The South Carolina Hospital Association is making several CAUTI: Catheter-Associated Urinary Tract Infection educational materials available for our member hospitals. Below are some examples hospitals have shared with us.

**Lake City Community Hospital: Unnecessary Foley Object**

Lake City Community gave out the attached brochure, one page flyer, and 10 question T/F quiz to all staff on the unit during their CAUTI educational effort.

8 door prize baskets were awarded via a random drawing among team members who completed and turned in the quiz. The quiz was graded, and employees also received in-service credit for participating as an added incentive.

Note the fun alien theme!
Qsource

Qsource (a nonprofit, healthcare quality improvement and information technology consultancy) created a photo opportunity for hospital staff. Each team member was encouraged to develop their own unique messaging and express themselves in action shots. Because the staff actively participated in the design and implementation, the positive response was overwhelming.

Having a co-worker give the reminder is more effective than one coming from a stranger!

The photo posters are very easy to make and inexpensive to produce.
If your hospital or organization has CAUTI prevention tools you would like to share, please contact Rosemary Thompson at rthompson@scha.org.
The CAUTI Times: Alternatives to Foley Catheterization

Let’s Review the Alternatives To Foley Caths!!!

Hourly Rounding: Ensure your Patient’s bathroom needs are met by developing a Toileting Schedule!

Incontinence Care: Use the Proper Products to Reduce Skin Breakdown!

Condom Caths: Use a Condom Cath in Men to Reduce Infections associated with Indwelling Catheters!

Extra, Extra: Get That Foley OUT!!!
Foley Necessity???

Not an Accessory!!!

**Necessity:**
- Acute Urinary Retention/Bladder Outlet Obstruction
- Need for Accurate Urine Output Measurements in Critically ill Patients
- To Assist in Healing of Sacral/Perineal Wounds in Incontinent Patients
- Patient Requires Prolonged Immobilization
- To Improve Comfort for End of Life Care

**Accessory:**
- Patient Request
- Convenience
- Patient Confusion
- Nurse Preference
- Incontinence

RSFH Models: St. Francis ICU
On the CUSP:
Stop Catheter Associated Urinary Tract Infections (CAUTI) Project

TRUE/FALSE QUIZ: Please answer each question by writing in “True” or “False”

1. __________ One of the goals of the project is to improve patient safety and outcome.
2. __________ 300,000 patients develop hospital-acquired Urinary Tract Infections (UTIs) per year.
3. __________ 80% of hospital-acquired UTIs are associated with indwelling urinary catheters.
4. __________ 5% of hospitalized patients are catheterized.
5. __________ The risk of developing a Catheter Associated Urinary Tract Infection (CAUTI) increases by 2% each day the urinary catheter remains in place.
6. __________ Perineal or sacral wounds in the incontinent patient is an appropriate indication for a urinary catheter to assist in healing.
7. __________ If a patient has a “chronic” foley on admission, the need for continued use should still be assessed during the hospitalization and upon subsequent admissions.
8. __________ About half of the patients with a urinary catheter do not have a valid indication for placement.
9. __________ Adverse urinary catheter outcomes include increases in infections, length of stay, cost, patient discomfort and antibiotic usage.
10. __________ There are specific actions that can be taken to manage the incontinent patient without requiring catheterization.

Name: __________________________________________
Department: ____________________________________

Watch Out for UFOs!
(Unnecessary Foley Objects)
Urinary Catheters Outcomes:
- Infections ↑
- Patient Length of Stay ↑
- Cost ↑
- Patient Discomfort ↑
- Antibiotic Usage ↑

Patient Management for Incontinence:
- Turn patient every 2 hours to cleanse area and change linens
- Use quilted pad under patient
- Utilize skin barrier creams
- Start toilet training program: offer bedpan or commode with assist every 2 hours

Questions?
Call: ______ or ______

Project Team Members:
{LIST HERE}

Promptly Remove Foley Catheters

A Focus On Patient Safety

Infection Prevention and Control Initiative

(Adapted Nov. 2008 from brochure by Mohamad G Fakih, MD, MPH)
Guidelines for Urinary Catheter Need

Is there a Foley Catheter in place?

**Yes**

Does the patient meet criteria for a Foley?

**Yes**

Foley Indications:
1. Urinary Tract Obstruction
2. Gross Hematuria with clots
3. Neurogenic bladder
4. Urologic surgery or studies
5. Stage 3-4 sacral decubitus in the incontinent patient
6. Hospice/Comfort Care

**No**

Continue to monitor Foley need on a daily basis

**With MD’s order**

**No**

No action necessary. Avoid catheter placement.

Urinary Catheters:
- 600,000 patients develop hospital-acquired urinary tract infections (UTIs) every year.
- 80% of these infections are from a urinary catheter.
- About half of the patients with a urinary catheter do not have a valid indication for placement.
- Each day the urinary catheter remains in place the risk of urinary infection (CAUTI) increases 5% per day.

Indications for Urinary Catheters:
- Urinary Tract Obstruction: blood clots; enlarged prostate; urethral problems
- Neurogenic Bladder: retention of urine
- Urologic studies or surgery; perioperative use in selected cases
- Stage III or IV sacral decubiti in the incontinent patient (to assist in healing
- Hospice/Comfort/Palliative Care patient
- Output monitoring only on the most seriously ill patients (those with the acuity of an ICU patient)
- Chronic on admission (continued need should be assessed upon each admission & during hospitalization)
- Required immobilization for trauma or surgery

Urinary Catheters are not Indicated for:
- Incontinence
- Convenience
- Patient Requests
- Urine Specimen Collection
- Output monitoring (in general)
On the CUSP: “Stop Catheter Associated Urinary Tract Infections” Project

Goals:
- Decrease Catheter Associated Urinary Tract Infections (CAUTI), which will in turn improve patient outcomes and decrease length of stay.
- Improve Patient Safety and Outcome.

Background:
- 600,000 patients develop hospital-acquired UTIs per year.
- 80% of these are associated with indwelling urinary catheters.
- 10 – 15% of hospitalized patients are catheterized.
- Approximately half of the patients with a urinary catheter do not have a valid indication for placement.
- Each day the urinary catheter remains, the risk of the CAUTI increases 5%.

Specific Goals:
- Reeducate nurses and physicians re. the indications for the urinary catheter use.
- Reduce the unnecessary use of urinary catheters (particularly indwelling urinary catheters in in-patients).
- Reduce the risk of hospital-acquired urinary tract infections.

Prevention of CAUTI:
Follow criteria indicated for a urinary catheter:

1. Urinary Tract Obstruction: blood clots; enlarged prostate; urethral problems
2. Neurogenic Bladder: retention of urine
3. Urologic studies or surgery; perioperative use in selected cases
4. Perineal or sacral wounds in the incontinent patient (to assist in healing)
5. Hospice/Comfort/Palliative Care patient
6. Output monitoring only on the most seriously ill patients (those with acuity of an ICU patient)
7. Chronic on admission (Continued need should be assessed upon admission & during hospitalization)
8. Required immobilization for trauma or surgery

**Promptly Remove Unnecessary Foley Catheters**

Questions? Call ____________

(Adapted Nov. 2008 from poster by Mohamad G Fakih, MD, MPH)
PURPOSE

Urinary Tract Infections (UTI) have been shown to occur more frequently than other infections associated with healthcare, accounting for 36% of all Healthcare Acquired Infections in the United States. Most healthcare associated UTIs are associated with an indwelling urinary catheter. The risk of acquiring a UTI depends on the method of catheterization, duration of catheter use, the quality of catheter care, and host susceptibility. Studies have shown a strong and direct correlation between catheter use greater than six days and Catheter Associated Urinary Tract Infection (CAUTI) occurrence. In the same study, it was also reported that bacteriuria is nearly universal by day 30 of catheterization.

SCOPE/ACCOUNTABILITY

All healthcare providers, hospital personnel hired or contract who insert and maintain urinary catheters.

POLICY

The necessity for the appropriate insertion and management of urinary catheters has been emphasized by the Institute of Healthcare Improvement, Association for Professionals in Infection Control and Epidemiology, and the Center for Disease Control to reduce and prevent the occurrence of catheter associated infections. More than 30 million Foley catheters are inserted annually in the United States, and these catheterization procedures probably contribute to 1 million CAUTIs.

PROCEDURE

1. Insert catheters only for appropriate indications and leave in place only as long as needed.
• Minimize urinary catheter use and duration of use in all patients, particularly those at higher risk for CAUTI or mortality from catheterization such as women, the elderly, and patients with impaired immunity.
• Avoid the use of urinary catheters in patients and nursing home residents for the management of incontinence.
• Use urinary catheters in operative patients only as necessary, rather than routinely.
• For operative patients who have an indication for an indwelling catheter, remove the catheter as soon as possible postoperatively, preferably within 24 hours, unless there are appropriate indications for continued use documented.
• Avoid using indwelling urinary catheters for patients in chronic renal failure who are on dialysis and don’t make urine.

II. Proper Techniques for Urinary Catheter Insertion
A. Perform hand hygiene immediately before and after insertion or any manipulation of the catheter device or site.
B. Ensure that only properly trained persons who know the correct technique of aseptic catheter insertion and maintenance are given this responsibility.
C. Insert urinary catheters using aseptic technique and sterile equipment.
   • Use sterile gloves, drape, sponges, an appropriate antiseptic or sterile solution for periurethral cleaning, and a single-use packet of lubricant jelly for insertion. Refer to “Clinical Nursing Skills sixth edition” (or current edition as indicated) by Smith, Duell, and Martin located on each floor for the appropriate insertion procedure found on page 713 -725.
   • Once a new urinary catheter has been placed for the first time obtain a urine sample and send it to the lab for a baseline UA. This will help to establish whether the patient has a Urinary Tract Infection prior to insertion of the catheter. A physician’s order must be obtained for the UA.
D. Properly secure the indwelling catheter after insertion to prevent movement and urethral traction.
E. Unless otherwise clinically indicated, consider using the smallest bore catheter possible, consistent with good drainage, to minimize bladder neck and urethral trauma.
F. If intermittent catheterization is used, perform it at regular intervals to prevent bladder overdistension.

III. Protocol for obtaining Urine Specimens from patients who are admitted to the hospital with indwelling urinary catheters already in place.
• If the patient arrived to the hospital with an indwelling catheter already in place from the nursing home or LTAC and the physician orders a routine UA or UA for Culture and Sensitivity the following steps should be taken:
  1. Discontinue the old indwelling urinary catheter.
  2. Follow steps A-F in section II of this policy for proper techniques for urinary catheter insertion and insert a new indwelling urinary catheter.
  3. Obtain a sterile urine specimen and send it to the lab as specified by the physician’s orders.

IV. Proper Techniques for Urinary Catheter Maintenance
A. Following aseptic insertion of the urinary catheter, maintain a closed drainage system.
   • If breaks in aseptic technique, disconnection, or leakage occur, replace the catheter and collecting system using aseptic technique and sterile equipment.
   • Use Urinary catheter systems with pre-connected, sealed catheter tubing junctions.
B. Maintain unobstructed urine flow.
   • Keep the catheter and collecting tube free from kinking.
   • Keep the collecting bag below the level of the bladder at all times. Do not rest the bag on the floor.
   • Empty the collecting bag regularly using a separate, clean collecting container for each patient; avoid splashing, and prevent contact of the drainage spigot with the non-sterile collecting container.
C. Use Standard Precautions, including the use of gloves and gown as appropriate, during any manipulation of the catheter or collecting system.
D. Changing indwelling catheters or drainage bags at routine, fixed intervals is not recommended. Rather, it is suggested to change catheters and drainage bags based on clinical indications such as infection obstruction, or when the closed system is compromised.

E. Do not clean the periurethral area with antiseptics to prevent CAUTI while the catheter is in place. Routine hygiene (e.g., cleansing of the meatal surface during daily bathing or showering) is appropriate.

F. Unless obstruction is anticipated (e.g., as might occur with bleeding after prostatic or bladder surgery) bladder irrigation is not recommended. If obstruction is anticipated, closed continuous irrigation is suggested to prevent obstruction.
   - If obstruction occurs and it is likely that the catheter material is contributing to obstruction, change the catheter.

G. Routine irrigation of the bladder with antimicrobials is not recommended.

H. Routine instillation of antiseptic or antimicrobial solutions into urinary drainage bags is not recommended. Clamping indwelling catheters prior to removal is not necessary.

**Specimen Collection**

J. Obtain urine samples aseptically.
   - If a small volume of fresh urine is needed for examination (i.e., urinalysis or culture), aspirate the urine from the needleless sampling port with a sterile syringe/cannula adapter after cleansing the port with a disinfectant.
   - Obtain large volumes of urine for special analyses aseptically from the drainage bag.

**Daily Assessment of the Need to Continue Urinary Catheters**

During rounds, each patient should be assessed for the presence of a urinary catheter. The reason for use is reviewed. If there is no indication, nurses are instructed to contact physicians to obtain an order to discontinue the catheter.

The following is a List of Reasons for Urinary Catheters to **remain in:**

- Abdominal/Pelvic or Colorectal Surgery (questionable after 48 hours)
- Renal/Urology or Gastric Bypass surgery
- Accurate I & O for patients who are hemodynamically unstable or on strict hourly urine outputs
- Skin breakdown (decubitus ulcers)
- 24 hour urine collection
- Chemically paralyzed and sedated
- Epidural Catheter
- Inability to void/urinary retention
- Pelvic fracture/Crush injury
- Head injury

**REFERENCES**

APIC “Guide to the Elimination of Catheter-Associated Urinary Tract Infections (CAUTIs) 2008


APIC (ASSOCIATION FOR PROFESSIONALS IN INFECTION CONTROL AND EPIDEMIOLOGY)

HICPAC (HEALTHCARE INFECTION CONTROL PRACTICES ADVISORY COMMITTEE) A COMMITTEE FROM THE CENTERS FOR DISEASE CONTROL.

IC POLICY/305-IC-709 INDWELLING URINARY CATHETER INSERTION AND CARE (121510) MF sr
A Review of Strategies to Decrease the Duration of Indwelling Urethral Catheters and Potentially Reduce the Incidence of Catheter-Associated Urinary Tract Infections

Michael S. Bernard, Kathleen F. Hunter, and Katherine N. Moore

Indwelling urinary catheters are widely used in hospitalized patients and can be an appropriate means of therapeutic management under specific circumstances. However, many indwelling urinary catheters are used without clear indications (Gokula, Hickner, & Smith, 2004; Jain, Parada, David, & Smith, 1995), thus putting patients at an unnecessary risk for complications during their hospitalization. Catheter-associated complications include physical and psychological discomfort to the patient, bladder calculi, renal inflammation, and most frequently, catheter-associated urinary tract infections (CAUTI) (Gokula, Smith, & Hickner, 2007). The development of CAUTI in older adults can result in falls, delirium, and immobility (Hazelett, Tsai, Gareri, & Allen, 2006).

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The use of indwelling urinary catheters in hospitalized patients presents an increased risk of the development of complications, including catheter-associated urinary tract infection (CAUTI). With regard to the risk of developing a CAUTI, the greatest factor is the length of time the catheter is in situ. The aim of this article is to review the evidence on the prevention of CAUTI, particularly ways to ensure timely removal of indwelling catheters. Published studies evaluating interventions to reduce the duration of catheterization and CAUTI in hospitalized patients were retrieved. The research identified two types of strategies to reduce the duration of indwelling urinary catheters and the incidence of CAUTI: nurse-led interventions and informatics-led interventions, which included two subtypes: computerized interventions and chart reminders. Current evidence supports the use of nurse-led and informatics-led interventions to reduce the length of catheterizations and subsequently the incidence of CAUTI.

Key Words: Catheter-associated urinary tract infection (CAUTI), indwelling urinary catheters, informatics, hospital-acquired infections, bacteremia.

Urinary tract infections (UTIs) account for at least 35% of all hospital-acquired infections (Hart, 2008), with 80% of those being attributed to the use of indwelling catheters (Gokula et al., 2007). In addition to the impact on quality of life, CAUTIs place a financial burden on the health care system in terms of treatment and increased length of stay. The exact cost of CAUTI is difficult to calculate due to changes in clinical and billing practices (Saint, 2000). However, in the U.S., concern over care costs resulting from a largely preventable problem has resulted in changes to the Centers for Medicare & Medicaid Services’ (CMS) reimbursement system, with hospitals no longer receiving additional payment for CAUTIs that were not present at the time of admission (Wald & Kramer, 2007). In addition to financial cost, CAUTIs affect patient well-being. In a systematic review that examined the clinical and economic
consequences of bacteriuria from catheters, 3.6% of those with symptomatic UTI also developed bacteremia, and mortality from bacteremia can be as high as 10% (Saint, 2000). Although morbidity and mortality rates are relatively low from CAUTIs compared to other hospital-acquired infections, the use of urinary catheters in hospitalized patients leads to a large cumulative risk burden for mortality (Gould et al., 2009). Potentially serious complications associated with indwelling urethral catheters and the possible development of CAUTI warrant efforts to restrict the use of these devices by having clear indications for insertion and discontinuation.

Indications for Indwelling Urinary Catheter Use

Indications for short-term catheterization (less than 30 days) have been described by several authors (Gokula et al., 2007; Gould et al., 2009; Hooton et al., 2010; Nazarko, 2008). These include a) urinary retention, b) obstruction to the urinary tract, c) close monitoring of the urine output of critically ill patients, d) urinary incontinence that poses a risk to the patient because of Stage 3 or greater ulcer to the sacral area, and e) comfort care for terminally ill patients. Despite such recommendations and guidelines, catheters are often placed for inappropriate or poorly documented reasons (Gokula et al., 2004; Jain et al., 1995; Munasinghe, Yazdani, Siddique, & Hafeez, 2001; Raffaele, Bianco, Aiello, & Pavia, 2008). Among hospitalized patients, the rate of unnecessary urethral catheterization has been reported between 21% and 50% (Gardam, Amihod, Orenstein, Consolacion, & Miller, 1998; Gould et al., 2004; Jain et al., 1995; Saint, 2000). The majority of inappropriately placed catheters are initiated and inserted in the emergency department (Gokula et al., 2007; Munasinghe et al., 2001). Urinary catheters are inserted without a physician order in as many as one-third of patients, and even if an order is recorded, no documented rationale is provided. The lack of documented rationale was identified several years ago (Gardam et al., 1998) and remains an ongoing problem (Gokula et al., 2004, 2007).

Individuals 65 years of age or older are at increased risk for unnecessary catheterization (Gokula et al., 2007; Holroyd-Leduc et al., 2007; Saint, 2000), a concern given their high risk of developing complications, particularly infection. No recent research has been published on decision making related to the use of indwelling catheterization, but historically, the increased use in older adults has been an attempt to manage bladder emptying in those with cognitive impairment, incontinence, and decreased function in carrying out activities of daily living (Hampton, 2006; Hazelett et al., 2006) or convenience to staff (Jain et al., 1995; Saint, Lipsky, Baker, McDonald, & Ossenkop, 1999). Anecdotal evidence and case studies suggest that these reasons may continue in some settings.

Whatever the reason for insertion, assessment of the continued need for an indwelling catheter is often overlooked, and catheters then remain in situ without proper indications (Jain et al., 1995; Rabkin et al., 1998). Dingwall and McLafferty (2006) reported that although nursing staff have knowledge about proper and improper indications for urinary catheters and associated risk, they continue to use indwelling urinary catheters for reasons of personal preference and do not assess their continual use. Even with the best nursing care for those with indwelling urinary catheters, each day presents an increasing risk for infection, ranging from 3% to 10% (Hooten et al., 2010; Saint, Lipsky, & Goold, 2002). Strategies should be developed to ensure that catheters are used only when indicated and only for as long as they are needed. Thus, the purpose of this review was to evaluate the current literature for research-based strategies to reduce catheter insertion time and to review the effects of these strategies on the duration of catheterization and incidence of CAUTIs.
Methods

A search of the electronic databases MEDLINE, CINAHL, Cochrane Database, Google, and Google Scholar was conducted. Grey literature (abstracts from conferences or presentations) was also sought for the years 2000 to 2010 using Google Scholar.

Search terms were *indwelling urinary catheter*, *Foley catheter*, and *urinary catheter*, *UTI*, added *UTI*, *bacturia*, *pyuria*, CAUTI*, catheter acquired urinary tract infection, acute care, acute-care, tertiary care, tertiary-care, and hospitalized. Fifty-three abstracts were appraised, and only research studies that addressed acute-care patients, the timely removal of catheters (removal once no longer indicated), and the outcome measures of duration of indwelling urinary catheter and incidence of CAUTIs were included. Of the 53 abstracts reviewed, 9 were relevant to the research questions.

Evidence Base for Strategies To Decrease Indwelling Catheter Use

Nine studies were found that focused on reducing the duration of catheter use, and subsequently, the incidence of CAUTIs (see Table 1). Most of these studies involved reminder systems to trigger the review for continued use of indwelling urinary catheters. Two key interventions were noted: nurse-led (Crouzet et al., 2007; Elpern et al., 2009; Fakhih et al., 2008; Huang et al., 2004; Robinson et al., 2007) and informatics-led with two subtypes – computerized reminders (Apisarnthanarak et al., 2007; Cornia, Amory, Fraser, Saint, & Lipsky, 2003; Topal et al., 2005) and chart reminders (Loeb et al., 2008).

Nurse-led interventions. Nurse-led interventions utilize nursing staff (charge nurse, clinical nurse specialist, or staff nurses) to assess, after a set period of time, whether an indwelling urinary catheter is still indicated for the patient. This leads to a decision to discontinue or continue the catheter through collaborative discussion with the physician or use of a standing order. Elpern et al. (2009) employed a quasi-experimental design in a medical intensive care unit (ICU) at Rush Medical Center (Chicago), including all patients admitted with an indwelling urinary catheter or with an indwelling urinary catheter inserted during their stay. The initial phase of the intervention was the identification of patients with an indwelling urinary catheter by a member of the nursing staff. On a daily basis, in consultation with the staff nurses and with the physician, the investigators determined whether there were appropriate indications for the continuation of the patients’ catheters as defined in a literature review on the indications for use. Data were collected over a six-month period with outcome measures, days of catheter use, and rates of CAUTI. The prospective data were compared to retrospective data from the 11-month pre-study initiation. Results indicated that the active intervention of daily consultation and review of the need for a catheter significantly reduced the number of indwelling urinary catheter days per month as well as the number of CAUTIs.

Taiwanese researchers Huang et al. (2004) also investigated a nurse-led intervention to continue indwelling urinary catheters. Participants were recruited from five ICUs: cardiovascular, coronary care, surgery, neurosurgery, and medicine. A 12-month observational period was followed by a 12-month intervention period. Those with indwelling urinary catheters were identified through the computerized order entry system. All patients who had indwelling urinary catheters were included in the study. Indications for insertion and continuation of the catheters were defined; the primary intervention was a daily reminder to physicians by nursing staff to remove catheters five days after insertion. Overall, there was a consistent decrease in the duration of catheters in situ from 7.0 +1.1 days to 4.6 + 0.7 days and a statistically significant reduction in incidence of CAUTI from 11.5 + 3.1 to 8.3 + 2.5 per 1000 catheter days.

A French research group (Crouzet et al., 2007) conducted a quasi-experimental study of a nurse-led intervention in several non-critical acute care units (neurosurgery, cardiovascular surgery, orthopedic surgery, neurology, and geriatrics). All patients who had undergone urinary catheterization in hospital were included. The study took place over six months, with a three-month observational phase and a three-month intervention phase. During the observational phase, CAUTIs occurred on days 5 and 6 of catheterization; thus, the target day for removal was day 4. Although there was no overall reduction in length of time that the catheters were in situ (8.4 vs. 6.7 days), there was a statistically significant reduction in CAUTI (12.8 vs. 1.8). The authors attribute the improvement to increased surveillance as well as decreased catheter days.

Fakhih et al. (2008) used a quasi-experimental design that made use of pre-existing, nurse-led multidisciplinary rounds and involved 10 nursing units over three phases (pre-intervention, intervention, and post-intervention). Each unit served as a control and as part of the intervention for one period of time. Nursing staff were given education on indications for urinary catheters based on recommendations of the Centers for Disease Control and Prevention (CDC) (Gould et al., 2009). If no indications existed for catheterization during the daily rounds, the nurses contacted the physician for an order to discontinue the catheter. There was a statistically significant reduction in the number of urethral catheterization days and the percentage of unnecessary catheter days in the intervention phase of the study. Unfortunately, the authors report that once the study was complet-
<table>
<thead>
<tr>
<th>Author/Year</th>
<th>Methods</th>
<th>Participants</th>
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<tr>
<td>Elpern et al., 2009</td>
<td>Quasi-experimental design. 11-month observational period compared against a 6-month intervention period.</td>
<td>All participants in the MICU at an acute care hospital in Chicago who had an indwelling urinary catheter during their unit stay were included.</td>
<td>Patients with an indwelling urinary catheter identified on a daily basis. Indications for use in patients identified with staff nurses. Patients with inappropriate indications identified by staff nurses and co-investigations discussed with physician.</td>
<td>CAUTI incidence reduced from 4.7/100 catheter days to zero ($p = 0.01$). Duration reduced from 311.7 days per month to 238.6 days per month ($p &lt; 0.001$).</td>
<td>Discussion of statistics used in analysis was not present. CIs were not present making the reliability of the results hard to determine.</td>
</tr>
<tr>
<td>Fakih et al., 2008</td>
<td>Quasi-experimental design. Three phases: Pre-intervention measuring over five days, intervention measuring over 10 days, and post-intervention measuring over four weeks.</td>
<td>All patients with an indwelling urinary catheter admitted to the units identified by a charge nurse during daily rounds; 4963 patient-days observed.</td>
<td>Nurses educated on the indications for appropriate catheter use based on CDC guidelines. If indication was not present for identified patients during rounds, then nurses contacted doctors for an order to discontinue the indwelling urinary catheter.</td>
<td>CAUTI not measured. Duration reduced from 203 urinary catheter days per 1000 patient days to 162 urinary catheter days per 1000 patient days ($p = 0.002$). No significant reduction of duration between pre- and post-intervention periods ($p = 0.32$).</td>
<td>CAUTI not reported; however, due to the established link between duration and rate of CAUTI, this study still may provide a level of evidence in the reduction of CAUTI through their intervention.</td>
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<td>Crouzet et al., 2007</td>
<td>Prospective, non-randomized, time-sequenced design. Three-month prospective observational phase followed by a three-month prospective intervention phase.</td>
<td>All patients undergoing urinary catheterization were included in the study. Patients with urinary catheters on admission were excluded from the study.</td>
<td>Staff nurses reminded physicians to remove any unnecessary indwelling urinary catheters after four days of being in situ and on a daily basis thereafter.</td>
<td>CAUTI rate decreased from 10.6 per 100 patient days to 1.1 per 100 patient days ($p = 0.003$). CAUTI incidence reduced from 12.3 to 1.8 per 1000 catheters days ($p = 0.03$). Duration decreased from a mean of 8.4 days to 6.7 days. However this was not significant ($p = 0.14$).</td>
<td>Unnecessary, catheterization was not clearly defined. Between individual units, the duration decreased significantly on only two out of the five units. Collectively, there was no significant reduction in the duration of indwelling urinary catheter.</td>
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*continued on next page*
ed, on a subsequent visit to the site, there was a regression to pre-intervention practice in the post-intervention phase. This emphasizes the need for on-going support of staff in practice changes.

Robinson et al. (2007) used a mixed retrospective and prospective study design. Patient records for a two-week period were reviewed retrospectively to identify those who had had indwelling urinary catheters. For many patients in this study, no appropriate reason could be identified, and many developed CAUTIs. In the two-week prospective arm, the charge nurses identified patients without a clear indication for a catheter. The authors concluded that the charge nurses’ active interventions in requesting discontinuation of unneeded catheters resulted in a 67% reduction in the number of days of catheter use and a 26% reduction in the number of CAUTIs when compared to the results from the retrospective arm.

Informatics-led interventions. Informatics-led interventions make use of technological information systems, including computerized, order-entry systems that automatically prompt health care practitioners to take action with regard to a specified and defined intervention. Two studies were found that described two types of order-entry systems. The first was a computerized order-entry and charting system that prompted health care workers to assess and reassess the indications for the use of indwelling urinary catheters (Topol et al., 2003). The second involved recording the use of catheters in a computerized database, similar to medication entry orders with automatic stop orders (Apisarnthanarak et al., 2007; Cornia et al., 2003).

Computerized interventions. Topal et al. (2005) used the computerized order-entry and charting system in four general medicine units at an acute care hospital in Connecticut. They used a quasi-experimental design over three collection cycles, pre-intervention and intervention at two points, each of which was 53 days in duration. In each cycle, the researchers measured and recorded the use of antimicrobials, the incidence of CAUTIs, and the duration of catheterization. The intervention phase included two separate strategies. The first was to enter the indications for the catheter being ordered into a computerized system in the emergency department and then sending these orders with the indications to the admitting doctors. The admitting doctors were then prompted to choose one of three orders for the discontinuation of the indwelling urinary catheter: a) to discontinue the catheter, b) to maintain the catheter for an additional 48 hours, and c) to leave the catheter in place. The second strategy was to allow the nurses to discontinue catheters that no longer had an indication based on their assessment and a standing order. Nursing staff received education sessions on the indications for indwelling urinary catheters use, alternatives, and

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<th>Studies that Focused on the Duration of Catheter Use with Nursing-Led Interventions (continued)</th>
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<tr>
<td>Robinson et al., 2007</td>
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<td>Huang et al., 2004</td>
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</table>
bladder scanning after removal to ensure that patients were not in retention. The interventions resulted in a 42% reduction in the duration of catheterization, and follow up at one year revealed a 79% reduction in the duration of catheterization.

Cornia et al. (2003) utilized a quasi-experimental design to determine the effect of a computerized reminder system on the length of catheterization. The study focused on patients admitted to medical and cardiovascular wards at a city hospital in Seattle. They conducted the study on two floors, each of which contained a set of wards. One floor and its wards served as the intervention group, and the other served as the control group. The intervention included a computerized order-entry system that required the physician to indicate the rationale for initiating catheters and after three days, added daily reminders to determine whether the catheters were still warranted. On the control ward, catheters were initiated as written orders, with no reminder system. The number of days of catheterization between the two intervention and control units, as well as the number of UTIs, were compared after the first day of catheterization. The authors reported a statistically significant reduction in the number of catheterization days from 8 to 5 compared to the control ward. However, they did not find a significant reduction in the rate of CAUTI. A lack of blinding on the control unit (knowing they were part of a research study) may have changed practice so that infection rates were reduced.

In an inner-city hospital in Thailand, Apisarnthanarak et al. (2007) tested the computerized order-entry system to reduce indwelling urinary catheter use. The authors used pre- and post-measures to evaluate the efficacy of a program that focused on nurses’ reminders to physicians to order the removal of unnecessary catheters. The intervention was a daily reminder to the nurses on the computerized order-entry system to identify patients with catheters that had been in place for more than three days and then to notify the attending physicians if catheters were not indicated. The nurses had been previously educated on what constituted appropriate indications based on the authors’ review of the literature. The primary outcome measure was the development of CAUTI, which the authors compared at two points in time: pre-intervention and intervention. There was a significant reduction in the number of catheter-utilization days, with a mean reduction from 11 to 3 days, as well as a significant reduction in CAUTIs (see Table 2).

**Chart reminders.** In a randomized controlled trial in three acute care hospitals in Ontario, where all patients had indwelling urinary catheters, Loeb et al. (2008) utilized automatic stop orders through the medication order-entry system. Subjects were assigned either to a group with automatic stop orders or to a control group for which the current practice was maintained. The intervention consisted of an automatic pre-written stop order in the intervention group’s charts to discontinue the use of the catheter if there was no longer an indication for its use. Nursing staff were required to select an indication if they wished to maintain the indwelling urinary catheter. The indications for use included urinary obstruction, neurogenic bladder, urinary retention, urological surgery, fluid challenge for acute renal failure, open sacral wound for incontinent patients, and urinary incontinence in terminally ill patients. There was a significant reduction in the number of days of catheter use and a significant decrease in the number of CAUTIs in the intervention group (see Table 3).

**Discussion**

The purpose of this review was to discuss the current research on strategies for timely removal of indwelling urethral catheters and to assess the strategies on effectiveness and impact on incidence of CAUTI. Only nine studies were found that addressed the topic. The available evidence supports nurse-led or chart reminders to stimulate consistent daily assessment of the continuing need for a catheter and to remove it as soon as possible. Among the current studies, only one (Loeb et al., 2008) was a randomized controlled trial. The experimental design was possible because of the unique computerized charting system in the study setting, which allowed the easy identification and randomization of their participants. In the other studies, randomization into two groups was not feasible because the nature of the interventions made it possible to carry them out only in an entire hospital unit.

Another factor that reduced the quality of the studies – excluding those of Apisarnthanarak et al. (2007), Cornia et al. (2003), and Loeb et al. (2008) – was the lack of reported confidence intervals (CIs), which made it difficult to judge the precision of the statistics, making the results less reliable as predictors of the effectiveness of the interventions.

The studies took place across several settings: critical care (Apisarnthanarak et al., 2007; Elpern et al., 2009; Loeb et al., 2008), medicine (Cornia et al., 2003; Fakih et al., 2008; Huang et al., 2004; Topal et al., 2005), and surgical units (Crouzet et al., 2007; Robinson et al., 2007). Four countries were represented: Canada (Loeb et al., 2008), France (Crouzet et al., 2007), the United States (Cornia et al., 2003; Elpern et al., 2009; Fakih et al., 2008; Huang et al., 2004; Robinson et al., 2007; Topal et al., 2005), and Thailand (Apisarnthanarak et al., 2007). The potential differences in health care practices and education in these settings could affect the generalizability of the results. Moreover, all interventions, whether nurse-led or informatics-led, demonstrated a significant reduction in the duration of catheterization. However, practice change may be limited to particular settings because of resource issues. For example, to be implemented, an intervention that
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<td>Apisarnthanarak et al., 2007</td>
<td>Quasi-experimental design without a control. 10-month preintervention period (control) followed by a 12-month interventional period.</td>
<td>All patients admitted with an indwelling urinary catheter or who had a catheter placed.</td>
<td>A nurse-generated daily reminder to physicians three days after initiation of an indwelling urinary catheter via the computerized order-entry system to remove catheters that were no longer indicated.</td>
<td>CAUTI rate decreased from a mean rate of 21.5 infections per 1000 catheter-days to 5.2 infections per 1000 catheter days ($p &lt; 0.001$). The duration of urinary catheterization decreased from a mean of 11 days to 3 days ($p &lt; 0.001$).</td>
<td>Study completed in a non–North American setting, which may limit generalizability to other settings.</td>
</tr>
<tr>
<td>Topal et al., 2005</td>
<td>Quasi-experimental design. Three collection cycles: One pre-intervention cycle and two intervention cycles separated by a year.</td>
<td>All patients admitted with an indwelling urinary catheter or who had a catheter placed.</td>
<td>Two-part intervention. First, patients who had catheters initiated in the emergency had the indications for initiation of their indwelling urinary catheter entered into the computerized order entry system. The admitting physician then had the choice to enter into the computerized system to either discontinue the catheter, leave it in chronically, or continue it for an additional 48 hours. The second part of the intervention entailed allowing nurses to independently discontinue catheters based on education sessions offered to them on the proper indication for the continuation of catheters.</td>
<td>Period 1: CAUTI rate was not significant with a decrease from 10 episodes per 1000 catheter-days to 9 episodes per 1000 catheter-days ($p = 0.054$). Duration of catheter use was reduced 42% from 892 to 521 days ($p &lt; 0.001$). Period 2: CAUTI rate decreased from 10 episodes per 1000 catheter-days to two episodes per 1000 catheter-days ($p &lt; 0.001$). Duration of catheter use was reduced 79% from 892 to 184 days ($p &lt; 0.001$).</td>
<td>A significant decrease in CAUTI and reduction in duration was found over an extended period of time but not initially. The first part of the intervention that utilizes the computerized order-entry system focuses on every second day assessments as opposed to daily assessments.</td>
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<td>Cornia, Amory, Fraser, Saint, &amp; Lipsky, 2003</td>
<td>Quasi-experimental design with a control. Set up across two time periods between two floors of medical units. Allowing for each floor to serve as a control and an intervention.</td>
<td>All patients admitted with a catheter or who had a catheter placed while on the unit.</td>
<td>Intervention group utilized a computerized order-entry system that required the physician to indicate the rational for the utilization of the catheter and provided a reminder after three days every day if the catheter was still indicated.</td>
<td>No significant difference in CAUTI rate between the two groups ($p = 0.71$). Duration mean decreased from $8 \pm 5$ to $5 \pm 3$ (95% CI 0 to 5; $p = 0.03$).</td>
<td></td>
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**Table 2. Informatics-Led Interventions: Computerized Reminders**
depends on a computerized system requires the presence of such a system. Because models of nursing practice differ, it may not be reasonable to expect that an intervention that worked in one setting is necessarily translatable to another.

There was a lack of consistency in the definition of short-term catheterization. Two common definitions were noted: 1 to 14 days (Fernandez & Griffiths, 2006; Joanna Briggs Institute, 2008), or 1 to 30 days (Cochran, 2007; Gould et al., 2009). While most studies that offer a definition for short-term use do not explicitly identify reasoning for their criterion, CDC guidelines for the prevention of CAUTI (Gould et al., 2009) chose 30 days as a base for short-term catheterization. This standard is based on a classic study (Warren, Tenney, Hoopes, Muncie, & Anthony, 1982) that showed bacteriuria reach a steady state at 30 days with an indwelling urinary catheter, potentially presenting different risks for short-term versus long-term catheter use.

The studies reviewed, independent of the type of intervention used except for those of Crouzet et al. (2007) and Robinson et al. (2007), showed a significant reduction in the duration of catheterization with a planned removal, and only two (Fakih et al., 2008; Robinson et al., 2007) of the nine studies reviewed did not demonstrate a significant reduction in CAUTI. These findings, although limited by the quality of the studies, demonstrate the potential of interventions based on the review of indications for catheterization. Even if CAUTI was no different in any of the studies, the reduced nursing care time, the ability of the patient to be more mobile, and patient comfort would justify early removal. These outcomes were not measured in any of the studies.

Implications for Nursing

Although the studies used different interventions, they all involved registered nurses with nurse-led interventions or nurses systematically monitoring patients and reminding physicians which patients had indwelling urethral catheters. The front line participation of registered nurses demonstrated their critical role in reducing complications from indwelling urinary catheters. Further research could assess the benefit of targeted education of nurses about indwelling urinary catheters cessation and the effect that education has on systems to ensure catheter removal at appropriate end points.

For undergraduate nursing students, this education could be integrated into their learning of the catheterization skill. Because the knowledge base behind the indications for catheterization is well established, new nurses need to think critically about the indicated need for catheterization and the length of their use when they use their skills to initiate and maintain a urethral catheter.

There is a need to understand the transfer of this knowledge into practice. With regard to nurses who have knowledge about indications for the use of indwelling urinary catheters, as Dingwall and McLafferty (2006) identified, their knowledge does not necessarily translate into practice. A research question needs to be asked about this phenomenon, for example, “What in the culture of nursing practice prevents the translation of knowledge into practice on the proper use of indwelling urinary catheters?”

Conclusion

Indwelling urinary catheterization is an invasive intervention with potentially serious outcomes that can lead to morbidity and mortality issues in hospitalized patients. Although there is a clinical agreement on the indications for catheterization in acute care, more evidence is required to determine the optimum method of ensuring timely removal of indwelling urethral catheters.
catheters in all settings. The current studies identify both nurse-led and informatics-led interventions as successful in reducing the length of catheterizations, and subsequently, the incidence of CAUTI. Research into the barriers of translating knowledge about CAUTI into practice may be important in application of these interventions.

References


