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Major Article

Impact of a change in surveillance definition on performance assessment of a catheter-associated urinary tract infection prevention program at a tertiary care medical center

Madhuri M. Sopirala MD, MPH ^{a,*}, Asma Syed MD ^a, Roman Jandarov PhD ^b, Margaret Lewis MSN ^c

^a University of Cincinnati College of Medicine, Cincinnati, OH

^b Division of Biostatistics and Bioinformatics, Department of Environmental Health, University of Cincinnati College of Medicine, Cincinnati, OH

^c University of Cincinnati Medical Center, Cincinnati, OH

Key Words:

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Background: In January 2015, the Centers for Disease Control and Prevention (CDC)/National Health Safety Network (NHSN) changed the definition of catheter-associated urinary tract infection (CAUTI). We evaluated the outcomes of a robust CAUTI prevention program when we performed surveillance using the old definition (before 2015) versus the new definition (after 2015). This is the first study to evaluate how the change in CDC/NHSN definitions affected the outcomes of a CAUTI reduction program.

Methods: Baseline was from January 2012 to September 2014; the intervention period was from October 2014 to February 2016. Staff nurses were trained to be liaisons of infection prevention (Link Nurses) with clearly defined CAUTI prevention goals and with ongoing monthly activities. CAUTI incidence per 1000 catheter days was compared between the baseline and intervention periods, using the 2 definitions.

Results: With the new definition, CAUTIs decreased by 33%, from 2.69 to 1.81 cases per 1000 catheter days (incidence rate ratio [IRR] = 0.67; 95% confidence interval [CI]: 0.48-0.93; $P < .016$). With the old definition, CAUTIs increased by 12%, from 3.38 to 3.80 cases per 1000 catheter days (IRR = 1.12; 95% CI: 0.88-1.43; $P = .348$).

Conclusion: We aggressively targeted CAUTI prevention, but a reduction was observed only with the new definition. Our findings stress the importance of having a reasonably accurate surveillance definition to monitor infection prevention initiatives.

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Catheter-associated urinary tract infections (CAUTIs) are one of the most common and preventable healthcare-associated infections.¹⁻³ The Centers for Medicare and Medicaid Services use CAUTIs as the basis for denial of additional payments to hospitals.⁴ The incidence of CAUTIs increased by 6% from 2009 to 2013 despite a national goal and a push to reduce the CAUTI rate by 25% by the year 2013.⁵⁻⁷ No data exist on prevention efforts from hospitals, making it unreasonable to attribute this increase to flaws in the surveillance definition. In January 2015, the Centers for Disease Control and Prevention (CDC)'s National Health Safety Network (NHSN) changed the definition of CAUTI.^{8,9}

Based on prior work,¹⁰ in October 2014 we developed an infection prevention program (Link Nurse Program) that uses staff nurses as liaisons of infection prevention and systematically trained their focus on CAUTI prevention. We sought to evaluate how the outcomes of our robust CAUTI prevention program fared with the use of different CDC/NHSN definitions of CAUTI that were in effect at some point during the study. This is the first study to report the effect of specific CDC/NHSN definitions of CAUTI on the outcome of prevention efforts.

METHODS

At a 699-bed tertiary care academic medical center in the state of Ohio, we extracted all urine cultures from the electronic clinical information system and the infection control database for 5 intensive care units (ICUs): medical, surgical, cardiovascular, neuroscience, and burns. The baseline study period was from January

* Address correspondence to Madhuri M. Sopirala, MD, MPH, Infectious Diseases, University of Cincinnati College of Medicine, 231 Albert Sabin Way, MSB 6109, ML 0560, Cincinnati, OH 45267.

E-mail address: msopirala@gmail.com (M.M. Sopirala).

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Table 1
Monthly education and activities of Link Nurses who were focused on CAUTI prevention during the intervention period

Intervention Month	Link Nurse Meeting Activity
September 2014	8-hour infection prevention training for Link Nurses
October 2014	Link Nurse return demonstration training of urinary catheter maintenance
November 2014	Cross-sectional audit of all urethral catheters in the hospital
December 2014	<ul style="list-style-type: none"> • Link Nurse training on collection of urine cultures • Shared urethral catheter audit results • Link Nurse self-commitment to 3 action items for their units based on the audit results
January 2015	<ul style="list-style-type: none"> • Sharing of unit-based CAUTI prevention activities by Link Nurses • Specific instructions for urine culture collection shared with Link Nurses
February 2015	<ul style="list-style-type: none"> • Foley insertion competency training using mannequin • Assignment to Link Nurses to perform competency training on their units for urinary catheter insertion and maintenance
March 2015	CAUTI prevention objectives and strategies engaging patients and family members shared with Link Nurses to be disseminated on their units
April 2015	Catheter insertion competencies on units completed by Link Nurses and shared at the meeting
May–July 2015	Link Nurses shared their unit-based activities
August 2015	Roll out of urinary catheter kit to standardize step-by-step process of insertion; Link Nurses educated on the kit and helped with the roll-out
September 2015–February 2016	Link Nurses shared their unit-based activities

CAUTI, catheter-associated urinary tract infection.

Table 2
Old and new surveillance definitions used in the study

2013 & 2014 CDC/NHSN CAUTI Criteria (Old Definition)	2015 CDC/NHSN CAUTI Criteria (New Definition)
<p>Patient had an indwelling urinary catheter in place for >2 calendar days, with day of device placement being Day 1, and catheter was in place on the date of event OR had an indwelling urinary catheter in place for >2 calendar days and had it removed the day of or the day before the date of event</p> <p>AND</p> <p>at least 1 of the following signs or symptoms: fever (>38°C); suprapubic tenderness*; costovertebral angle pain or tenderness*</p> <p>AND</p> <p>EITHER</p> <p>1. a positive urine culture of ≥105 colony-forming units (CFU)/ml with no more than 2 species of microorganisms.</p> <p>OR</p> <p>2. at least 1 of the following findings: a. positive dipstick for leukocyte esterase and/or nitrite b. pyuria (urine specimen with ≥10 WBC/mm³ of unspun urine or >5 WBC/high power field of spun urine c. microorganisms seen on Gram stain of unspun urine AND a positive urine culture of ≥103 and <105 CFU/ml with no more than 2 species of microorganisms.</p> <p>Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between two adjacent elements.</p>	<p>Patient must meet 1, 2, and 3 below:</p> <ol style="list-style-type: none"> 1. Patient had an indwelling urinary catheter that had been in place for > 2 days on the date of event (day of device placement = Day 1) AND was either: Still present on the date of event, OR Removed the day before the date of event 2. Patient has at least one of the following signs or symptoms: fever (>38.0°C), suprapubic tenderness,* costovertebral angle pain or tenderness,* urinary urgency,* urinary frequency,* dysuria* 3. Patient has a urine culture with no more than two species of organisms, at least one of which is a bacteria of ≥105 CFU/ml. All elements of the UTI criterion must occur during the Infection Window Period.

CDC/NHSN, Centers for Disease Control and Prevention/National Healthcare Safety Network; CAUTI, catheter-associated urinary tract infection.

*With no other recognized cause.

2012 to September 2014; the intervention period was from October 2014 to February 2016. The institutional review board determined that the study was not human subjects research.

The Department of Infection Prevention/Control instituted an 8-hour training program, which constituted training 1 staff nurse per each patient care unit (PCU). In September 2014, 27 staff nurses were trained in infection control principles, microbial transmission mechanisms, microbiological testing protocols, and specimen collection, using previously described methods.¹⁰ They either volunteered or were selected by the nursing administration to be a Link Nurse, with the opportunity to use their work for a clinical ladder project for professional advancement. Link Nurses met monthly after the initial 8-hour training. Their PCU-based activities are outlined in Table 1.

The major changes in the 2015 definition (new definition) of CAUTI compared to the definition in effect until December 2014 (old definition) are as follows:

Any urine cultures with *Candida*, yeasts or molds, and those with colony counts less than 10⁵ CFU/ml were no longer considered during surveillance for CAUTIs. Exclusion of present on admission (POA) symptoms and a change to the use of calendar days for determining POA were introduced in January 2013. We used the 2013

definition as the “old definition.” We performed surveillance for the entire study period using both the old and new CDC/NHSN definitions for CAUTI. Table 2 describes the old and new definitions. We measured the monthly incidence in CAUTI rate per 1000 urinary catheter days (with the old and new definitions) in ICUs and analyzed the reduction in the CAUTI rate after implementation of the Link Nurse Program. As in previous studies,^{10,11} a Poisson regression analysis was used to generate an incidence rate ratio (IRR) compared with the baseline CAUTI rate for both the old and new definitions. Statistical analyses were performed using R version 3.3.0.28 software.

RESULTS

During our surveillance in the baseline period using the new CAUTI definition, we observed 142 CAUTIs in 52,721 urinary catheter days. The CAUTI rate was 2.69 cases per 1000 catheter days. During the intervention period, we observed 49 CAUTIs with 27,122 urinary catheter days, with a CAUTI rate of 1.81 cases per 1000 catheter days. This represents a 33% decrease in the CAUTI rate during the intervention period compared to the baseline period, with an IRR of 0.67 (95% confidence interval [CI]: 0.48-0.93; *P* = .016) (Fig 1).

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