

**CE**

# Reducing Catheter-Associated Urinary Tract Infections in Home Care

The Performance Improvement Department of one home healthcare agency (HHA) identified an increase in the rate of catheter-associated urinary tract infections (CAUTI) during 2009. An investigation was undertaken to identify factors that contributed to this increase and an action plan was implemented to reduce the rate of infections. Modifications were made to the surveillance process to align the infection rate calculation with Centers for Disease Control and Prevention (CDC) guidelines and staff education was undertaken to ensure utilization of evidence-based practice. An overall reduction in the CAUTI rate was achieved through this multifactorial approach.

## *A Performance Improvement Project*



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## Introduction

Prevention of healthcare-associated infections (HAIs) is a priority for healthcare workers in all settings. The acute care setting is the most frequent site for surveillance of these infections but medical devices, such as venous access devices and indwelling Foley catheters are used in many healthcare settings, including home, necessitating surveillance and prevention efforts across the healthcare continuum.

According to the Centers for Disease Control and Prevention (CDC) (2011), catheter-associated urinary tract infections (CAUTIs) are the most frequently occurring HAIs, accounting for more than 30% of HAIs reported by acute care hospitals. The Association for Professionals in Infection Control and Epidemiology (APIC) (2008b) reports that CAUTI is the most common infection in long-term care residents. In the home care setting, Sorbye et al. (2005) reported that as many as 5.4% of patients use an indwelling urinary catheter and Getliffe and Newton (2006) identified that 8% of home care patients developed CAUTIs. Surveillance and prevention efforts are, therefore, essential to providing quality healthcare within the home care setting.

## Identification of the Problem

The home healthcare agency (HHA) is a hospital-affiliated, Medicare and Medicaid-certified agency serving patients in two counties of central New York. The HHA has an active daily census of about 750 patients and an average length of service of 28.8 days. Seventy-five percent of the patients are enrolled in traditional or managed Medicare insurance programs. Employees include more than 100 nurses (registered nurses [RNs] and licensed practical nurses [LPNs]), 36 therapists (including physical, occupational, speech, and respiratory therapists), one registered dietitian, four medical social workers, and 12 home health aides. Additional aide services are provided via a contract with other agencies.

The agency's Performance Improvement Process has included surveillance of CAUTIs since 2007. A steady increase in rates from the previous 2 years was noted early in 2009, with a marked increase during the third quarter. A performance improvement project was undertaken to determine why rates were increasing and plan a reduction strategy.

## Literature Review

Indwelling urinary catheters are used in multiple healthcare settings for the management of urinary retention and obstruction, prevention of wound deterioration associated with urinary incontinence, and comfort care during terminal illness (Cochran, 2007). They are more likely to be used for prolonged periods of time in long-term and home care settings, with the likelihood of bacteriuria increasing with the duration of use (Cochran, 2007). Prolonged catheterization (>6 days) was identified as the most prevalent risk factor in the development of CAUTIs with increased risk also associated with catheter-care violations, female gender, and increasing age (APIC, 2008b).

The definitions of CAUTI, established by both the Healthcare Infection Control Practices Advisory Committee (HICPAC) and the APIC were reviewed. HICPAC and APIC recommendations indicated that surveillance efforts should focus on symptomatic CAUTIs (APIC, 2008a; HICPAC, 2009). Asymptomatic bacteriuria is common in catheterized individuals and does not necessitate medical intervention in the absence of other problems. In fact, overuse of antibiotics in the treatment of asymptomatic bacteriuria has been identified as a potential factor in the development of antibiotic resistance (APIC 2008b). Getliffe and Newton (2006) reported that failure to discriminate between symptomatic and asymptomatic CAUTIs has resulted in the inability to compare community infection rates. Standardization of surveillance definitions was recommended in order to overcome this problem. CDC (2009) defines the surveillance terms as follows:

- Symptomatic urinary tract infection (UTI)—patient with an indwelling urinary catheter in place at the time (or removed within 48 hours) of specimen collection, who presents with a positive urine culture or urinalysis AND at least one of the following symptoms: fever (>38° C), suprapubic tenderness, or costovertebral angle pain.
- Asymptomatic bacteremic UTI—patient ≥1 year of age with an indwelling urinary catheter in place at the time (or removed within 48 hours) of specimen collection who presents with no signs or symptoms (e.g., no fever [>38° C], suprapubic tenderness, or costovertebral angle pain) but has both a

- Limiting indwelling catheter use by implementation of alternate strategies, such as intermittent catheterization whenever appropriate.
- Ensuring that clinicians are competent with hand hygiene and aseptic technique when inserting an indwelling urinary catheter.
- Selecting the smallest bore catheter that will allow for adequate drainage.
- Maintaining a closed drainage system whenever possible.
- Preventing obstruction of the drainage system and positioning the bag below the level of the bladder at all times.
- Stabilization of the catheter to reduce mechanical urethritis.
- Emptying the collection bag regularly and instructing caregivers to clean drainage bags.
- Changing the indwelling catheter and drainage bag based on clinical indications such as infection or obstruction rather than at regular intervals.
- Avoiding routine irrigation.
- Practicing routine meatal care while the catheter is in place.
- Ensuring aseptic collection of urine samples either from a newly inserted catheter or via a needleless sample port, which has been cleansed with a disinfectant.

**Figure 1.** Infection prevention strategies in urinary catheter care (Herter & Kazer, 2010).

positive urine culture with no more than two microorganisms AND a positive blood culture with at least one matching uropathogen to the urine culture (or two matching blood cultures drawn on separate occasions if the matching pathogen is a common skin contaminant).

- Indwelling catheter—a catheter that passes from the urethra to the bladder, is left in place, and is connected to a closed drainage system.

Standardization of rate calculations is also necessary to ensure valid data comparison. CDC (2009) guidelines indicate that CAUTI rates are reported per 1,000 catheter days and calculated as follows:

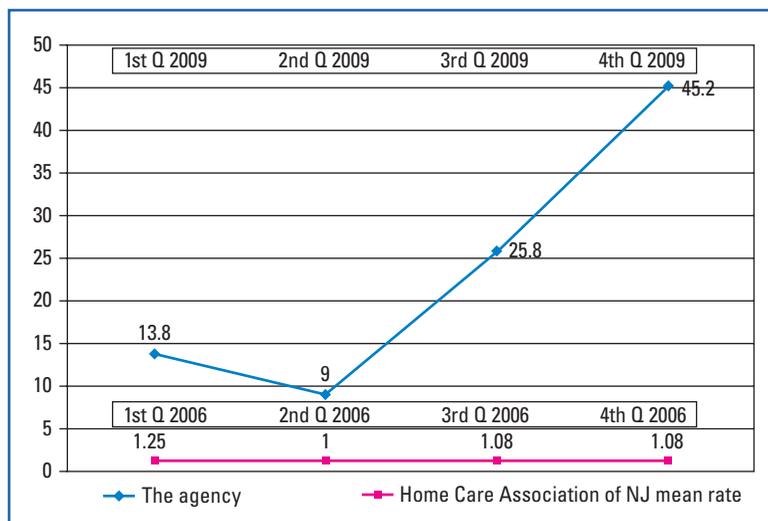
$$\frac{\text{\# CAUTI developing >48 hours after start of care}}{\text{\# of catheter days for ALL patients with an indwelling catheter}} \times 1,000$$

The development of CAUTIs is associated with increased morbidity, mortality, and healthcare expense (CDC, 2011). In the elderly population, reported symptoms associated with the presence of UTIs include worsening mental and functional status and falls are viewed as an indication

that the presence of a UTI should be investigated (Midhun, 2004). The severity of these potential consequences highlight the importance of incorporating evidence-based care for indwelling urinary catheters, including infection control measures and strategies as outlined in Figure 1. Incorporation of such measures may decrease the CAUTI rate by as much as 17% to 69% (Herter & Kazer, 2010).

### Surveillance Process

The validity of the agency's surveillance process came into question during the latter half of 2009 when the CAUTI rate rose significantly. Figure 2 illustrates this increase and



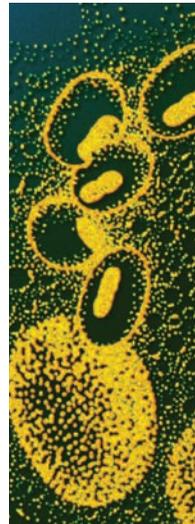
**Figure 2.** Catheter-associated urinary tract infection rate comparison: 2006 New Jersey Benchmarking Project and the 2009 home health agency's (HHA's) rates.

Sources: 2009 HHA data and 2006 data reported by Sienkiewicz, Wilkinson, & Emr (2008).

compares the agency's rate in 2009 with the benchmarking data reported by the New Jersey Benchmarking Project in 2006 (Sienkiewicz et al., 2008). The New Jersey Benchmarking Project began the process of establishing CAUTI benchmarks for home care agencies in New Jersey in order to promote systematic comparison of outcomes between agencies. The agency's 2009 rate increase corresponded with a nearly 50% reduction in agency admissions. This correlation and the stark differences between agency rates and those of the New Jersey Benchmarking Project led the performance improvement department to question the appropriateness of surveillance definitions and methods used for rate calculation.

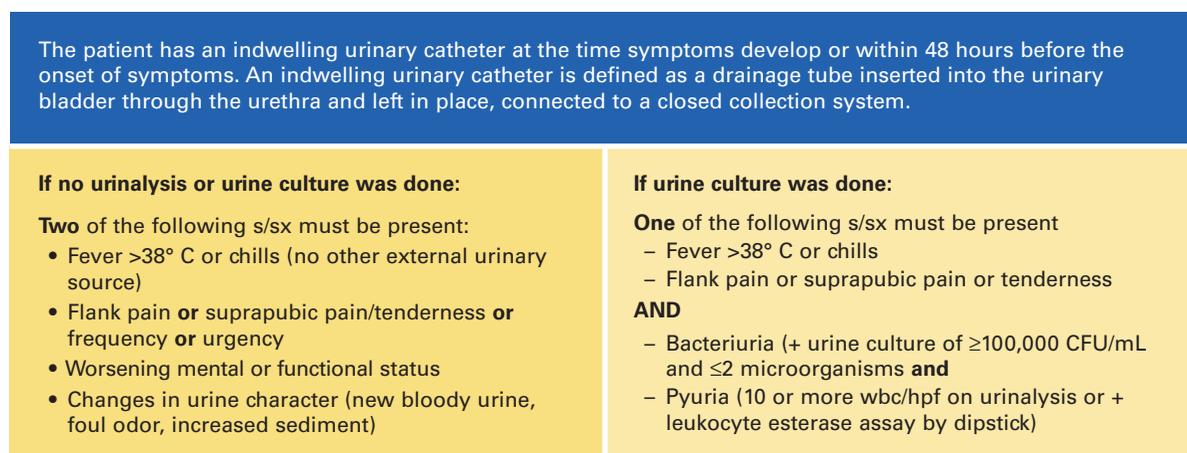
The agency's criteria for inclusion of patients in CAUTI surveillance data through 2009 included physician diagnosis of UTI and/or positive culture with no reference to the presence or absence of patient symptoms. In addition, infections in patients with any type of device used to assist with urinary elimination, e.g., indwelling urethral catheter, straight catheter, nephrostomy tube, or suprapubic catheter, were included in data collection. Beginning in 2010, the agency modified its CAUTI definition to include only symptomatic CAUTIs based on the criteria identified by HICPAC (2009) (Figure 3). Only those with an indwelling catheter passing from the urethra to the bladder were included in rate calculations.

Through 2009, agency calculations had included the catheter days for only those patients who had been admitted to the agency within the



Policy and procedure changes were made in the areas of catheter irrigation, catheter change frequencies, specimen collection, and care/changing of the collection bag.

quarter being reported. The agency's surveillance process indicated that infections occurred more often in long-term patients (those who had been open to the agency for more than 2 months). As a result, the reported rates were inflated by the inaccurate denominator, and the rapid rise in the third and fourth quarters was directly related to the decreased agency admission rate. The rate of infection was recalculated based on the CDC formula and catheter days for ALL patients, not just patients admitted during the current quarter, were included. Using the new rate calculation, a reduction in the reported CAUTI rates was noted for 2009 (Table 1). Thus, changing the calculation process to be consistent with CDC recommendations resulted in lower reported rates.



**Figure 3.** Home health agency 2010 home care catheter-associated urinary tract infection definitions.

Note: s/sx = signs and symptoms; wbc/hpf = white blood cells per high powered field.

**Table 1. 2009 Catheter-Associated Urinary Tract Infection (CAUTI) Calculation Comparisons for the Home Health Agency**

	2 <sup>nd</sup> Q Old Calculation	2 <sup>nd</sup> Q New Calculation	3 <sup>rd</sup> Q Old Calculation	3 <sup>rd</sup> Q New Calculation	4 <sup>th</sup> Q Old Calculation	4 <sup>th</sup> Q New Calculation
Number of patients with Foley catheter	72	160	36	125	50	254
Number of catheter days	2007	8293	1009	8073	664	6827
Number of CAUTIs	18	18	26	26	30	30
Infection rate = number of infections per 1,000 catheter days	9.0	2.2	25.8	3.2	45.2	4.4

Note. Q = quarter.

### Changes in Education to Support the Performance Improvement Initiative

Once calculation rates and definitions were modified, the agency rate still exceeded those reported by the New Jersey Benchmarking Project. Therefore, the agency's focus shifted to the delivery of patient care. An internal review of the following was completed: agency policies, procedures, standards of care, and patient-teaching tools as they related to indwelling catheter care and management.

Evidence-based practice for management of indwelling catheters in the home care setting was used as a basis for policy and procedure changes and for staff re-education. Primary resources included, "Indwelling Urinary Catheters: Best Practice for Clinicians (Wound, Ostomy and Continence Nurses Society [WOCN], 2009); and consultation with a urologist in community practice. Strategies identified in the Bladder Bundle (APIC, 2008b) were included as appropriate to the home care setting (Figure 4). Specific aspects of the bundle which were amenable to home care intervention included ongoing assessment of the need for indwelling catheterization; consideration of alternative treatments, such as condom or intermittent catheterization; aseptic insertion; and approaches to ongoing maintenance.

Policy and procedure changes were made in the areas of catheter irrigation, catheter change

- A**septic insertion and proper maintenance is paramount.
- B**ladder ultrasound may avoid indwelling catheterization.
- C**ondom or intermittent catheterization in appropriate patients.
- D**o not use the indwelling catheter unless you must!
- E**arly removal of the catheter using reminders or stop orders appears warranted.

Source: Association for Professionals in Infection Control and Epidemiology (APIC). (2008b).

**Figure 4. Bladder bundle.**

From: Greene L, Marx J, Oriola S, Guide to the Elimination of Catheter-Associated Urinary Tract Infections (CAUTIs). Washington, DC: Association for Professionals in Infection Control and Epidemiology, 2008: 40. Used with permission.

frequencies, specimen collection, and care/ changing of the collection bag. For example, parameters for indwelling catheter irrigation were limited to those situations in which blood clots, mucus, or sediment were obstructing the flow of urine (Emr & Ryan, 2004). Routine irrigation of the indwelling catheter was discouraged. The standard of care related to specimen collection was revised to include insertion of a new indwelling catheter prior to

specimen collection whenever possible (APIC, 2008b). Scripting suggestions were provided to the RNs when requesting doctors' orders. For example, "the patient is exhibiting signs of a UTI. The catheter has been in place since \_\_\_\_\_. We are requesting an order to change the catheter and obtain a specimen for urinalysis and culture." Protocols were established for changing and cleansing the collection bags. Education also included indications for indwelling catheter use and alternatives, such as intermittent self-catheterization or condom catheters as appropriate.

### Staff Education

Staff education related to CAUTI prevention included all clinical staff, including RNs, LPNs, therapists, home health aides, social workers, and dietician. The detail and instructional strategy varied by discipline. In all aspects of education, principles of infection control were emphasized. For example, hand hygiene has been included in the agency's mandatory annual skilled and nonskilled (HHA)-based competencies since 2010. The education plan for patient and caregiver also included hand washing and a greater emphasis was placed on the need for appropriate peri-care and the proper care and cleansing of catheter connection sites, drainage spouts, and drainage bags with return demonstration of all instruction expected. Implementation of sterile technique for catheter insertion and specimen collection was a focus of skilled nursing instruction.

Varied instructional strategies were used to educate staff (Figure 5). Mandatory clinical competencies are skill-based demonstrations, which must be completed by the RNs, LPNs, and home health aides annually. Mandatory annual self-instruction modules are self-study packets completed by all agency staff prior to their annual review. Additional self-instruction packets are presented to discipline specific staff for completion throughout the year, as a need is identified.

- **Large group instruction** was provided to all clinical staff, including RNs; LPNs; physical, occupational, and speech therapists; dietitian; and medical social workers, during a monthly forum. Clinicians were able to attend in person or receive the information

Summary of Staff Education Strategies	
Large Group Instruction	Target audience: Nursing and rehabilitation staff
Small Group Lecture and Demonstration	Target audience: Nursing staff
Mandatory Clinical Competencies	Target audience: Nursing and home health agency (HHA) staff
Mandatory Annual Self-Instruction Modules	Target audience: All clinical staff
Mandatory Self-Study Packets With Post-Test	Target audience: Nursing staff
Small Group Case Study Review	Target audience: Clinical staff
Nursing Orientation Program	Target audience: Newly hired nursing staff

**Figure 5.** Staff education strategies summary.

Source: HHA Education Department.

electronically. An overview of the CAUTI problem and definition of a symptomatic CAUTI were presented. In addition, guidelines to prevent CAUTIs, an introduction to the new/revised standard of care, policies and procedures, and patient education tools were included.

- **Small group instruction via team meetings** was provided by the staff educator. Instruction included lecture and demonstration of techniques for specimen collection, catheter securement, changing and cleansing the collection bag, and peri-care. Discussion included indwelling urinary catheter management, maintaining a closed system, minimizing catheter irrigation, and the importance of patient diet and hydration in preventing infections. Strategies for managing issues, such as urinary leakage and constipation were also presented.
- **2010 and 2011 mandatory clinical competencies** for all skilled nursing staff included catheter insertion procedure. Insertion technique was observed at the agency setting for all with follow-up observations in the home for any new agency employees. A discussion of strategies for reducing CAUTI development followed all staff demonstrations.

### Slide #1 Urinary tract infections (UTIs) are the most common healthcare-associated infection.

- Virtually all healthcare-associated UTIs are associated with catheter use.
- Untreated UTIs can lead to blood stream infections.
- Untreated UTIs lead to increased morbidity and mortality, and an increased cost associated with hospitalization.
- CAUTIs can be prevented by use of recommended infection control measures.

Source: CAUTI Guideline Fast Facts @ [http://www.cdc.gov/hicpac/CAUTI\\_fastFacts.html#1](http://www.cdc.gov/hicpac/CAUTI_fastFacts.html#1).

### Slide #3 Prevention of CAUTIs

- Hand hygiene whenever touching catheter.
- Peri-care daily and after episodes of bowel incontinence.
- Keep drainage bag below level of the bladder.
- Maintain free flow of urine at all times in the catheter system.
- If accidentally disconnects, cleanse the end of drainage tubing using mechanical friction with alcohol for 10 seconds and reconnect.
- Do not let drainage spout come in contact with anything.
- Keep patient adequately hydrated.
  - Instruct patient to drink 6–8 oz of noncaffeinated fluid daily and include cranberry juice daily unless contraindicated.
- Insert catheter using strict sterile technique.
- Irrigate ONLY for obstruction by blood or mucous (with physician order).
- Whenever possible, obtain specimen from a newly inserted catheter. If unable to change the catheter for sample collection, cleanse the collection port using mechanical friction with alcohol for 10 seconds.
- Discourage use of leg bag unless leaving the home (to maintain a closed system as much as possible).
- If patient uses leg bag, teach patient/caregiver to clean the bag that is removed by rinsing with water, followed by filling bag and tubing with either 1 part white vinegar and 3 parts water or 1 part household bleach and 9 parts water, allowing it to sit for 30 min on a hard surface, drain, dry outside of bag, and hang over towel rack to air dry. Do not rinse.

### Slide #2 How CAUTIs Develop?

#### From outside the catheter:

- Contamination of the catheter at the time of insertion.
- Touching the outside of the patient's catheter without performing hand hygiene.

#### From inside the catheter

- From reflux of urine in tubing or drainage bag positioned higher than the level of the bladder.
- Disconnecting system for any reason without adequate cleansing, e.g., changing from one bag to another or performing irrigation.

### Slide #4 CAUTI Questions

1. One way to prevent CAUTI is to teach the patient/caregiver cleansing of the catheter bags with either 1 part white vinegar and 3 parts water OR 1 part household bleach and 9 parts water.
  - a. True
  - b. False
2. CAUTIs can be prevented by (select all that apply):
  - a. Instructing the patient/caregiver to perform hand hygiene before handling the catheter.
  - b. Instructing the patient/caregiver to keep the drainage bag lower than the level of the bladder to prevent return of urine into the bladder.
  - c. Instructing the patient/caregiver: if tubing accidentally disconnects from the catheter, cleanse the ends of the tubing with alcohol and reconnect.
  - d. Instructing the patient/caregiver that peri-care should be completed only after a bowel movement.

Answers: Question 1 is a; Question 2 is a, b, and c

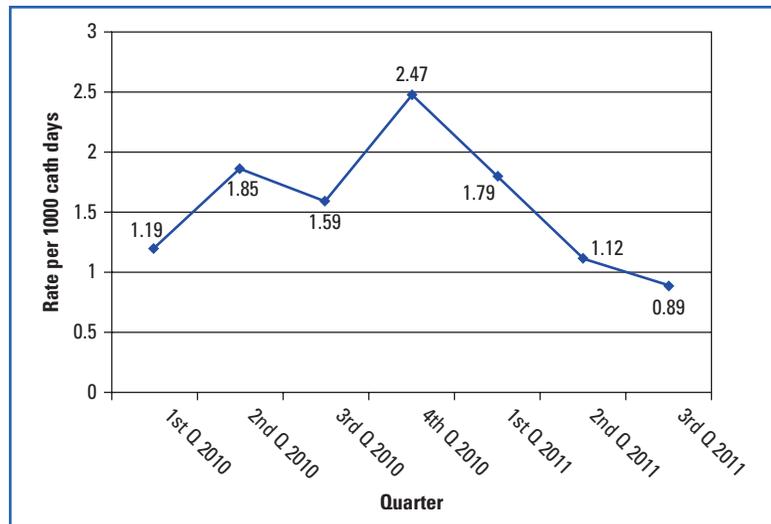
Source: The HHA Annual Inservice Fair, 2011.

**Figure 6.** Annual self-study packet related to catheter-associated urinary tract infection (CAUTI) prevention: All clinical staff.

- **2011 mandatory clinical competencies** for home health aide staff included demonstration of peri-care and indwelling urinary catheter care.
- Mandatory **annual self-instruction modules** were updated. All clinical staff, RN, LPN, rehabilitation staff, medical social workers, and home health aides were required to review information on the causes of CAUTIs and prevention strategies. Two modules were presented, one for RNs and LPNs, and another for non-nursing staff. Test questions with immediate feedback concluded this module (Figure 6).
- **Self-study packets** were also designed to include updated nursing policies and procedures. These were distributed to all RNs and LPNs. Following review of the material, a post-test was completed. Immediate feedback was given to nurses with remediation for any score below 85%.
- **Case study:** The chart of an active patient who had recurrent CAUTIs was selected for review by each clinical team at a monthly team meeting. An interactive discussion facilitated by a member of the staff education department was completed. Staff members were then asked to identify opportunities for improvement in the patient's plan of care.
- **Nursing Orientation Program** was revised to include evidence-based practices, which are known to decrease the occurrence of CAUTIs. Clinician guides for patient/caregiver education are distributed and reviewed. Patient education tools specific to managing the indwelling urinary catheter are introduced. Clinical competencies completed during orientation include demonstrating proper insertion of the indwelling urinary catheter and related care.

## Outcomes

Outcomes of this project were assessed using both a focused review of patients with indwell-



**Figure 7.** Catheter-associated urinary tract infection rate 2010–2011, the home health agency.

ing catheters, and surveillance of CAUTI infection rates. Care provided to 30 patients who had an indwelling catheter during June 2010 was reviewed. Limited documentation related to patient education was noted and the need for additional staff education related to observation of patient/caregiver skills was recognized. Re-education related to patient education was provided at subsequent team meetings. Ongoing record reviews continue to identify a lack of observation of caregiver technique related to hand hygiene, peri-care, and equipment management but didactic instruction between clinician and caregiver is being documented more consistently.

Surveillance of CAUTI rates continued on a quarterly basis. A goal of fewer than 1 CAUTI per 1,000 catheter days, based on New Jersey Benchmarking project results (Sienkiewicz et al., 2008), was set by the Performance Improvement Department. During the second quarter of 2010, additional data became available for those patients who were rehospitalized at the network hospital with a UTI. The Performance Improvement staff was able to access hospital-based documentation related to culture results and patient signs and symptoms at the time of hospital readmission. As a result, an increase in the reported rate occurred during the second quarter. The majority of staff education occurred during the second and early third quarters, leading to a decrease



**Surveillance of catheter-associated urinary track infection (CAUTI) rates continued on a quarterly basis. A goal of fewer than 1 CAUTI per 1,000 catheter days, based on New Jersey Benchmarking project results, was set by the Performance Improvement Department.**

in infection rates noted during the third quarter. Fourth quarter results demonstrated an unexpected increase in CAUTI rates and was followed immediately by a re-education program with all staff, including a review of agency outcomes related to CAUTIs and strategies for prevention. Following this re-education, the CAUTI rate has dropped for three consecutive quarters, achieving the target goal of <1/1,000 catheter days in the 3rd Q 2011 (Figure 7). This ongoing reduction in the rate of infections was also communicated to the staff as part of an agency meeting and via a poster presentation.

### Future Plans

CAUTI surveillance will continue with implementation of the following:

- Track and trend data by both the clinician and the team.
- Monitor infection rates for patients with suprapubic catheters.
- Focused review of the care provided to patients who develop CAUTIs.
- Remedial staff instruction as indicated by record review and observation of care provided during supervised visits.

### Implications for Home Health

Providing high-quality healthcare across settings requires an ongoing identification of patient outcomes and the factors that contribute

to those outcomes. The nursing process and quality review processes, such as the Plan, Do, Check, Act format, are methods that offer a systematic approach to the examination of issues and introduction of evidence-based interventions when action is needed. This project provided an opportunity to incorporate these processes into the agency's efforts to improve quality of care.

Lessons learned from this project have included:

- Efforts to improve outcomes require assessment of both the techniques for measuring the outcome and patient-care delivery. An assumption that either one alone is the cause of an undesired outcome could prevent the agency from achieving maximum improvement.
- Changing clinical staff behavior requires utilization of adult learning principles and incorporation of various instructional strategies:
  - The reason for change must be clearly communicated.
  - Barriers to the new behavior and suggestions for overcoming the barriers need to be identified at the outset.
  - Feedback loops should be incorporated to increase engagement, application, and retention of new information. Examples included: test questions, skill demonstration, application to case studies, and ongoing notification of outcomes.
- A mechanism to incorporate new information into ongoing staff education is important due to staff turnover and the natural tendency for new behavior to decrease over time until it has been embedded into the clinicians' practice.
- Desired outcomes may be achieved despite a lack of evidence in clinical documentation to support that all aspects of best practice have been employed, as indicated by the ongoing lack of documentation of caregiver observation related to catheter management.

### Outcome and Assessment Information Set Implications

Development of a CAUTI may lead to cognitive and functional declines. For example, the

altered mental status, which often accompanies a CAUTI in an older adult, may result in the inability to manage medications appropriately or to demonstrate poor judgment with regard to safety. Weakness associated with CAUTI may result in a decreased ability to complete activities of daily living and/or increase the patient's risk to fall. Complications of the CAUTI, medication mismanagement, or a fall could result in the need for emergent care or readmission to the hospital, both of which are measured via Outcome and Assessment Information Set (OASIS) outcome data. Reducing the occurrence of CAUTIs has the potential to positively impact both functional and utilization outcomes, such as the rate of hospital readmission and emergent care utilization.

### Summary

Reducing the rate of CAUTIs among home care patients was identified as an agency goal in late 2009. The process for attaining this goal involved a comparison of both the surveillance process and the patient-care practices with evidenced-based practice. Modifications to the surveillance process were implemented and staff education completed based on these findings. As a result, the rate of CAUTI occurrence has decreased steadily during 2011. ■

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