operations, especially in gastric, hepatic, colorectal, or biliary tract surgeries. Gastric juice reflux, aspiration, and/or more serious injury during the procedure might be reasons for this phenomenon. Pathogens causing POP are ubiquitous in healthcare settings, which are similar to those responsible for other hospital-acquired pneumonia.

Several factors have been correlated with POP after abdominal operations; therefore, it is likely that much could be done perioperatively to reduce the frequency of the complication. Most measures are the same strategies used for the prevention of surgical site infections,[5] including the management of underlying disease (especially chronic cardiovascular disease, diabetes mellitus, chronic pulmonary disease), improving the patient's nutritional status, cessation of smoking, improving operation skill, and reducing the duration of surgery. Focusing on these measures in these patients could reduce their risk for POP.

In conclusion, the POP incidence is not low in abdominal operations, and the complication is more common in patients with chronic cardiovascular disease or in habit of smoking, and its major pathogens are gram negative bacteria.

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Clinical Relevance of the 2014 and 2015 National Healthcare Safety Network's Catheter-Associated Urinary Tract Infection Definitions

To the Editor—Catheter-associated urinary tract infection (CAUTI) is the healthcare-associated infection most commonly reported to the National Healthcare Safety Network (NHSN).[1] The Centers for Medicare and Medicaid Services (CMS) use CAUTI rates to help define hospital quality and to determine reimbursement.[2]

The NHSN periodically updates the surveillance definition of CAUTI; substantial revisions occurred in 2009, 2013, and 2015. Previous authors have described poor correlation between surveillance and clinical CAUTI cases. For example, Neelakanta et al[3] reported that >50% of patients with a surveillance CAUTI had a non-UTI source of fever using the 2013 definition. While one would not expect a surveillance definition to precisely mirror clinical cases, many would argue that it is inappropriate to use surveillance data to levy financial penalties on hospitals when it poorly reflects clinical cases.

In this study, we compared 2014 and 2015 surveillance CAUTI to clinical CAUTI in 2 hospitals to determine which surveillance definition has the highest concordance with clinical CAUTI diagnoses.

METHODS

Setting and Population

This retrospective cohort study was conducted at 2 affiliated academic hospitals. Together, the hospitals have ~1,200 medical-surgical and 143 critical-care beds. One hospital has solid organ transplantation, bone marrow transplantation, and burn units. Eligible cases were obtained by querying the NHSN for CAUTI diagnosed between January 1, 2014, and December 31, 2014. A case patient was excluded if his or her medical record was incomplete or if the patient was <18 years old.

An infection preventionist reviewed eligible cases to confirm that they met the 2014 and to determine whether they met the 2015 NHSN CAUTI definitions. An infectious diseases physician reviewed each case of surveillance CAUTI to decide whether it was also a clinical CAUTI. Clinical documentation was used to establish the presence of urinary tract infection

TABLE 1. Univariate and Multivariate Associations With Clinical Diagnosis of CAUTI

	Univariate analysis		Multivariate analysis	
Variable	Clinical CAUTI Odds Ratio (95% CI)	*P* Value	Clinical CAUTI Odds Ratio (95% CI)	*P* Value
Age, median years (IQR)	1.03 (0.82–1.31)	.79	0.89 (0.66–1.20)	.44
Male	1.62 (0.75–3.49)	.21	…	…
Critical care (vs other)	0.94 (0.42–2.08)	.88	1.75 (0.63–4.85)	.28
Gram negative bacillus (vs other)	5.86 (2.57–13.38)	<.001	2.65 (0.94–7.48)	.07
Urinalysis				
WBC/HPF ≥ 10 vs <10	1.97 (0.81–4.80)	.13	…	…
Moderate/large leukocyte esterase	2.58 (1.15–5.79)	.02	…	…
Positive nitrite	2.11 (0.54–8.17)	.36	…	…
Positive urinalysis[a]	2.59 (1.03–6.55)	.04	3.18 (1.07–9.40)	.04
2015 (vs 2014) NHSN definition	5.67 (2.47–13.01)	<.001	3.93 (1.33–11.61)	.01

NOTE. CAUTI, catheter-associated urinary tract infection; NHSN, National Healthcare Safety Network; IQR, interquartile range; WBC/HPF, white blood cell count per high-powered field.
[a]Positive urinalysis defined as >10 WBC/HPF, nitrite positive, or moderate-to-high leukocyte esterase concentration.

(UTI), other concurrent infections, and noninfectious conditions that could cause fever.

Definitions

In 2014, the NHSN defined CAUTI as (1) the presence of a urinary catheter for >2 days; (2) temperature >38°C or symptoms consistent with UTI; and (3a) urine culture with ≤2 organisms, 1 of which is $\geq 10^5$ colony-forming units (CFU)/mL or (3b) urinalysis with pyuria, leukocyte esterase, or nitrite plus urine culture with ≤2 organisms, 1 of which is $\geq 10^3$ CFU/mL.[5] The 2015 NHSN CAUTI definition differed in that a urine culture must have $\geq 10^5$ CFU/mL, urinalysis results were no longer used to define CAUTI, and *Candida* spp were no longer considered uropathogens.[6]

Clinical CAUTI was defined as documentation of CAUTI in the medical record. Subcategories of clinical CAUTI included "definite CAUTI," the documentation of UTI without another documented etiology of fever, and "possible CAUTI," documentation of both UTI and another cause of fever. In addition, a composite "positive urinalysis" variable was created and defined as the presence of pyuria with ≥10 white blood cells per high-powered field (WBC/HPF) or a moderate-to-high concentration of leukocyte esterase or nitrites.

Statistical Analysis

The primary outcome was the presence of clinical CAUTI. Bivariate analyses were used to compare the primary outcome to variables. Multivariate analyses were performed with candidate variables defined as those with bivariate $P < .20$.

RESULTS

In total, 124 CAUTIs were reported to the NHSN in 2014, but 7 case patients were excluded from the study (6 had incomplete medical records and 1 was a pediatric patient). Therefore, 117 CAUTIs from 113 unique patients were included. All of these cases met the 2014 CAUTI definition, but only 77 (65.8%) met the 2015 definition. The median age of the case patients was 57 years (IQR, 47–66 years), and 83 (42.8%) were male.

Clinical CAUTI was diagnosed in 72 patients (61.5%) identified by the 2014 definition and 58 (80.6%) of those identified by the 2015 definition. Of the clinical CAUTIs identified by the 2014 definition, 36 (50%) were considered to be definite CAUTIs. Similarly, 31 CAUTIs (53.5%) identified by the 2015 definition were considered definite CAUTIs. Pneumonia was the most common infection accompanying possible CAUTI: 14 (39%) of 2014 possible CAUTIs and 10 (37%) of 2015 possible CAUTIs.

Independent predictors of clinical CAUTI included a positive urinalysis (OR, 3.18; 95% CI, 1.07–9.40) and use of the 2015 definition (OR, 3.93; 95% CI, 1.33–11.61) (Table 1). A urine culture positive for gram-negative bacilli trended toward significant independent association with clinical CAUTI (OR, 2.65; 95% CI, 0.94–7.48).

DISCUSSION

Supporting the findings of previous authors, we found that the transition to the 2015 NHSN CAUTI surveillance definition may result in a reduction in the CAUTI rate.[7] Dicks et al[8] estimated that CAUTI rates would decrease by 25% based solely on the exclusion of *Candida* spp from the 2015 definition. In this study, the 2015 definition was an independent predictor of clinical CAUTI, suggesting that the reduction was primarily due to exclusion of asymptomatic bacteriuria.

This study found clinical CAUTI to be independently associated with a positive urinalysis and growth of gram-negative bacilli. While pyuria is a sensitive test for UTI, it is not specific to infection in catheterized patients because the

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catheter may elicit an inflammatory response.[9,10] Gram-negative bacilli are common uropathogens, but they, too, may represent colonization rather than infection.[10] Clinical judgment is required to distinguish clinical CAUTI cases from asymptomatic bacteriuria.

Strengths of this study include the multicenter design and inclusion of medical-surgical, transplant, and critical-care populations. Limitations include a relatively small sample size and inclusion of only academic medical centers.

Our data suggest that introduction of the 2015 definition may result in both a reduction in surveillance CAUTI and increased concordance with clinical CAUTI cases. While the 2015 NHSN CAUTI surveillance definition is more clinically relevant than the previous iteration, further refinement could be attained by reintroducing urinalysis criteria to the definition or by limiting the definition of uropathogens to gram-negative bacilli alone.

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