

CONTINENCE CARE



Pad Weighing for Reduction of Indwelling Urinary Use and Catheter-Associated Urinary Tract Infection

A Quality Improvement Project

Tara Beuscher

■ ABSTRACT

Catheter-associated urinary tract infections pose a significant risk to hospitalized patients. Measuring accurate urinary output is a common reason for indwelling catheterizations in acutely ill patients. The risk of catheter-associated infections may be eliminated while maintaining ability to measure urinary output of incontinent patients through the use of a highly absorbent pad and weighing postincontinence. The dry pad weight is subtracted from the wet pad weight and the resulting difference (expressed in grams) equals the volume of urine leaked into the pad in milliliters. We found that using this system of improved measurement of urine output when compared to documenting the number of incontinent episodes while allowing removal of indwelling urethral catheters as soon as possible.

KEY WORDS: CAUTI, incontinence, urinary catheter, weighing pads

■ Introduction

Accurate intake and output measurement is an essential component of caring for acutely ill individuals and it has been identified as an appropriate indication for the placement of an indwelling urinary catheter.¹ However, indwelling urinary catheters predispose patients to catheter-associated urinary tract infections (CAUTIs), and the risk for infection is proportionally related to the length of time the catheter remains indwelling.² In recent years, there has been increased focus on reducing CAUTI rates by several regulating agencies. The Centers for Medicare & Medicaid Services announced that beginning in 2008, it would no longer reimburse hospitals for costs attributable to CAUTIs.³ The average cost of a CAUTI varies from \$1200 to more than \$2700 per episode.⁴ In 2009, the Institute for Healthcare Improvement added CAUTIs as a focus of its Improvement Map Campaign.⁵ In 2010, The Joint Commission⁶ proposed the implementation of evidence-based practices to prevent CAUTIs as one of its 2012 National Patient Safety Goals.

Multiple alternatives have been discussed to limit the use of urinary catheters. Written policies and criteria, dedicated nursing staff to supervise catheter usage, computerized physician and nursing order entry systems, intermittent catheterization, the use of portable bladder ultrasound scanners, external urinary collection devices, aseptic catheter insertion, maintenance of a closed urinary drainage system, and selective use of anti-infective catheters have all been endorsed in various clinical practice guidelines.⁷

Nevertheless, the need for accurate measurement of urinary output is at cross-purposes with the goal of reducing the time a urinary catheter remains indwelling. Removing urinary catheters and allowing acutely ill patients to be incontinent of urine results in dramatically reduced accuracy of output data. In an attempt to improve accuracy of urinary output data while reducing indwelling urinary catheter days, several staff members with neonatal intensive care experience conceived of a program to weigh absorbent pads of incontinent adult patients. It has been common practice to weigh diapers to obtain accurate urinary output in nontoliet trained pediatric settings for decades. The dry diaper weight is subtracted from the wet diaper weight. The resulting difference in gram weight is then converted to milliliters (1 g = 1 ml). A literature review failed to identify any clinical practice guideline for CAUTI prevention published in the past 30 years that suggested using and weighing absorbent pads to provide accurate urinary output.⁷ Instead, these guidelines appear to have been written assuming that an indwelling catheter is the only viable alternative for measuring intake and

■ **Tara Beuscher, DNP, RN-BC, GCNS-BC, ANP-BC, CWOCN, CFCN,** Advanced Practice Nurse III - Nurse Practitioner, Transitional Care Hospital, University of Virginia Health System, Charlottesville.

The author has no conflict of interest to report.

Correspondence: Tara Beuscher, DNP, RN-BC, GCNS-BC, ANP-BC, CWOCN, CFCN, Transitional Care Hospital, University of Virginia Health System, 2965 Ivy Rd, PO Box 801095, Charlottesville, VA 22908 (tb2nm@virginia.edu).

DOI: 10.1097/WON.0000000000000068

output in the acutely ill and incontinent adult. Existing evidence challenges this assumption, and weighing diapers to measure intake and output is frequently advocated in infants and children who are not toilet trained. While statistically differences in diaper weights obtained long after the diaper was wet have been measured, these differences have not been found to be clinically relevant.⁸

■ Methods

The long-term acute care (LTAC) facility is designed to care for chronically critically ill individuals and those needing acute care over an extended period of time. Individuals who require slow weaning from mechanical ventilation and those with very large or complex wounds are examples of the types of patients who require LTAC services.

The UVA Transitional Care Hospital is a relatively new, LTAC with a maximum capacity of 40 beds. At the time this quality improvement project was planned, the census was approximately 20 patients. Every patient was managed in a private room and all required contact isolation protocol due to the high percentage of patients with multidrug-resistant organism infection or colonization. The nursing staff questioned the need for indwelling urinary catheter use on every patient every day. Instead they sought alternatives for measuring urinary output that would enable earlier removal of the indwelling catheter with the associated decreased risk for CAUTI. Physicians expressed concern about the need for accurate measurement of urinary output volumes and the impact of current clinical practice, which included recording output by documenting the number of incontinent episodes as compared to the volume of urine discharged with these episodes.

In an attempt to provide a better estimate of actual output, our interprofessional patient care committee came up with the idea to weigh the pads of incontinent adults using a technique similar to that already used to measure urinary output in pediatric patients in diapers. Our LTAC employed highly absorbent pads to contain urine. We reasoned that the soiled pads could be weighed in grams, dry weight subtracted, and difference would be the volume contained in the pad as one gram equals one milliliter (ml) or cubic centimeter (cc). Any staff member (RN, LPN, PCA—patient care assistant, respiratory therapist, physical/occupational therapist) who was involved in assisting with care after a patient was incontinent could weigh the pad.

At the time this project was implemented, we had switched our bed pads to Ultrasorbs AP Underpads (Medline Industries, Inc, Mundelein, Illinois) as part of a pressure ulcer-prevention protocol. We had also implemented a structured skin care regimen; patients who were incontinent of urine or stool were cleansed daily and after major incontinence episodes using a 1-step premoistened cloth

(Comfort Shield Barrier Cream Cloths, Sage Products, Cary, Illinois) that contains a skin cleanser, moisturizer, and dimethicone-based skin protectant. We observed that this process had previously been successful in reducing moisture-associated skin damage and hospital-acquired pressure ulcers (D. Mercer, oral communication, February 2013).

We then searched for a cost-effective and accurate scale capable of measuring weight in grams. The Salter Brecknell Electronic Postal Scale (item number 901-7010SB, Quill Corporation, Philadelphia, Pennsylvania, \$87.99 each) was chosen for its accuracy, size, and cost. The scales were evaluated and cleared by clinical engineering prior to use. Scales were placed in each room where it was important to have accurate urinary output. A container was set on top of the scale that was sufficiently large to hold a large saturated pad; these containers were purchased from a local retailer. Scales were calibrated with the container in place so that the weight of the container did not affect the calculation. Pads were weighed directly in the container. Scales and containers stayed in the room until no longer needed at which time they were thoroughly sanitized, following our standard protocol. Any visible soiling of the container was cleaned in the room using a bleach wipe.

Fifty large pads were weighed to assess variability in pad weight. A bimodal distribution emerged, with 23 pads (46%) weighing 115 g and 27 pads (54%) weighing 120 g (mean = 117.7, SD = 2.5). While we acknowledged this difference, we reasoned that this variability was too small to be of clinical significance.⁹ A card containing information on the dry weight was laminated and attached to the base of the scale for ease of subtracting dry pad weight from wet pad weight (Figure 1).

We then instituted the pad-weighing regimen. When a urinary catheter is removed, patients are checked frequently for ability to drain their bladder completely via an ultrasonic bladder scanner (Diagnostic Ultrasound, Redmond, Washington). Scans were stopped after 2 PVR scans were less than 50 cc. If the bladder scan revealed a residual volume greater than 200 cc, the urinary catheter was reinserted. Residual urine volumes between 50 and 200 cc were monitored closely to determine the need for catheter reinsertion.

Nursing staff were trained to use the scale August 2012. Ten separate training sessions were held on different shifts, during the week and on weekends to educate the majority of staff. During the training sessions, the process of weighing the pads, subtracting dry weight from wet weight along with a demonstration of a large pad holding over a liter of fluid and still feeling dry was shown. This education was provided to all clinical staff, including RNs, LPNs, PCAs, RTs, PTs, OTs, and SLPs as all direct care staff provide patient care, including repositioning and hygiene.

Staff were taught to weigh pads in grams and subtract the dry weight; the result of this calculation was converted to milliliters and documented in the patient's electronic



FIGURE 1. Pad/basket and scale.

health record. Pads containing a mix of urine and liquid stool were weighed and all volume was marked as urinary output. The passage of liquid stool was also documented in the appropriate section of the EHR. Solid stool was

removed from the pad and disposed prior to pad weighing to maximize the accuracy of urinary volume measurement.

Pilot Program

An appropriate patient was chosen for a trial that same month and a pilot program initiated. Urinary output documented in milliliters (rather than merely documenting the number of incontinent episodes) was found to improve medical decision-making and outcomes for our trial patient. Specifically, weighing pads was found sufficient to evaluate suspected fluid overload that ultimately led to weaning from a ventilator. Physicians were so pleased with the methods for measuring urine output in our initial patient that they began supporting and encouraging adaptation of this technique for measuring urinary output in others. Nurses and patient care assistants also found the process to be acceptable.

Weighing of incontinent pads became standard practice in September 2012 for all patients able to void who required accurate urinary output measurement. Once again the screening protocol for urinary retention using bladder scan technology was utilized. We calculated occurrence rates of CAUTI and daily prevalence of catheter use before and after implementation of this quality improvement project. Differences in the number of indwelling catheter days and CAUTI occurrences were calculated monthly and were reviewed over a period of 7 months and data were compared to a 7-month period prior to implementation of our new technique for measuring urinary output. Given the comparatively small size of our LTAC, we realized that reduction of CAUTI occurrence by 1 was likely to exert a significant influence on our occurrence rates.

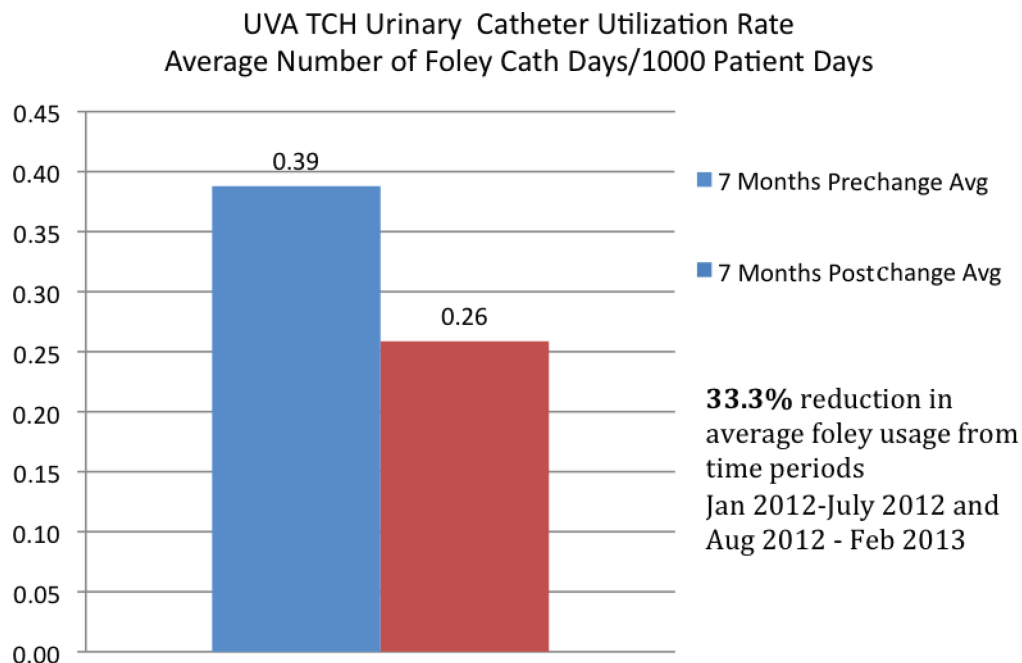


FIGURE 2. Indwelling urinary catheter utilization rate.

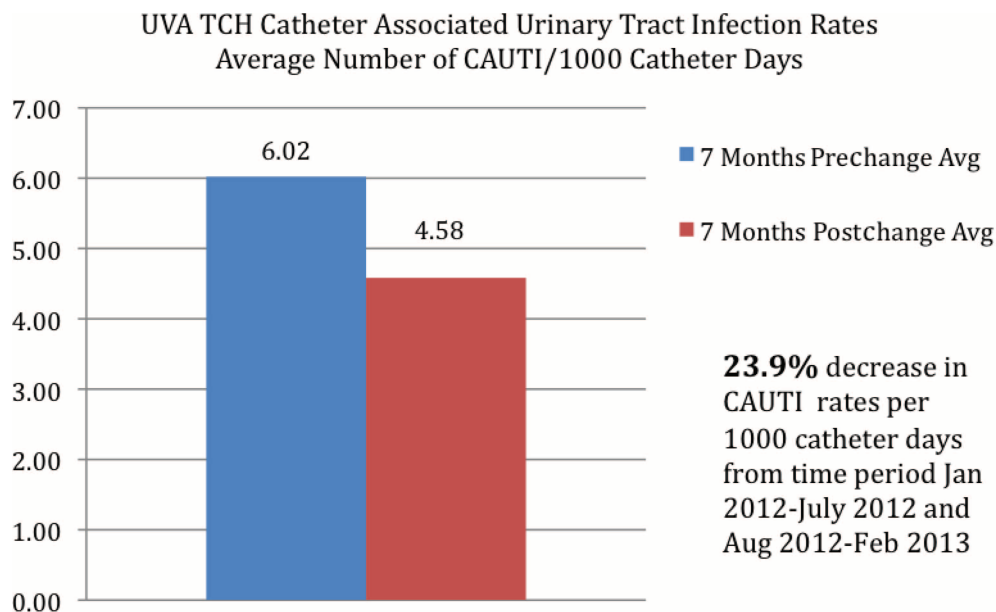


FIGURE 3. CAUTI/1000 catheter days.

Outcomes

Following institution of our quality improvement project, our facility experienced a 33.3% reduction in catheter days over a 7-month period (Figure 2). In the 7 months prior to the pilot, we had an average of 0.39 urinary catheter days/1000 patient days compared with 0.26 in the 7 months postchange (Wilcoxon rank sum test $Z = 0.383$, $P = .702$). We also saw a 23.9% reduction in the number of CAUTI/1000 urinary catheter days from 6.02 to 4.58 in the same 7 months pre- and postimplementation (Wilcoxon rank sum test $Z = 0.262$, $P = .794$) (Figure 3). A 41.1% decrease was seen in the number of CAUTI/1000

patient days, from 1.79 to 1.06 (Wilcoxon rank sum test $Z = 1.307$, $P = .191$) (Figure 4).

Discussion

Outcomes of this quality improvement project suggest that routine pad weighing in selected patients reduces both use of urinary catheters and CAUTI occurrence. Although the reduction in urinary catheter use and CAUTI was not statistically significant, results were deemed clinically meaningful.

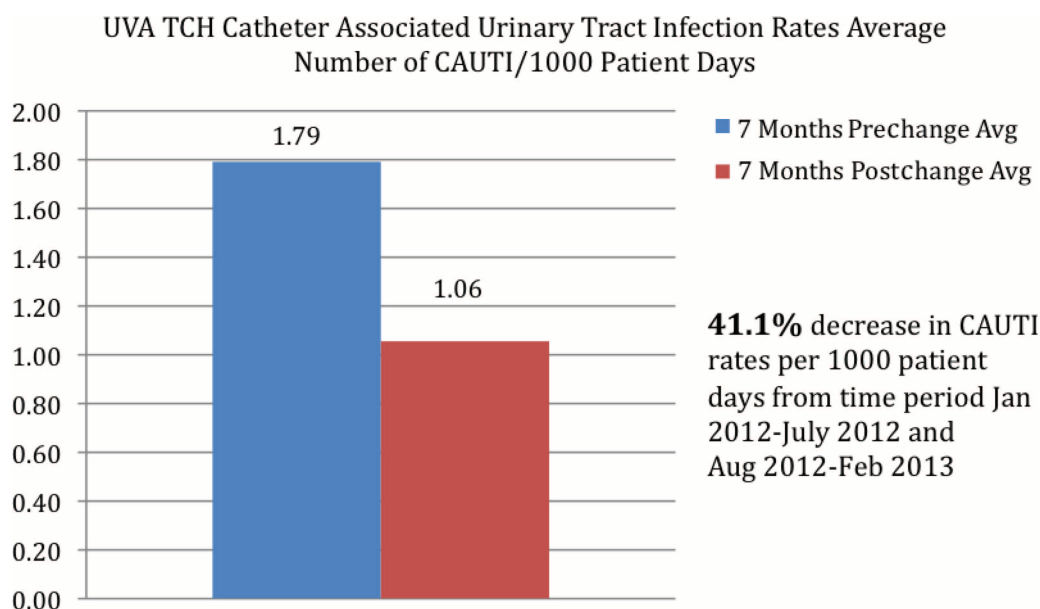


FIGURE 4. CAUTI/1000 patient days.

Use of absorbent pads during our quality improvement program reduced overall pad usage from \$6.43 per patient day to \$5.90 per patient day. This reduction in pad usage may reflect increased attention to and focus on proper pad usage through staff education. The cost of the scale, container, and instruction card was approximately \$90 each. Based on our 23.9% decreased CAUTI rate, we estimate preventing 2 CAUTIs at an average of \$2000 each for an estimated savings of \$4000 during this period.

Following this evaluation period, our facility has purchased additional scales for measurement of urinary output. We plan to add a scale to each room so that there is no missed opportunity for measurement of urine output.

■ Future Directions

We found that adopting this innovative technique for measuring urinary output via pad weighing reduced indwelling urinary catheter usage. The cost to implement this program was limited to the purchase scales and basins. Preventing 2 CAUTIs offsets the cost of purchasing scales for 40 rooms. Not only did our urinary catheter utilization rate drop, we also achieved a decline in the CAUTI rate per 1000 urinary catheter days. We acknowledge that having achieved a lower number of indwelling urinary catheters, each CAUTI is anticipated to exert a greater effect on the overall rate. Institutions with a strong plan to reduce the use of indwelling urinary catheters should not be unduly penalized if a reduction in indwelling catheter days results in a higher CAUTI rate as the denominator becomes smaller.¹⁰

■ Conclusions

Outcomes from this quality improvement project demonstrate the feasibility of measuring urinary output in selected acutely ill patients with resorting to prolonged use of an indwelling urinary catheter. This decline in overall catheter use exposed fewer patients to the associated risks of hospital-acquired CAUTI. Research reproducing this technique in the context of a formal study is indicated to determine if the trends we noted are statistically significant.

KEY POINTS

- ✓ Weighing absorbent pads in order to determine urinary output can reduce indwelling catheter days in patients in a long-term acute care facility.
- ✓ Fewer indwelling urinary catheters may reduce the risk of CAUTI for those patients who can be managed with absorptive pads.

■ References

1. Gould CV, Umscheid CA, Agarwal RK, et al. Healthcare Infection Control Practices Advisory Committee (HICPAC). CDC guideline for prevention of catheter-associated urinary tract infections 2009. *Infect Control Hosp Epidemiol.* 2009;31: 319-326.
2. Burton DC, Edwards JR, Srinivasan A, et al. Trends in catheter associated urinary tract infections in adult intensive care units—United States, 1990-2007. *Infect Control Hosp Epidemiol.* 2011;32:748-756.
3. Wald HL, Kramer AM. Nonpayment for harms resulting from medical care: catheter-associated urinary tract infections. *JAMA.* 2007;298:2782-2784.
4. Vonberg RP, Behnke M, Geffers D, et al. Device-associated infection rates for non-intensive care unit patients. *Infect Control Hosp Epidemiol.* 2006;27:357-361.
5. Institute for Healthcare Improvement. Improvement map. <http://www.ihl.org/IHI/Programs/ImprovementMap/>. Accessed March 12, 2013.
6. The Joint Commission. Proposed 2012 National Patient Safety Goals Hospital Accreditation Program. http://www.jointcommission.org/assets/1/6/NPSGs_CAUTI-VAP_HAP_20101119.pdf. Accessed April 4, 2014.
7. Conway LJ, Larson EL. Guidelines to prevent catheter-associated urinary tract infection: 1980 to 2010. *Heart Lung.* 2012;41:271-283.
8. Carlisle J, Moore A, Cooper A, et al. Changes in infant disposable diaper weights at selected intervals post-wetting. *Pediatr Nurs.* 2012;38(4):223-226.
9. Sands JM, Mound DB, Layton HE. The physiology of water homeostasis. In: *Core Concepts in the Disorders of Fluid, Electrolytes and Acid-Base Balance.* 2013:1-28.
10. Wright M, Kharasch M, Beaumont JL, Peterson LR, Robicsek R. Reporting catheter-associated urinary tract infections: denominator matters. *Infect Control Hosp Epidemiol.* 2013;32(7): 635-640.