
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<tr>
<td>Patient positioning</td>
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<td>Patient and family education</td>
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<td>Sepsis monitoring</td>
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</table>

*Table 2: Consider assessing these processes to understand where the barriers contributing to CAUTI may be in your organization*
Prioritize the gaps to be addressed and develop an action plan. Consider the cost effectiveness, time, potential outcomes, and realistic possibilities of each gap identified. Determine which are a priority for the organization to focus on. Be sure that the advisory team supports moving forward with the project plan so they can continue to remove barriers. Design an experiment to be trialed in one small area for a short period of time and create an action plan for implementation.

**TYPICAL GAPS IDENTIFIED IN CAUTI**

- Lack of accountability
- Little organizational focus on CAUTI prevention
- Lack of leadership oversight
- Inappropriate prolonged duration of catheter use
- Inconsistent communication of CAUTI prevention updates
- Inconsistent education of new protocols
- Complex work environment with many distractions
- New or visiting staff members
- Lack of impetus to defend reason for continued catheter placement
- Staffing needs
- Poor gauge size standards
- Emergent patient needs
- Lack of adequate supplies
- Environmental cleaning

*Table 3: By identifying the gaps in CAUTI prevention compliance, organizations can tailor their project improvement efforts more effectively.*

Evaluate outcomes, celebrate wins, and adjust the plan when necessary. Measure both process and outcome metrics. Outcome metrics include the rates outlined in the leadership checklist. Process metrics will depend upon the workflow you are trying to improve and are generally expressed in terms of compliance with workflow changes. Compare your outcomes against other related metrics your organization is tracking. Routinely review all metrics and trends with both the advisory and project teams and discuss what is going well and what is not. Identify barriers to completion of action plans, and adjust the plan if necessary. Once you have the desired outcomes in the trial area, consider spreading to other areas (IHI, 2006).

It is important to be nimble and move quickly to keep team momentum going, and so that people can see the results of their labor. At the same time, don’t move so quickly that you don’t consider the larger, organizational ramifications of a change in your plan. Be sure to have a good understanding of the other, similar improvement projects that are taking place so that your efforts are not duplicated or inefficient.

**CAUTI COMPARATIVE OUTCOMES**

- Hand hygiene compliance
- Sepsis cases
- Cases of urethral stenosis
- Patient comfort
- Falls
- CAUTI-related complications, such as urosepsis
- ICU LOS

*Table 4: Consider evaluating related metrics to better understand CAUTI presence and contributing factors.*
Catheter-associated Urinary Tract Infections (CAUTI)

A UTI is an infection involving any part of the urinary system, including urethra, bladder, ureters, and kidneys. Urinary tract infections are one of the most common HAIs, accounting for up to 40% of infections reported in acute care hospitals (Edwards et al., 2009).

CAUTIs are a frequent cause of harm and death in US hospitalized patients. Of all reported UTIs acquired in hospitals, up to 80% are associated with a urinary catheter—a thin, flexible tube put in a patient’s body to drain the urine from their bladder (Apisarnthanarak et al., 2007).

Physicians may recommend a catheter placement if the patient:

- Can’t control urination
- Is incontinent
- Experiences urinary retention

Epidemiology

The source of the bacteria that cause CAUTIs may come from:

- Endogenous factors, such as from meatal, rectal, or vaginal colonization.
- Exogenous factors, usually through contaminated hands of healthcare staff during catheter insertion or when changing the urine collecting system.

Researchers suggest that CAUTIs develop (Maki & Tambyah, 2001):

- By capillary action.
- When there’s a break in the closed drainage tubing.
- By contamination of the collection urine bag.

Duration of catheterization is the leading risk factor for CAUTI. Nearly 95% of UTIs in the ICU are associated with urinary catheters. The precursor to CAUTI, known as bacteriuria, develops rapidly, with an average daily rate of 3% to 10%. Over a quarter of patients with a catheter in place for 2 to 10 days develop bacteriuria growth, and almost all patients with catheters for over 1 month develop bacteriuria. Therefore, catheterization for over one month is typically deemed long-term catheterization (Chenoweth & Saint, 2013).

In addition to the duration of catheter use, the inappropriate distribution of antibiotics can cultivate circumstances which may contribute to CAUTI. It is estimated that up to 50% of antibiotics prescribed today are unnecessary or inappropriate. This rampant misuse significantly contributes to the growth of multidrug resistant organisms, such as methicillin-resistant staphylococcus aureus (APSS 3B: Antimicrobial Stewardship).

Clinical Implications

Of all reported hospital-acquired UTIs, up to 80% are associated with urinary catheters (Apisarnthanarak et al., 2007). Other studies have shown that urinary catheters are used in large numbers in patients where it was not indicated or for longer than clinically necessary (Saint et al., 2000).

CAUTI cases increase hospital costs and are associated with increased harm and death (Laupland et al., 2005; Wald & Kramer, 2007; Cope et al., 2009), as indicated by the estimated 13,000 deaths annually directly due to CAUTIs (Klevens et al., 2007).

Healthcare-associated UTI frequency among all other HAIs is 12.9%, 19.6%, and 24% in the US, Europe, and developing countries, respectively (Tandogdu & Wagenlehner, 2016). In the UK specifically, CAUTIs are associated with 45,717 additional bed-days and 1,467 deaths (Smith et al., 2019).

According to a 2008 survey of US hospitals, more than 50% of hospitals did not monitor which patients were catheterized and 75% did not monitor duration and discontinuation (Saint et al., 2008). This statistics are alarming because when left unattended, CAUTI can quickly lead to other complications including urosepsis, septicemia, prostatitis, epididymitis, orchitis, cystitis, pyelonephritis, gram-negative bacteremia, endocarditis, vertebral osteomyelitis, septic arthritis, endophthalmitis, and meningitis (CDC, 2020).

Financial Implications

Each CAUTI incident is associated with a cost of approximately $758 and cumulatively, a total of between $340 and $450 million is spent annually to treat CAUTI incidents in the US alone (CDC & NHSN, n.d.). Furthermore, CAUTIs are considered to be a preventable complication of hospitalization by the Centers for Medicare and Medicaid Services. As such, no additional payment is provided to hospitals for CAUTI treatment-related costs.
From an international perspective, in the UK, for example, total CAUTI-related direct hospital costs were estimated at £54.4 million (Smith et al., 2019).

Best Strategies for Prevention

- **Decrease the use and duration of urinary catheters.**
  - A restrictive catheter policy paired with daily review of necessity and appropriateness decreased catheterization from almost 18% to 6.6% (Lo et al., 2014).

- **Assess appropriateness of alternative methods** (Gray et al., 2016; CDC, 2009).
  - Evidence-based alternatives to indwelling catheterization include intermittent catheterization, bedside bladder ultrasound, external condom catheters, and suprapubic catheters:
    - **Intermittent catheters (in-and-out catheters):** Patients may use intermittent catheters post-surgery for a short period of time.
    - **External catheters (condom catheters):** External catheters have a tube that leads from the condom device to a drainage bag and are placed outside of the body to cover the head. External catheters are reported to be more comfortable and have been shown to carry a lower risk of infection than indwelling catheters. It is important to note that condom catheters require daily changing.
    - **Suprapubic catheter:** Suprapubic catheters involve insertion of catheter into the bladder through a tiny hole in the abdomen.

- **Insert catheters only for appropriate indications, such as** (Hanchett, 2012):
  - Urinary retention or obstruction
  - Severe illness or immobility
  - Incontinence
  - Skin issues
  - At the request of a patient or in the case of end-of-life care
  - In the perioperative setting
  - In association with pressure ulcer healing
  - When hourly urine volume measurements are required
  - When daily volume measurements are required in the case that the urine volume could not be assessed using alternative methods (weighing, bedpan etc.) (Meddings et al., 2015)
  - See Appendix 1 for a full table of appropriate and inappropriate indications for indwelling catheter use.

- **Insert catheters using an aseptic technique and sterile equipment** (Hanchett, 2012).
  - Perform hand hygiene.
  - Use a catheter insertion kit with sterile gloves.
  - Ensure the use of a drape, cleaning supplies, sterile lubricant, and sterile catheter attached to drain bag.

- **Perform thorough, consistent daily maintenance** (Hanchett, 2012).
  - Document daily necessity assessment.
  - Verify intact tamper.
  - Verify catheter securement device is in place.
  - Perform hand hygiene with soap and water.
  - Empty drain bag using a clean container
  - Verify unobstructed flow.
  - Determine continuation of catheter using tools such as the Houdini Tool Catheter Removal Protocol.

- **Use smallest gauge catheter.**
  - Choose the smallest size to provide proper drainage. Large catheters can cause irritation and pain. If the diameter is too small, emptying the bladder will take a long time or may result in leakage (NHS Southern Health, 2020).
    - The universal gauge used for determining the external diameter of the tube is known as the French size.
Resources

- NHS: Urinary Catheter Care Guidelines with Competency Checklists
- Ohio Hospital Association: CAUTI gap analysis worksheet
- AHRQ: Toolkit for Reducing CAUTI in Hospital Units
- WHO: Prevention of CAUTI Student Handbook
- CDC: Comparison of Alternative Methods to Indwelling Catheters
- External Collection Devices as an Alternative to the Indwelling Urinary Catheter: Evidence-Based Review and Expert Clinical Panel Deliberations
- Strategies to Prevent Catheter-Associated Urinary Tract Infections in Acute Care Hospitals: 2014 Update
- AHRQ: Long Term Care CAUTI Surveillance Worksheet
- PatientCareLink: CAUTI Implementation, Action Plan, and Rounding Worksheets
- Houdini Tool Catheter Removal Protocol

For hospital project improvement teams for general improvement:

- CMS: Hospital Improvement Innovation Networks
- IHI: A Framework for the Spread of Innovation
- The Joint Commission: Leaders Facilitating Change Workshop
- IHI: Quality Improvement Essentials Toolkit
- SIPOC Example and Template for Download
- SIPOC Description and Example
Education for Patients and Family Members

The outline below illustrates all of the information that should be conveyed to the patient and family member by someone on the care team in a consistent and understandable manner.

**Explain why a catheter is needed.** A member of the healthcare team should elaborate on the reasons behind the need for a catheter and include a basic overview of circumstances in which one might be used. This should include information about duration and potential complications, like CAUTI.

**Indicate what to watch out for.** Family members can serve as an extra pair of eyes and ears and can alert medical staff if something might be wrong. Family members should have an understanding of what to look for that may indicate deterioration, such as pain. Additionally, family members should know exactly when to call for help, where to go for help, and with whom they should speak.

Instead of employing a directive conversation style, an active, engaging conversation should take place, leaving capacity for questions and repeat-back strategies. When patients and family members understand the signs and symptoms that could be indicative of a problem, they are able to serve as an extra set of eyes in order to elevate this concern as early as possible.

**Describe what can be anticipated.** In addition to explaining when to call for help in the case of a potential emergency, healthcare providers should also thoroughly explain the treatment that can be expected, including the duration of catheter use. By engaging in these conversations before a problem arises, family members can be prepared in the circumstance of necessary treatment and will have an understanding of where to go to find out more information about their loved one’s condition.

**Evaluate what they can do.** Patients and family members should understand that their actions, such as frequent hand hygiene, can be pivotal in the prevention of CAUTI. Additionally, while family members may want to be physically close with their hospitalized loved one upon visitation, it is important to convey to the visitors that they should avoid coming into contact with the equipment around and related to the patient’s catheter.

If a family member is highly involved in their loved one’s care, they should be encouraged to ask questions and maintain a log of assessments that should be conducted daily. This family member should feel empowered to remind the healthcare staff if they missed a certain step in the process.

**Questions patients and family members might ask:**
- “Is this catheter necessary?”
- “How long will this catheter remain in place?”
- “Are there alternative methods?”
- “Why do I have a urinary catheter in place?”

**Resources for Patient and Family Member CAUTI Education:**
- Mt Nittany Health: Discharge Instructions Caring for Your Indwelling Urinary Catheter
- Newton-Wellesley Hospital: Using a Foley Catheter and Instructions Post-Discharge
- The Patient’s Perspectives Series: Preventing Catheter-associated Urinary Tract Infections video
Measuring Outcomes

Topic
Catheter-associated urinary tract infections (CAUTI)
Rate of patients with CAUTI per 1,000 urinary catheter-days - all inpatient units

Outcome measure formula

Numerator: Catheter-associated urinary tract infections based on CDC NHSN definitions for all inpatient units (CDC, 2015)
Denominator: Total number of urinary catheter device-days for all patients that have an urinary catheter in all tracked inpatient locations where an indwelling urinary catheter is defined as a drainage tube that is inserted into the urinary bladder through the urethra, is left in place, and is connected to a drainage bag.

*Rate is typically displayed as CAUTI/1000 urinary catheter-days

Metric recommendations

Indirect Impact:
All patients with conditions that lead to temporary or permanent incontinence

Direct Impact:
All patients that require a urinary catheter

Lives Spared Harm:

\[ \text{Lives} = (\text{CAUTI RATE baseline} - \text{CAUTI Rate measurement}) \times (\text{Urinary Catheter} \text{ days baseline}) \]

Lives Saved:

\[ \text{Lives Saved} = \text{Lives Spared Harm} \times \text{Mortality Rate} \]

Notes
To meet the NHSN definitions, infections must be validated using the hospital-acquired infection (HAI) standards. Infection rates can be stratified by unit type (CDC, 2020). Infections that were present on admission (POA) are not considered HAIs and not counted.

Data collection:
CAUTI and urinary catheter-days can be collected through surveillance (at least once per month) or gathered through electronic documentation. Denominator documented electronically must match manual counts (+/- 5%) for a 3 month validation period.
CAUTI can be displayed as a Standardized Infection Ratios (SIR) using the following formula:

\[ \text{SIR} = \frac{\text{Observed CAUTI}}{\text{Expected CAUTI}} \]

Expected infections are calculated by NHSN and available by location (unit type) from the baseline period.

Mortality (will be calculated by the Patient Safety Movement Foundation):
The PSMF, when available, will use the mortality rates associated with Hospital Acquired Conditions targeted in the Partnership for Patient’s grant funded Hospital Engagement Networks (HEN). The program targeted 10 hospital acquired conditions to reduce medical harm and costs of care. “At the outset of the PIP initiative, HHS agencies contributed their expertise to developing a measurement strategy by which to track national progress in patient safety–both in general and specifically related to the preventable HACs being addressed by the PIP. In conjunction with CMS’s overall leadership of the PIP, AHRQ has helped coordinate development and use of the national measurement strategy. The results using this national measurement strategy have been referred to as the “AHRQ National Scorecard,” which provides summary data on the national HAC rate (AHRQ, 2013). Catheter Associated Urinary Tract Infections was included in this work with published metric specifications. This is the most current and comprehensive study to date. Based on these data the estimated additional inpatient mortality for Catheter Associated Urinary Tract Infection Events is 0.023 (23 per 1000 events).
Endnotes

Conflicts of Interest Disclosure

The Patient Safety Movement Foundation partners with as many stakeholders as possible to focus on how to address patient safety challenges. The recommendations in the APSS are developed by workgroups that may include patient safety experts, healthcare technology professionals, hospital leaders, patient advocates, and medical technology industry volunteers. Workgroup members are required to disclose any potential conflicts of interest.

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References


Appendices

Appendix 1

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<th>Examples of appropriate uses of indwelling catheters</th>
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<tr>
<td>Patient with acute and/or chronic urinary retention or bladder outlet obstruction</td>
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<tr>
<td>Maintain a continuous outflow of urine for patients with voiding difficulties (as a result of neurological disorders that cause paralysis or loss of sensation affecting urination)</td>
</tr>
<tr>
<td>Need for accurate measurements of urinary output in critically ill patients</td>
</tr>
<tr>
<td>Perioperative use for selected surgical procedures, e.g., patients undergoing urological surgery or other surgery on contiguous structures of the genitourinary tract</td>
</tr>
<tr>
<td>Anticipated prolonged duration of surgery – catheters inserted for this reason should be removed in theatre recovery unit</td>
</tr>
<tr>
<td>Patients anticipated to receive large-volume infusions or diuretics during surgery or need for intraoperative monitoring of urinary output</td>
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<tr>
<td>To assist in healing of open sacral or perineal wounds in selected incontinent patients</td>
</tr>
<tr>
<td>Patient requiring prolonged immobilisation, e.g., potentially unstable thoracic or lumbar spine or multiple traumatic injuries such as pelvic fractures</td>
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<tr>
<td>To improve comfort for end of life care if needed</td>
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<table>
<thead>
<tr>
<th>Examples of inappropriate uses</th>
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<tr>
<td>Don’t use indwelling catheters as a substitute for nursing care of the patient or resident with incontinence</td>
</tr>
<tr>
<td>Don’t use as a means of obtaining urine for culture or other diagnostic tests when the patient can voluntarily void</td>
</tr>
<tr>
<td>Don’t use for prolonged postoperative duration without appropriate indications</td>
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