Indwelling urinary catheter management and catheter-associated urinary tract infection prevention practices in Nurses Improving Care for Healthsystem Elders hospitals

Regina Fink RN, PhD, AOCN, FAAN, Heather Gilmartin MSN, RN, FNP-BC, CIC, Angela Richard MS, RN, Elizabeth Capezuti PhD, RN, FAAN, Marie Boltz PhD, CRNP, Heidi Wald MD, MSPH

*Department of Professional Resources, University of Colorado Hospital, Aurora, CO
bCollege of Nursing, University of Colorado Anschutz Medical Campus, Aurora, CO
cSchool of Medicine, University of Colorado Anschutz Medical Campus, Aurora, CO
dCollege of Nursing, New York University, New York, NY

Key Words:
HAI
Indwelling urinary catheter care practice
Nursing care
Nosocomial infection
Infection prevention
Urinary tract infection

Background: Indwelling urinary catheters (IUCs) are commonly used in hospitalized patients, especially elders. Catheter-associated urinary tract infections (CAUTIs) account for 34% of all health care associated infections in the United States, associated with excess morbidity and health care costs. Adherence to CAUTI prevention practices has not been well described.

Methods: This study used an electronic survey to examine IUC care practices for CAUTI prevention in 3 areas—(1) equipment and alternatives and insertion and maintenance techniques; (2) personnel, policies, training, and education; and (3) documentation, surveillance, and removal reminders—at 75 acute care hospitals in the Nurses Improving the Care of Healthsystem Elders (NICHE) system.

Results: CAUTI prevention practices commonly followed included wearing gloves (97%), handwashing (89%), maintaining a sterile barrier (81%), and using a no-touch insertion technique (73%). Silver-coated catheters were used to varying degrees in 59% of the hospitals; 4% reported never using a catheter-securing device. Urethral meatal care was provided daily by 43% of hospitals and more frequently that by 41% of hospitals. Nurses were the most frequently reported IUC inserters. Training in aseptic technique and CAUTI prevention at the time of initial nursing hire was provided by 64% of hospitals; however, only 47% annually validated competency in IUC insertion. Systems for IUC removal were implemented in 56% of hospitals. IUC documentation and routine CAUTI surveillance practices varied widely.

Conclusions: Although many CAUTI prevention practices at NICHE hospitals are in alignment with evidence-based guidelines, there is room for improvement. Further research is needed to identify the effect of enhanced compliance with CAUTI prevention practices on the prevalence of CAUTI in NICHE hospitals.

Copyright © 2012 by the Association for Professionals in Infection Control and Epidemiology, Inc.

Catheter-associated urinary tract infection (CAUTI) is the most common health care–associated infection (HAI), accounting for 34% of all HAI. More than 500,000 CAUTIs are reported annually in the United States, resulting in significant morbidity and mortality and excess resource utilization. CAUTI is of special concern in vulnerable elderly hospitalized patients, based on reports of inappropriate utilization of indwelling urinary catheters (IUCs) in this population.

Despite its prevalence, CAUTI historically has not been a priority of hospital infection control activities. A national survey of infection control practitioners conducted by Saint et al demonstrated poor implementation of CAUTI prevention practices that reduce catheter-days, such as avoidance of IUCs and early catheter removal. These findings are of concern in light of the literature suggesting that universal application of evidence-based prevention practices, such as those described in the Centers for Disease Control and Prevention (CDC) 2010 evidence-based guidelines, would result in the elimination of 20%-70% of CAUTIs.
The CDC document makes more than 60 specific recommendations for CAUTI prevention, the majority of which are supported by only limited evidence. Many of these recommendations address CAUTI prevention techniques specific to nursing practice, such as indications for catheter insertion, insertion technique, catheter materials, management of obstruction, specimen collection, training, surveillance, and documentation. The degree to which these CAUTI prevention practices are adhered to by nurses has not yet been examined. Nurses Improving the Care of Healthsystem Elders (NICHE) is an international geriatric nursing program that supports the organizational capacity to provide age-sensitive care to more than 250 US and international member hospitals. We conducted an electronic survey of NICHE hospitals to determine their adherence to CAUTI prevention practices related to nursing interventions, including bladder management, IUC care, and surveillance.

METHODS
Design, data collection, and sample

A descriptive design was used to survey NICHE hospital nurse coordinators about IUC practices. NICHE, a national program of the Hartford Institute for Geriatric Nursing, provides resources and technical support to enhance hospitals’ systemic capacity to embed evidence-based geriatric knowledge into practice. NICHE is a membership program that requires an organizational commitment, including participation of senior personnel in a NICHE Leadership Training Program and ongoing demonstration of active geriatric programming. NICHE coordinators at each site organize a steering committee to implement and sustain the NICHE program by influencing the incorporation of geriatric-specific protocols and staff education programs, among other activities.

The typical NICHE member hospital is a medium-sized (mean number of beds, 377), urban (87%), teaching hospital (65%) with not-for-profit ownership (76%). Some 66% of NICHE hospitals have attained American Nurses Credentialing Center magnet recognition status.

The survey was designed to provide baseline data collection for a collaborative CAUTI prevention study. Surveillance to Prevent CAUTI, or STOP CAUTI (http://www.ucdenver.edu/academics/colleges/medicalschool/departments/medicine/hcpr/cauti/Pages/default.aspx). In December 2009, an invitation to complete an electronic survey was disseminated by Survey Monkey methodology to a subgroup of NICHE member hospital coordinators (n = 20) who planned to participate in the STOP CAUTI workgroup. In June 2010, NICHE coordinators at all remaining NICHE sites (n = 233) were invited to complete the survey. Respondents were encouraged to gather information related to survey items from a variety of sources including, but not limited to, nurses from the unit or units that were the primary focus of their NICHE activities, infection preventionists, clinical informatics staff, local educators, and purchasing staff. Once data were collected, the survey took 10 minutes to complete. The coordinators at the original 20 sites were also asked to send a copy of their hospital’s IUC placement, management, and/or CAUTI prevention policy and procedure if it existed. E-mail reminders were sent at 2 weeks and again at 4 weeks after the survey launch. The Colorado Multiple Institutional Review Board deemed this study to be exempt from human subjects research oversight.

Survey development and data analysis

The 25-item survey instrument, informed by an evidence-based literature review in the fall of 2009, included both quantitative and qualitative questions on IUC care practices in 3 areas: (1) equipment and alternatives to catheters, insertion practices, and maintenance techniques; (2) personnel, training and education, and catheter policies; and (3) documentation, surveillance, and removal reminders. An expert panel consisting of nurse researchers, infection preventionists, and a physician reviewed the survey before it was pilot tested at an NICHE member hospital. The survey instrument is available on request from the corresponding author.

Data were entered into SPSS version 19 (IBM, Armonk, NY). Survey items and demographic data were summarized using descriptive statistics and tests of difference and association, with α set at 0.05.

RESULTS

Out of the 255 NICHE hospitals, 75 acute care hospitals (mean number of beds, 391) from 29 states and Canada responded, for a 34% response rate. Table 1 summarizes the characteristics of participating hospitals. There were no differences between responding and nonresponding hospitals in terms of bed size, urban setting, and magnet or teaching status. Responding hospitals were less than likely nonresponding hospitals to be government-owned (P = .039). Table 2 summarizes the CDC’s recommended prevention practices along with the responses of the participating NICHE hospitals. Findings for individual prevention practices are discussed in detail in what follows.

Equipment and alternatives, insertion practices, and maintenance techniques

Respondents reported heterogeneous patterns of use of various catheter materials. Hospital-wide use was most commonly reported for latex-containing catheters (55%), followed by silicone catheters (39%). Silver-coated catheters were a close third, with 35% of respondents reporting their use hospital-wide. Of note, 59% of hospitals reported some use of silver-coated catheters. Antibiotic-impregnated catheters were used only in selected patients (6%) and on selected units (2%). Use of rubber and temperature-sensing catheters was reported only in selected patient populations (43% and 30%, respectively) and on selected units (2% and 19%, respectively).

Reports of the use of IUC alternatives and adjuncts are summarized in Figure 1. The most common IUC alternatives were commodes, with 93% of respondents reporting using them always or frequently. Straight catheters and condom catheters were used less often, (always in 33% and frequently in 25%). Female urinals were reportedly never used by 85% of respondents, with access cited as a limiting factor. Among adjuncts, bladder scanners were always or frequently used by 80% of respondents. Only 4% reported never using a catheter-securing device in their hospital. Access to a bladder scanner and catheter-securing device were also cited as problems frequently in 55% of respondents and always in 22% of respondents.

Most hospitals routinely used sterile technique during IUC placement: 97% of respondents reported always using sterile gloves, 89% reported always washing hands, 81% reported always maintaining a sterile barrier, and 74% reported always using a nontouch technique for IUC insertion. Of note, perineal washing with an antiseptic cleanser was always practiced only 44% of the time.

Routine urethral meatal care was performed daily at 43% of hospitals, twice daily in 25%, and 3 times daily in 16%; 16% of respondents reported performing routine care only as needed. Soap and water was used for urethral care by 56% of respondents, 24% performed routine personal hygiene with various products (e.g., bath in a bag, personal care cloths with dimethicone), and 20% used only an antiseptic product. A small percentage of the hospitals...
Tables and figures: Table 1, Table 2

**DISCUSSION**

We have described in detail the CAUTI prevention practices in a sample of NICHE hospitals. Although many practices at these hospitals are in alignment with evidence-based guidelines, there is considerable heterogeneity of practice in nearly all areas assessed (Table 2), leaving considerable room for standardization and improvement.

Our survey is complementary to the earlier survey of Saint et al,11 which queried a nationally representative sample of infection preventionists about selected CAUTI prevention strategies. In both our present sample and the earlier survey, only approximately one-third of the hospitals reported the use of silver-coated catheters house-wide, probably due to the equivocal evidence supporting this practice in light of the excess costs involved.12–14 Interestingly, the use of removal triggers (stop orders and reminders) might have increased substantially since 2008, with the earlier sample reporting the use of stop orders and reminders <10% of the time. In 2010, NICHE hospital respondent reporting using these strategies 56% of the time. We also asked about nursing-driven catheter removal protocols. Overall, 56% of hospitals had some early removal program. Despite this interval increase, 44% of hospitals still had no strategy for early removal, even in the face of strong evidence supporting this practice.

One particular strength of the present study is the detailed picture of nursing practice for CAUTI prevention that it provides. The HICPAC guideline recommends no cleaning of the periurethral area with antiseptics, but only routine hygiene (eg, cleansing of the meatal surface during daily bathing or showering).6 However, NICHE survey respondents reported a wide variety of regimens for routine cleaning and care of the urethral meatus during catheterization.

The heterogeneity in practice provides significant opportunities for implementing local policies and procedures that incorporate evidence-based guidelines. Health care policies and procedures in health care are designed to achieve regulatory compliance and to standardize practice for providers. Such standards are needed to bring best evidence to the bedside.15 Thus, it is telling that 28% of our respondents reported having no CAUTI prevention policy at all. Among those respondents subjected to a detailed review, none included all of the current evidence-based CAUTI prevention practices. Illustrative of this disconnect, bladder scanners were used as an adjunct for IUC avoidance in 80% of responding hospitals, but guidance on their use was found in only 10% of the policies and procedures reviewed.

---

Reported routine use of maximal barrier precautions (masks [0%], gowns [1%], double-gloving [1%], or a 3- to 4-minute hand scrub [13%]) before IUC insertion.

**Personnel, training and education, and policies**

Nursing staff most often inserted IUCs (cited by 72% of respondents), with attending physicians and residents performing this procedure less often (cited by only 28% of respondents). Training in aseptic technique and CAUTI prevention occurred at 64% of the hospitals at the time of initial nursing hire; however, less than half of sites annually validated IUC insertion competency (47%). In the previous year, 72% had provided CAUTI prevention education for nursing staff and 69% had completed a CAUTI quality improvement project. Some 60% of hospitals had provided patients and families teaching about IUC care, signs and symptoms of infection, and discharge instructions.

Some 72% of all responding hospitals reported having policy and procedures providing guidance on IUC placement, management, and/or CAUTI prevention. A detailed review of the policies and procedures from the STOP CAUTI workgroup hospital sites (n = 20), found that 40% were more than 2 years old and had not been revised recently based on current guidelines. Many policies cited evidence-based literature between 1994 and 2009 to support their practices. Of the hospitals without a dedicated IUC policy, 25% referred to nursing textbooks for guidance on IUC care. The content areas most commonly addressed in the policy and procedure review included reinforcement of a sterile closed system (70%) and procedures for obtaining urine specimens (65%). Approximately 50% of the policies included discussion about appropriate indications for catheter use, the importance of emptying of the urinary bag frequently (although regular intervals were not specified), and proper urethral meatal care (routine care parameters varied). Signs and symptoms of CAUTI and assessment parameters were delineated only 20% of the time. There was great heterogeneity with regard to inclusion of other content areas, such as insertion technique and bladder scanner parameters. There were no content areas common to all policies.

**Documentation, surveillance, and removal reminders**

Documentation of urinary output and catheter care management was universal but heterogeneous in method and content. Electronic documentation was reported by 61% of responding hospitals; paper documentation, by 35%; and a combination of both, by 4%. Specific documentation parameters varied significantly among hospitals (Fig 2), with no data field collected universally across hospitals. Type and size of catheter, date and location (unit) of insertion, indication for insertion, description of urine, signs of infection, routine catheter care, episodes of in-and-out catheterization, use of a bladder scanner and urine volume, and catheter removal date, were documented by more than 50% of respondents. Indications for additional catheter-days were documented less often (48%).

Routine surveillance for CAUTIs was reported by 74% of responding hospitals. Of those hospitals, 53% conducted house-wide surveillance, 13% examined ICU data only, and 8% collected data on particular units. Catheter-day data were collected for all units in 51% of responding hospitals, roughly corresponding to the same hospitals reporting house-wide surveillance. Regular feedback on CAUTI rates was routinely provided to nursing staff at the majority of responding hospitals (65%).

Systems to remind providers to remove indwelling catheters were in place in 56% (n = 42) of responding hospitals. Those hospitals used a combination of reminder systems; 72% (n = 30) used a nurse-driven protocol for discontinuation, 64% (n = 27) used chart-based reminders, 64% (n = 27) used an electronic stop order, and 62% (n = 26) used nurse-led catheter rounds.

---

**Table 1**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Respondents, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban setting</td>
<td>88</td>
</tr>
<tr>
<td>Teaching hospital</td>
<td>71</td>
</tr>
<tr>
<td>Magnet hospital*</td>
<td>61</td>
</tr>
<tr>
<td>Ownership status</td>
<td></td>
</tr>
<tr>
<td>Not for profit</td>
<td>85</td>
</tr>
<tr>
<td>Government owned</td>
<td>10</td>
</tr>
<tr>
<td>For profit</td>
<td>5</td>
</tr>
<tr>
<td>STOP CAUTI workgroup participant</td>
<td>27</td>
</tr>
<tr>
<td>HAI mandatory reporting state</td>
<td>61</td>
</tr>
</tbody>
</table>

*American Nurses Credentialing Center Magnet recognition.
Table 2
NICHÉ hospital respondent practices in compliance with selected HICPAC/CDC guidelines6

<table>
<thead>
<tr>
<th>Guidelines (level of evidence*)</th>
<th>NICHÉ hospital respondent practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appropriate catheter use</td>
<td>Insert catheters only for appropriate indications, and leave in place only as long as needed (IB).</td>
</tr>
<tr>
<td></td>
<td>Consider using alternatives to an IUC in selected patients when appropriate (NR/II).</td>
</tr>
<tr>
<td></td>
<td>Consider using external catheters as an alternative to IUCs in cooperative male patients without urinary retention or bladder outlet obstruction (II).</td>
</tr>
<tr>
<td>Proper technique for IUC insertion</td>
<td>Perform hand hygiene immediately before and after insertion or any manipulation of the catheter device or site (IB).</td>
</tr>
<tr>
<td></td>
<td>Ensure that only properly trained persons (eg, hospital personnel, family members, or patients themselves) familiar with proper aseptic catheter insertion and maintenance are given this responsibility (IB).</td>
</tr>
<tr>
<td></td>
<td>In the acute care hospital setting, insert urinary catheters using aseptic technique and sterile equipment (IB).</td>
</tr>
<tr>
<td></td>
<td>Use sterile gloves, drape, sponges, an appropriate antiseptic or sterile solution for periurethral cleaning, and a single-use packet of lubricant jelly for insertion (IB).</td>
</tr>
<tr>
<td></td>
<td>Further research is needed on the use of antiseptic solutions versus sterile water or saline for periurethral cleaning before catheter insertion (NR/II).</td>
</tr>
<tr>
<td></td>
<td>Properly secure IUCs after insertion to prevent movement and urethral traction (IB).</td>
</tr>
<tr>
<td></td>
<td>Consider using a portable ultrasound device to assess urine volume in patients undergoing intermittent catheterization to assess urine volume and reduce unnecessary catheter insertions (II).</td>
</tr>
<tr>
<td></td>
<td>Do not clean the periurethral area with antiseptics to prevent CAUTI while the catheter is in place. Routine hygiene (eg, cleansing of the meatal surface during daily bathing or showering) is appropriate (IB).</td>
</tr>
<tr>
<td>Catheter materials</td>
<td>Further research is needed on the effect of antimicrobial/antiseptic-imregnated catheters in reducing the risk of symptomatic UTI, their inclusion among the primary interventions, and the patient populations most likely to benefit from these catheters (NR/II).</td>
</tr>
<tr>
<td>Quality improvement programs</td>
<td>Implement quality improvement programs or strategies to enhance appropriate use of IUCs and reduce the risk of CAUTI based on a facility risk assessment (IB).</td>
</tr>
<tr>
<td></td>
<td>Education and training</td>
</tr>
<tr>
<td></td>
<td>Ensure that health care personnel and others providing catheter care receive periodic in-service training on techniques and procedures for urinary catheter insertion, maintenance, and removal (IB).</td>
</tr>
<tr>
<td></td>
<td>Provide education about CAUTI, other complications of urinary catheterization, and alternatives to IUCs (IB).</td>
</tr>
<tr>
<td></td>
<td>Consider implementing a system for documenting the following in the patient record: indications for catheter insertion, date and time of catheter insertion, individual who performed insertion, and date and time of catheter removal (II).</td>
</tr>
<tr>
<td>Surveillance</td>
<td>If surveillance for CAUTI is performed, ensure the availability of sufficient trained personnel and technology resources to support surveillance for urinary catheter use and outcomes (IB).</td>
</tr>
<tr>
<td></td>
<td>Use standardized methodology for performing CAUTI surveillance (IB).</td>
</tr>
<tr>
<td></td>
<td>When performing CAUTI surveillance, consider providing regular (eg, quarterly) feedback of unit-specific CAUTI rates to nursing staff and other appropriate clinical care staff (II).</td>
</tr>
</tbody>
</table>

*Levels of evidence: IA, a strong recommendation supported by high- to moderate-quality evidence suggesting net clinical benefits or harms. IB, a strong recommendation supported by low-quality evidence suggesting net clinical benefits or harms or an accepted practice (eg, aseptic technique) supported by low- to very low-quality evidence. IC, a strong recommendation required by state or federal regulation. II, a weak recommendation supported by any quality evidence suggesting a trade-off between clinical benefits and harms. NR/II, no recommendation or unresolved issue for which there is low- to very low-quality evidence with uncertain trade-offs between benefits and harms.

It is also critical that staff be made aware of policy revisions and be provided with annual training and education reviews related to catheter insertion and maintenance techniques. There is definite room for improvement in staff education, given that less than half of the sites queried provided annual validation of IUC insertion competency, and less than two-thirds provided CAUTI prevention and aseptic technique education during orientation. This survey provides a grim picture of nursing practice for CAUTI prevention, demonstrating that only 89% of nurses routinely washed their hands before IUC placement, 3% of respondents did not use sterile gloves, and only 81% used a sterile barrier during IUC placement. One limitation of this study is that we focused on nursing practice. Physician practices were beyond the scope of the study. Whether physicians who inserted catheters were provided any education or competency evaluation is unknown. Physician education and training should not be neglected, given that physicians shared responsibility for IUC placement in more than one-quarter of the NICHÉ respondent hospital sites.
Given the public's expectation for transparency in health care, stakeholders will continue to encourage the surveillance and reporting of HAIs such as CAUTIs and associated care measures. Surveillance and reporting efforts suffer because of poor documentation of such practices as the insertion and removal of IUCs. Although the evidence-based guidelines specify what should be documented, remarkably no single element related to IUCs was uniformly documented by all responding hospitals. Apparently, the shift to electronic medical records is providing an opportunity to standardize catheter documentation in a way that will have the additional benefit of allowing for tracking of catheter utilization and automation of CAUTI surveillance.

Of interest is the finding that 60% of hospitals educated patients and families on IUC self-care, signs and symptoms of infections, and discharge instructions. This is an encouraging finding in light of the essential roles of patients and families in ensuring patient safety, with those who report greater participation in their care also reporting higher quality of care and fewer adverse events. Hospitals that do not currently provide IUC care and maintenance education to patients and families should be encouraged to incorporate this into daily practice, partnering with patients to improve care. However, hospital administration must be aware that this strategy should not be a substitute for staff adherence to core infection control practices. Given the inconsistency in removal triggers, involving the patient and family may provide additional removal reminders for staff, facilitating earlier IUC removal, a primary CAUTI prevention strategy.

Limitations

Our results must be interpreted in light of the several limitations of this study. First, our sample of hospitals is not representative of hospitals nationwide; for example, NICHE hospitals are overwhelmingly not-for-profit hospitals. In addition, they may be particularly attentive to evidence-based nursing practice, given that they have made a tangible commitment to geriatric nursing excellence and are more likely than other hospitals to have a magnet designation. Within NICHE hospitals, the sample was also nonrandom, with close to one-third of the sample participating in baseline data collection for a CAUTI prevention study. The remainder volunteered to participate, and as such they also might have been more particularly interested in CAUTI prevention. Therefore, our results are not generalizable to all US hospitals, and may present an overly positive picture of the state of CAUTI prevention. Second, this study relied on self-reports from the NICHE hospital coordinators, who might not have had perfect knowledge of CAUTI prevention practices at their institution. Finally, this study did not comprehensively cover all of the practices in the CDC guideline, which was not available when this survey was created.

Implications

In the 2 years after this survey was conducted, several factors might have influenced the way in which hospitals are now addressing CAUTI prevention. First is the recent paradigm shift by major stakeholders to zero tolerance for preventable hospital-acquired conditions (HACs)—including CAUTIs—as exemplified by the Center for Medicare and Medicaid Services (CMS) HAC nonpayment policy. The CMS’s more recent proposal of hospitals’ mandatory CAUTI reporting to the National Healthcare Safety Network may provide the impetus for ensuring that policies and procedures are evidence-based and that staff are compliant with proposed practices. Second is the flurry of updated guidance regarding CAUTI prevention practices. Between 2008 and 2010, no fewer than 3 influential American professional societies issued guidelines for CAUTI prevention. In 2009, after a 29-year interval, the CDC updated its evidence-based guidance on CAUTI prevention practices. Although the various guidelines are not identical, they are relatively well-aligned, which should aid health care organizations in standardizing and implementing CAUTI prevention practices. More recently, to spur the uptake of such practices, the Joint Commission has adopted CAUTI prevention in hospitals and critical access hospitals as a National Patient Safety goal. The Joint Commission program supports the adoption of the CDC’s evidence-based guidelines and outlines steps for compliance. This Joint Commission strategy has proven successful for central line infections, and it can be assumed that hospitals throughout the United States will be updating their policies and their practices to be in compliance with evidence-based practice by 2013, as required for Joint Commission accreditation.

To complement these activities, a CDC/Health Research and Educational Trust effort supports the implementation of CAUTI prevention activities on a national level, although the reach of this effort is finite. Our findings suggest the need for translational science efforts such as the STOP CAUTI workgroup to bring national standards to the bedside, with respect for and understanding of local epidemiology and influences. Toward that end, knowledge of the extent of dissemination of CAUTI prevention practices is crucial to understanding the challenges that lie ahead in the effort to eliminate preventable CAUTIs. The results presented herein underscore how hospitals’ prevention efforts are falling short and suggest types of efforts that might be undertaken to support them by a variety of stakeholders, including the CDC, the Agency for Healthcare Research and Quality, and the CMS QIO program. Future work should explore the barriers to implementing prevention practices at the bedside.
Acknowledgments

The authors thank the participating NICHE hospital coordinators, Nina Shabbat, PhD, and Brian Bandle, for assistance with data management, and Karis May for help with formatting the manuscript.

References