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Relationship of Wound, Ostomy, and Continence Certified Nurses and Healthcare-Acquired Conditions in Acute Care Hospitals

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ABSTRACT

PURPOSE: The purpose of this study was to describe the (*a*) number and types of employed WOC certified nurses in acute care hospitals, (*b*) rates of hospital-acquired pressure injury (HAPI) and catheter-associated urinary tract infection (CAUTI), and (*c*) effectiveness of WOC certified nurses with respect to lowering HAPI and CAUTI occurrences.

DESIGN: Retrospective analysis of data from National Database of Nursing Quality Indicators.

SUBJECTS AND SETTINGS: The sample comprised 928 National Database of Nursing Quality Indicators (NDNQI) hospitals that participated in the 2012 NDNQI RN Survey (source of specialty certification data) and collected HAPI, CAUTI, and nurse staffing data during the years 2012 to 2013.

METHODS: We analyzed years 2012 to 2013 data from the NDNQI. Descriptive statistics summarized the number and types of employed WOC certified nurses, the rate of HAPI and CAUTI, and HAPI risk assessment and prevention intervention rates. Chi-square analyses were used to compare the characteristics of hospitals that do and do not employ WOC certified nurses. Analysis-of-covariance models were used to test the association between WOC certified nurses and HAPI and CAUTI occurrences.

RESULTS: Just more than one-third of the study hospitals (36.6%) employed WOC certified nurses. Certified continence care nurses (CCCNs) were employed in fewest number. Hospitals employing wound care specialty certified nurses (CWOCN, CWCN, and CWON) had lower HAPI rates and better pressure injury risk assessment and prevention practices. Stage 3 and 4 HAPI occurrences among hospitals employing CWOCNs, CWCNs, and CWONs (0.27%) were nearly half the rate of hospitals not employing these nurses (0.51%). There were no significant relationships between nurses with specialty certification in continence care (CWOCN, CCCN) or ostomy care (CWOCN, COCN) and CAUTI rates.

CONCLUSIONS: CWOCNs, CWCNs, and CWONs are an important factor in achieving better HAPI outcomes in acute care settings. The role of CWOCNs, CCCNs, and COCNs in CAUTI prevention warrants further investigation.

KEY WORDS: Catheter-associated urinary tract infections, Healthcare quality indicators, Healthcare-acquired conditions, Hospital-acquired pressure injury, Hospital-acquired pressure ulcer, Specialty certification.

INTRODUCTION

Reducing healthcare-acquired conditions (HACs), such as hospital-acquired pressure injuries (HAPIs) and catheter-associated urinary tract infections (CAUTIs), is an important strategy for improving patient outcomes and decreasing costs in acute care hospitals. Both adverse events are part of US healthcare policy and patient safety initiatives, including the Centers for Medicare & Medicaid Services (CMS) nonpayment to hospitals for the extra cost of treating these events.[1]

Numerous patients receiving care in acute care facilities in the United States develop HAPIs; the annual estimated cost of HAPI care is $9.1 billion to $11.6 billion.[2] Bergquist-Beringer and colleagues[3] reported a 3.6% HAPI rate among all surveyed inpatients and 7.9% among those at risk. Patients who develop HAPIs experience pain, have lower health-related quality of life, and are more likely to die during a hospital stay.[2-4]

Urinary tract infections are the most common hospital-acquired infection and about 80% are catheter-associated.[5] Lo and associates[5] reported that the daily risk of acquiring a urinary tract infection varies from 3% to 7% when an indwelling catheter is in place. Although the cost per case of CAUTI, ranging from $862 to $1007,[6] is low relative to other HACs, the total financial burden for hospitals due to nonreimbursement is substantial.[7] Other costs of CAUTI, such as patient discomfort, restricted activities of daily living, loss of dignity, potential for venous thromboembolism, and HAPI, have not been quantified.[7]

WOC certified nurses are prepared to improve the level and quality of care (acute and rehabilitative) for people with

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selected disorders of the integumentary, genitourinary, and gastrointestinal systems.[8] WOC certified nurses are RNs who are credentialed by the Wound, Ostomy, and Continence Nursing Certification Board in 1 or more specialty areas of wound, ostomy and continence care. Although evidence exists in studies using large samples about the effectiveness of WOC certified nurses in improving home healthcare outcomes (including urinary incontinence and pressure injuries) at both the individual patient care[9,10] and agency[9] level, little is known about the relationship between WOC certified nurses and HACs in acute care hospitals.

Using a large sample of acute care hospitals from the National Database of Nursing Quality Indicators (NDNQI), our study aims were to (1) determine the numbers and types of WOC certified nurses employed in NDNQI hospitals, (2) compare the characteristics of NDNQI hospitals that do and do not employ WOC certified nurses, (3) describe HAPI rates and HAPI risk and prevention interventions in NDNQI hospitals that do and do not employ WOC nurses with wound care specialty certification, (4) examine the association between WOC nurses with wound care specialty certification and HAPI rates, (5) describe CAUTI rates in NDNQI hospitals that do and do not employ WOC nurses with continence and/or ostomy care specialty certification, and (6) examine the association between nurses with continence and/or ostomy care specialty certification and CAUTI rates. For this study, we included WOC nurses with the following specialty certifications: CWOCN (certified wound, ostomy and continence nurse), CWCN (certified wound care nurse), CWON (certified wound ostomy nurse), CCCN (certified continence care nurse), and COCN (certified ostomy care nurse). COCNs were included in the study because they may have been the only WOC certified nurse in a hospital. HAPI prevention interventions included skin assessment, redistribution surface use, repositioning, nutritional support, and moisture management. Hospital-acquired pressure injury and CAUTI rates included the total HAPI rate, HAPI stage 2 and higher rate, HAPI stages 3 and 4 rate, and the total CAUTI rate.

For purposes of this study, we assumed that WOC certified nurses influence nursing interventions and patient outcomes through several mechanisms.[9,11] This assumption is based on their provision of direct care, education, and consultation to patients.[9] In addition, they provide consultation and direction to non-WOC certified nurses.[11] They also may be involved in developing procedures, guidelines, and protocols for patient care, as well as select supplies, beds, and the like.[9]

METHODS

Our study was a descriptive comparative design using retrospective analyses of data from the NDNQI from 2012 to 2013. All analyses were at the hospital level. Study procedures were reviewed and approved by the institutional review board at the University of Kansas Medical Center.

Sample

There were 3 study samples (Table 1). Sample 1 comprised NDNQI hospitals (n = 928 hospitals) that participated in the 2012 NDNQI Registered Nurse (RN) Survey that included specialty certification data. Registered nurses were eligible to complete the survey if they worked on the unit greater than 3 months and spent 50% or more time in direct care. Agency and contract RNs were excluded from taking the survey. Data from sample 1 were used to examine aims 1 and 2, which focused on hospitals that do or do not employ WOC specialty certified nurses.

Sample 2 (n = 674 hospitals) was a subset of sample 1; it comprised hospitals that reported HAPI and nurse staffing data. Only unit types that routinely report HAPI data were included in our analyses; they were critical care, step-down, medical, surgical, and medical-surgical units. Data from sample 2 were used to answer aims 3 and 4, which focused on HAPIs.

Sample 3 (n = 494), also a subset of sample 1, comprised hospitals that reported CAUTI and nurse staffing data. Within these hospitals, only unit types that routinely report CAUTI data were included: critical care, step-down, medical, surgical, and medical-surgical combined. Data from sample 3 were used to answer aims 5 and 6, which focused on CAUTI.

Study Measures

Specialty Certification

As noted previously, our source for specialty certification data was the 2012 NDNQI RN Survey. Registered nurses self-reported specialty certifications from a list of 76 certifications, clustered in 19 national certification programs. Because our analyses were at the hospital level, we measured CWOCN, CWCN, CWON, CCCN, and COCN as a count of the number of nurses holding each respective certification within the hospital. Table 1 summarizes specific certifications included in the analysis of each study aim.

For all other national specialty certifications, we used the count of hospital RNs holding certifications that were in a specialty area of nursing practice and were granted by national accredited nursing certification programs.[12] All certified nurses were included in the count. Each certified RN was counted only once, regardless of how many certifications the nurse held. Excluded certifications and credentials on the NDNQI RN survey were (*a*) certifications granted by multidisciplinary organizations not limited to nursing; (*b*) employer-based competencies, certifications, or other credentials; or (*c*) courses such as advanced cardiac life support and trauma nurse core course, or (*d*) not direct care related.

HAPI and CAUTI Outcomes

Both the NDNQI HAPI and CAUTI measures have been endorsed by the National Quality Forum (NQF) as national consensus measures and have met the rigorous NQF measurement criteria of importance, reliability and validity, usability, and feasibility.[13] NDNQI pressure injury data are collected quarterly using a 1-day point-in-time patient assessment. Hospital-acquired pressure injuries are identified by trained staff members as those obtained after admission to the facility. NDNQI defines quarterly rates as the number of patients with HAPI divided by the number of surveyed patients, times 100. Data on pressure injury risk and prevention are gathered during the same 1-day assessment but by chart review. This data set includes skin and pressure injury risk assessment on admission (yes, no), risk assessment 24 hours or less before the survey (yes, no), and risk status (at risk, not at risk). For those at risk, prevention measures include regular skin assessment, pressure redistribution surface use, repositioning, nutritional support, and moisture management during the 24-hour

TABLE 1.
Study Samples, Aims, and WOC Certifications Included in Analyses

Sample	Aims Examined	WOC Certified Nurses in Analyses
Sample 1 n = 928 hospitals that participated in 2012 NDNQI RN Survey	1. Determine the numbers and types of WOC certified nurses employed in NDNQI hospitals 2. Compare the characteristics of NDNQI hospitals that do and do not employ WOC certified nurses	CWOCN CWCN CWON CCCN COCN
Sample 2 Subset of sample 1 n = 674 hospitals Reported HAPI and staffing data Within hospitals, only unit types that routinely report HAPI data were included: critical care, step-down, medical, surgical, and medical-surgical combined	3. Describe HAPI rates and HAPI risk and prevention interventions in NDNQI hospitals that do and do not employ WOC nurses with wound care specialty certification 4. Examine the association between WOC nurses with wound care specialty certification and HAPI rates	CWOCN CWCN CWON
Sample 3 Subset of sample 1 n = 494 hospitals Reported CAUTI and staffing data Within hospitals, only unit types that routinely report CAUTI data were included: critical care, step-down, medical, surgical, and medical-surgical combined	5. Describe CAUTI rates in NDNQI hospitals that do and do not employ WOC nurses with continence and/or ostomy specialty certification 6. Examine the association between nurses with continence and/or ostomy specialty certification and CAUTI rates	CWOCN CCCN COCN

Abbreviations: CAUTI, catheter-associated urinary tract infection; CCCN, certified continence care nurse; COCN, certified ostomy care nurse; CWCN, certified wound care nurse; CWOCN, certified wound ostomy continence nurse; CWON, certified wound ostomy nurse; HAPI, hospital-acquired pressure injury; NDNQI, National Database of Nursing Quality Indicators; WOC, wound, ostomy, continence.

period preceding the survey (yes, not yes). Evidence for the reliability of NDNQI data collection methods on pressure injury identification, origination, pressure injury risk, and prevention has been established.[14-16]

NDNQI uses the Centers for Disease Control and Prevention's National Health Safety Network standard definitions for CAUTI.[17,18] CAUTI rates are calculated as the number of infections per 1000 catheter days.

Control Variables

Unit structure characteristics included as control variables were mean RN tenure on the unit and the nursing care hours variable of RN hours per patient day (RNHPPD). The NDNQI nursing care hours variables are NQF endorsed and are supported by substantial validity and reliability evidence.[19,20] We also included the hospital structure characteristic of American Nurses Credentialing Center Magnet Recognition Program status (Magnet, applicant, not Magnet) as a control variable.

NDNQI Data Quality

A site coordinator at each NDNQI hospital is responsible for collecting and submitting data or overseeing the process of data submission according to NDNQI definitions and protocols. The site coordinator and each person collecting or reporting data must receive training about the NDNQI data collection guidelines and pass tests on critical elements with high accuracy. For the RN survey, site coordinators use a detailed, standardized data collection protocol and timeline. All data, including RN survey data, are entered directly into a secure, password-protected NDNQI Web site with embedded quality control features. For example, the Web site does not allow defined out-of-range or illogical data to be saved. Data also are subjected to extensive quality audits by NDNQI staff. Refer to Boyle and colleagues[11] for more detailed description of NDNQI data quality.

Data Preparation

Three analysis files were developed. The first file was for sample 1 (addressing aims 1 and 2); it consisted of merged data from the NDNQI RN Survey and hospital demographic characteristics. Sample 2 (addressing aims 3 and 4) and Sample 3 (addressing aims 5 and 6) files consisted of merged data from the RN Survey and NDNQI clinical data on HAPIs or CAUTI, respectively. Hospital characteristics and staffing data also were merged into samples 2 and 3 files. All files were checked for errors and corrected as needed by NDNQI analytic staff.

Unit-level data were annualized and aggregated to the hospital level for analysis. Hospital-acquired pressure injury data were collected quarterly and CAUTI data were collected monthly, whereas the RN survey was conducted annually. Hospitals elected a single month in which to take the survey. Therefore, to ensure the clinical data were consequent to the RN survey, the first quarter or month of HAPI or CAUTI data was the same month of the RN Survey. For example, if a hospital conducted its annual RN survey in April of 2012, CAUTI data from April 2012 to March 2013 were annualized and matched to survey data. Thus all hospitals have a full year of clinical data following the RN survey data.

Only hospitals that reported 3 of 4 quarters of HAPI data and 9 of 12 months of CAUTI data were included. These data were annualized by summing the numerator (eg, the number of patients with HAPI) for the year and dividing by the summed denominator (e.g., the number of patients assessed) for the year. Once the data were annualized, the unit-level data for outcomes and staffing measures were aggregated to the hospital level and risk-stratified by adjusting for unit-type differences. First, rates for a unit were standardized by unit type by subtracting the average rate for units of that type and dividing by the unit type standard deviation to create a *z*-score. The resulting unit-level *z*-scores then were weighted by the exposure variable (the number of patients assessed for pressure injuries

and device days for CAUTI). The new unit-level scores then were averaged to create hospital-level scores. Finally, the hospital-level aggregate z-scores were converted back to the original metric (eg, CAUTI rate per 1000 patient days) for easier analytic interpretation.

DATA ANALYSIS

All analyses were conducted using SAS Version 9.4; P values ≤ 0.05 were deemed statistically significant. Descriptive statistics were generated to summarize hospital characteristics, the number of WOC certified nurses by specialty, HAPI assessment and prevention intervention rates, HAPI rates, and CAUTI rates. Descriptive statistics and χ^2 analyses were used to compare characteristics of hospitals that do and do not employ WOC certified nurses.

Analysis of covariance (ANCOVA) models were used to test associations between the outcome variables (HAPI rates, HAPI interventions, and CAUTI rates) and WOC nurse certifications in hospitals. Other hospital and RN staffing characteristics that may impact rates of HAPI or CAUTI were included as control variables: average patient risk for pressure injuries, RNHPPD, RN unit tenure, and hospital Magnet status.

RESULTS

Table 2 displays detailed hospital characteristics of the 3 samples; characteristics were observed to be similar across all 3 samples. The typical hospital in each sample was a general hospital, non-Magnet, not-for-profit, nonteaching, size fewer than 300 beds, located in a metropolitan area of 50,000 population or more, and with a medium case-mix index.

Numbers and Types of WOC Certified Nurses Employed in NDNQI Hospitals

Three hundred forty of the 928 sample hospitals (36.6%) employed WOC certified nurses; the average number of WOC certified nurses employed was 2.27 ± 2.06 (mean ± SD, range 1-15). Most of the employed WOC certified nurses were CWOCNs (1.70 ± 1.40 per hospital, range 1-10), whereas CCCNs were fewest in number (1.10 ± 0.30, range 1-2). Table 3 displays the number of WOC certified nurses by specialty.

Comparison of NDNQI Hospitals That Do and Do Not Employ WOC Certified Nurses

Hospitals employing WOC certified nurses were more likely to be a general hospital (χ^2= 38.55; P = .001), have Magnet Designation (χ^2= 57.32; P = .001), be an academic medical center (χ^2= 12.72; P = .002), be located in a metropolitan area with a population more than 50,000 (χ^2= 16.33; P = .001), have a bed size ≥ 300 (χ^2= 120.07, P = .001), have a high case-mix index (χ^2= 22.15; P = .001), and employ at least 100 other national specialty certified nurses (other than WOC certification) (χ^2= 156.90; P = .001). Also, hospitals employing WOC certified nurses were less likely to be owned by a for-profit entity (χ^2= 19.35; P = .001). See the Supplemental Digital Content (http://links.lww.com/JWOCN/A39) for further detail.

HAPI Rates, Risk Assessment, and Prevention

Hospitals that employed CWOCN, CWCN, and CWONs had lower total (M = 2.81% ± 3.92%), stage 2 and higher (M = 2.16% ± 2.84%), and stages 3 and 4 (M = 0.27± 0.69%) HAPI rates than hospitals that did not employ CWOCN, CWCN, and CWONs (M = 3.28% ± 5.49%, M = 2.39% ± 3.60%, M = 0.51% ± 2.12%, respectively; Table 4). Similarly, hospitals employing CWOCN, CWCN, and CWONs had slightly higher rates of pressure injury risk and skin assessment on admission (M = 95.58% ± 16.71%, M = 95.43% ± 18.01%, respectively) than hospitals not employing CWOCN, CWCN, and CWONs (M = 94.15% ± 21.24%, M = 93.13% ± 24.62%, respectively; Table 5). In contrast, hospitals employing CWOCN, CWCN, and CWONs had slightly lower rates of pressure injury risk assessment in the last 24 hours (M = 93.21% ± 35.00%) than hospitals not employing CWOCN, CWCN, and CWONs (M = 95.10% ± 17.81) (Table 5). All pressure injury intervention (skin assessment, redistribution surface use, repositioning, nutritional support, and moisture management) implementation rates were higher in hospitals employing CWOCN, CWCN, and CWONs than in hospitals not employing CWOCN, CWCN, and CWONs.

Association Between Wound Care Certified Nurses and HAPI Rates

Three ANCOVA models were fitted to HAPI rates: total HAPI rate, rate of HAPIs stage 2 and higher, and rate of stages 3 and 4 HAPIs (Table 6). The total HAPI rate model and the stage 2 and higher HAPI rate model were significant but had small overall r^2 values; only 4% to 6% of the variance was explained in either model (F = 4.38, P < .01, r^2= 0.04; F = 6.41, P < .01, r^2= 0.06, respectively). In the total HAPI rate and stage 2 and higher HAPI rate models, the only significant predictors of HAPI rate were the covariates patient risk (total HAPI model, F = 9.19, P < .01; HAPI ≥stage 2, F = 21.64, P < .01) and hospital Magnet status (Total HAPI model, F = 4.64, P = .01; HAPI ≥stage 2, F = 4.94, P < .01). In the model for the rate of stages 3 and 4 HAPIs, CWOCN, CWCN, and CWONs were significantly associated with lower occurances of stages 3 and 4 HAPIs (F = 3.88, P = .05). Patient risk also was significantly related to stages 3 and 4 HAPI rates (F = 6.25, P = .01). However, the overall model was nonsignificant (F = 2.03, P = .06, r^2 = 0.02).

CAUTI Rates and Association Between Continence Care Certified Nurses and CAUTI Rates

Table 4 displays CAUTI rates in hospitals that do and do not employ CWOCN, CCCN, COCNs. Hospitals employing CWOCN, CCCN, and COCNs had somewhat higher rates of CAUTI (M = 2.15 ± 2.26 per 1000 device days) than hospitals not employing CWOCN, CCCN, COCNs (M = 1.85 ± 2.80 per 1000 device days). The median CAUTI rate also was higher in hospitals employing CWOCN, CCCN, and COCNs (1.64 per 1000 device days) than hospitals not employing CWOCN, CCCN, and COCNs (0.83 per 1000 device days).

The ANCOVA model examining the effect of CWOCN, CCCN, and COCNs on CAUTI rates was nonsignificant (F = 0.86, P = .51, r^2= 0.01) (Table 6). Further, none of the control variables included in the model were significantly associated with CAUTI rates.

DISCUSSION

Our study provides new knowledge regarding WOC certified nurse employment in acute care and the relationship

TABLE 2.
Hospital Characteristics by Sample

Hospital Characteristic	Sample 1 (n = 928) (Aims 1 and 2), n (%)	Sample 2 (n = 674) (Aims 3 and 4), n (%)	Sample 3 (n = 494) (Aims 5 and 6), n (%)
Type			
General	768 (82.8)	643 (95.4)	471 (95.3)
Specialty	126 (13.6)	24 (3.6)	17 (3.4)
Critical access	34 (3.7)	7 (1.0)	6 (1.3)
Magnet status			
Non-Magnet	529 (57.0)	353 (52.4)	257 (52.0)
Magnet applicant	145 (15.6)	105 (15.6)	83 (16.8)
Magnet	254 (27.4)	216 (32.0)	154 (31.2)
Ownership			
Not-for-profit	743 (80.1)	557 (82.6)	399 (80.8)
Government, federal	25 (2.7)	19 (2.8)	18 (3.6)
Government, other	65 (7.0)	38 (5.6)	26 (5.2)
For-profit	95 (10.2)	60 (8.9)	51 (10.3)
Teaching status			
Academic medical center	96 (10.3)	66 (9.8)	41 (8.3)
Teaching	338 (36.4)	248 (36.8)	182 (36.8)
Nonteaching	494 (53.2)	360 (53.4)	271 (54.9)
Bed size			
<100	271 (29.2)	134 (19.9)	106 (21.4)
100-199	265 (28.6)	199 (29.5)	155 (31.4)
200-299	171 (18.4)	140 (20.8)	101 (20.4)
300-399	100 (10.8)	89 (13.2)	57 (11.5)
400-499	58 (6.3)	55 (8.2)	38 (7.7)
≥500	63 (6.8)	57 (8.4)	37 (7.5)
Location			
Metropolitan, population > 50,000	812 (87.5)	601 (89.2)	433 (87.7)
Micropolitan, population 10,000-49,999	93 (10.0)	62 (9.2)	52 (10.5)
Rural, population < 10,000	23 (2.5)	11 (1.6)	9 (1.8)
Case-Mix Index			
High ≥ 1.77	141 (18.3)	121 (19.3)	78 (17.3)
Medium 1.42-1.76	403 (52.4)	333 (53.1)	239 (52.9)
Low ≤ 1.41	225 (29.3)	173 (27.6)	135 (29.8)

Abbreviations: Sample sizes for case mix index were: Sample 1 = 769, Sample 2 = 627, Sample 3 = 452. Percentages may not add up to 100 due to rounding.

between WOC nurses with wound care specialty certification (CWOCN, CWCN, and CWON) and HAPI rates, as well as the relationship between WOC nurses with continence and/or ostomy care specialty certification (CWOCN, CCCN, and COCN) and CAUTI rates. Findings suggest that the employment of higher numbers of CWOCN, CWCN, and CWONs is associated with decreased HAPI rates and improved pressure injury risk assessment and prevention practices. Our results support those of other studies that involved WOC certified nurses in prevention programs to reduce HAPI rates. For example, Bales and Padwojski[21] reported lower HAPI rates after increasing the number of wound certified nurse hours, among other strategies. Anderson and colleagues[22] showed that wound certified nurse involvement in HAPI prevention decreased HAPI occurrence among intensive care unit (ICU) patients and increased adherence to redistribution surface and repositioning interventions. Our findings extend those of Anderson and colleagues to more specifically identify that hospitals employing CWOCN, CWCN, and CWONs had fewer total HAPIs, stage 2 and higher HAPIs, and HAPI stages 3 and 4 than hospitals not employing CWOCN, CWCN, and CWONs. Also, the implementation of skin assessment, nutritional support, and moisture management interventions as well as pressure redistribution surface use and repositioning

TABLE 3.
NDNQI Hospitals That Employ WOC Nurses (n = 340) by Specialty Certification

Certification	Number of NDNQI Hospitals (%)	Mean Number of WOC RNs	SD of WOC RNs	Min WOC RNs	25th Percentile WOC RNs	Median of WOC RNs	75th Percentile WOC RNs	Max WOC RNs
Any WOCN	340 (36.6)	2.27	2.06	1.00	1.00	1.00	3.00	15.00
CWOCN	190 (20.4)	1.70	1.40	1.00	1.00	1.00	2.00	10.00
CWCN	176 (19.0)	1.42	0.78	1.00	1.00	1.00	2.00	5.00
CWON	98 (10.6)	1.26	0.63	1.00	1.00	1.00	1.00	4.00
CCCN	21 (2.3)	1.10	0.30	1.00	1.00	1.00	1.00	2.00
COCN	43 (4.6)	1.23	0.68	1.00	1.00	1.00	1.00	4.00

Abbreviations: CCCN, certified continence care nurse; COCN, certified ostomy care nurse; CWCN, certified wound care nurse; CWOCN, certified wound ostomy continence nurse; CWON, certified wound ostomy nurse; max, maximum; min, minimum; NDNQI, National Database of Nursing Quality Indicators; WOC, wound, ostomy, continence; WOCN, wound ostomy continence nurse.

was higher among hospitals employing CWOCN, CWCN, and CWONs.

The 3.08% overall HAPI rate for critical care, step-down, medical, surgical, and medical-surgical units in our study was lower than the 3.6% rate of HAPI among these units found in 2010 NDNQI data analysis.[3] Results suggest that the downward trend in HAPI noted in previous research[23-25] continued through 2012 to 2013. In our study, the stages 3 and 4 HAPI rate among hospitals employing CWOCN, CWCN, and CWONs (0.27%) was nearly half the stage 3 and 4 HAPI rate of hospitals not employing CWOCN, CWCN, and CWONs (0.51%), indicating a benefit of wound specialty certification on HAPI rates. ANCOVA modeling that controlled for patient risk and RN and hospital factors provides additional support for the role of CWOCN, CWCN, and CWONs in reducing stages 3 and 4 HAPI development. Nonsignificance of the overall model may be related to the small number of stages 3 and 4 HAPI events, which resulted in too little power to achieve statistical fit and suggests that model parameters should be interpreted with caution.

Patient risk status was significantly related to HAPI rate, regardless of stage. This finding is consistent with other research that showed patients at risk for pressure injuries are more likely to acquire a pressure injury.[3,26,27] For example, Chen and associates[26] found that the incidence of pressure injury was 1.4% among acute care patients at no risk and 23.6% among patients at high risk for pressure injury. Assessment of pressure injury risk is performed routinely in acute care settings to establish a prevention plan and initiate appropriate interventions to ameliorate the risk. In our study, slightly higher rates of prevention interventions were implemented for those at risk among hospitals employing CWOCN, CWCN, and CWONs relative to hospitals not employing these certified nurses, but the differences were greater for pressure injury redistribution

TABLE 4.
HAPI and CAUTI Rates in NDNQI Hospitals That Do and Do Not Employ WOC Certified Nurses[a]

Rate	N	Mean	SD	25th Percentile	50th Percentile	75th Percentile
Hospitals employing WOC certified nurses						
Total HAPI[b]	274	2.81	3.92	0.42	1.81	3.46
HAPI stage 2 or above[b]	274	2.16	2.84	0.25	1.35	2.87
HAPI stage 3 or 4[b]	274	0.27	0.69	0.00	0.00	0.26
CAUTI[c]	141	2.15	2.26	0.50	1.64	3.09
Hospitals not employing WOC certified nurses						
Total HAPI[b]	362	3.28	5.49	0.24	1.73	4.12
HAPI stage 2 or above[b]	362	2.39	3.60	0.09	1.22	3.12
HAPI stage 3 or 4[b]	362	0.51	2.12	0.00	0.00	0.09
CAUTI[c]	265	1.85	2.80	0.12	0.83	2.39
All hospitals						
Total HAPI[b]	636	3.08	4.88	0.35	1.76	3.68
HAPI stage 2 or above[b]	636	2.29	3.29	0.15	1.29	3.04
HAPI stage 3 or 4[b]	636	0.40	1.66	0.00	0.00	0.18
CAUTI[c]	406	1.96	2.63	0.23	1.02	2.81

Abbreviations: CAUTI, catheter-associated urinary tract infection; CCCN, certified continence care nurse; COCN, certified ostomy care nurse; CWCN, certified wound care nurse; CWOCN, certified wound ostomy continence nurse; CWON, certified wound ostomy nurse; HAPI, hospital-acquired pressure injury; NDNQI, National Database of Nursing Quality Indicators; WOC, wound, ostomy, continence.
[a]HAPI rates are expressed in percentage. CAUTI rates are expressed as number of infections per 1000 catheter days.
[b]Hospitals employing CWOCN, CWCN, and CWONs.
[c]Hospitals employing CWOCN, CCCN, and COCNs.

TABLE 5.
HAPI Risk Assessment and Prevention Intervention Rates in NDNQI Hospitals That Do and Do Not Employ Wound Certified Nurses (CWOCN, CWCN, and CWON)[a]

Variable	N	Mean	SD	25th Percentile	50th Percentile	75th Percentile
Hospitals employing wound certified nurses						
Risk assessment on admission	274	95.58	16.71	98.67	99.71	100.00
Skin assessment on admission	274	95.43	18.01	98.86	99.80	100.00
Risk assessment in last 24 h	274	93.21	35.00	97.23	99.55	100.00
% of patients at risk	274	47.53	23.80	31.37	45.38	62.01
Skin assessment intervention	274	88.51	26.14	93.15	98.62	100.00
Redistribution surface intervention	274	82.79	29.81	84.43	96.82	100.00
Repositioning intervention	274	77.92	30.75	72.57	91.99	99.26
Nutritional intervention	274	65.55	31.52	44.81	71.92	91.76
Moisture management intervention	274	76.93	31.84	70.05	90.49	99.04
Hospitals not employing wound certified nurses						
Risk assessment on admission	362	94.15	21.24	98.35	99.66	100.00
Skin assessment on admission	362	93.13	24.62	98.73	99.80	100.00
Risk assessment in last 24 h	362	95.10	17.81	98.04	99.70	100.00
% of patients at risk	362	46.25	26.25	28.25	43.57	62.88
Skin assessment intervention	362	85.63	28.53	90.07	98.16	99.99
Redistribution surface use intervention	362	75.89	36.54	67.18	94.73	99.98
Repositioning intervention	362	76.83	32.76	65.85	93.71	99.29
Nutritional support intervention	361	60.43	36.27	33.28	68.55	93.35
Moisture management intervention	362	73.83	33.59	59.70	89.70	99.08
All hospitals						
Risk assessment on admission	636	94.77	19.42	98.40	99.70	100.00
Skin assessment on admission	362	94.12	22.03	98.74	99.80	100.00
Risk assessment in last 24 h	362	94.29	26.61	97.66	99.63	100.00
% of patients at risk	362	46.80	25.21	29.49	44.35	62.49
Skin assessment intervention	362	86.88	27.53	91.78	98.38	100.00
Redistribution surface use intervention	362	78.86	33.95	73.81	95.93	100.00
Repositioning intervention	362	77.30	31.89	68.19	92.85	99.28
Nutritional support intervention	361	62.64	34.36	38.01	69.70	92.63
Moisture management intervention	362	75.17	32.85	64.43	90.19	99.04

Abbreviations: CWCN, certified wound care nurse; CWOCN, certified wound ostomy and continence nurse; CWON, certified wound ostomy nurse; HAPI, hospital-acquired pressure injury; NDNQI, National Database of Nursing Quality Indicators.
[a]All rates are expressed in percentage.

surface use and nutritional support. The CWOCN, CWCN, and CWONs in acute care practice are often responsible for hospital policies and procedures related to pressure injury prevention including usage of pressure redistribution surfaces[28] and may participate in organizational activities to sustain prevention practice. The specific role of these nurses in nutritional support to prevent HAPIs warrants further investigation.

The 1.96% overall CAUTI rate for critical care, step-down, medical, surgical, and medical-surgical units in our study was similar to the year 2010 CAUTI rate of 2.00% among these units found by Waters and colleagues[25] and slightly lower than the CAUTI rate of 2.19% reported by Saint and associates[29] for ICUs and non-ICU units in late 2013. Our results may suggest the CAUTI rate stabilized after the 10% downward trend between 2008 and 2010 noted by Waters' group,[25] although national data show that CAUTI rates rose 6% from 2009 to 2013.[30] In our study, the mean CAUTI rate among hospitals employing CWOCN, CCCN, and COCNs (2.15) was higher than the CAUTI rate in hospitals not employing these nurses (1.85). ANCOVA modeling that controlled for patient risk and RN and hospital factors showed no association between the use of CWOCN, CCCN, and COCNs and lower CAUTI rates. Nonsignificance of the overall model may be related to the small number of CAUTI events and small number of CWOCN, CCCN, and COCNs employed, which resulted in too little power to achieve statistical fit.

Multiple care providers are involved in CAUTI prevention and monitoring, including first-line RNs, infection control

TABLE 6.
ANCOVA Models for Association of WOC Certified Nurses With HAPI and CAUTI Rates

Model Outcome	Source	df	*F*	*P*	Model *F* (*P*)	Model r^2
Total HAPI rate	CWOCN, CWCN, CWON	1	2.68	.10	4.38 (<.01)	0.04
	Patient risk	1	9.19	.00		
	RNHPPD	1	3.48	.06		
	RN tenure	1	1.62	.20		
	Magnet status	2	4.64	.01		
HAPI stage 2 or greater	CWOCN, CWCN, CWON	1	1.42	.23	6.44 (<.01)	0.06
	Patient risk	1	21.64	<.0001		
	RNHPPD	1	3.65	.06		
	RN tenure	1	1.90	.17		
	Magnet status	2	4.94	.01		
HAPI stage 3 or 4	CWOCN, CWCN, CWON	1	3.88	.05	2.03 (.06)	0.02
	Patient risk	1	6.25	.01		
	RNHPPD	1	1.01	.31		
	RN tenure	1	0.41	.52		
	Magnet status	2	0.31	.74		
CAUTI	CWOCN, CCCN, COCN	1	1.54	.22	0.86 (.51)	0.01
	RNHPPD	1	0.33	.56		
	RN tenure	1	0.10	.76		
	Magnet status	2	1.16	.31		

Abbreviations: ANCOVA, analysis of covariance; CAUTI, catheter-associated urinary tract infection; CCCN, certified continence care nurse; COCN, certified ostomy care nurse; CWCN, certified wound care nurse; CWOCN, certified wound ostomy continence nurse; CWON, certified wound ostomy nurse; HAPI, hospital-acquired pressure injury; RNHPPD, registered nurse hours per patient day; WOC, wound, ostomy, continence.

nurses and officers, and physicians. Nevertheless, WOC nurses with continence care specialty certification are an excellent resource regarding care of indwelling urinary catheters, and they are well positioned to provide valuable input into CAUTI prevention programs.[28,31,32] CWOCN and CCCNs are especially qualified for bladder assessment and prioritizing interventions based on assessment findings (eg, interventions about complete bladder emptying, urinary retention, and incontinence), which are crucial in preventing CAUTI.[31,32] Further, CWOCN and CCCNs can work with nursing staff to implement the evidence-based American Nurses Association (ANA) CAUTI Prevention Tool for acute care settings.[32] Developed in collaboration with the CMS Partnership for Patients through a technical expert panel of nurses, the ANA CAUTI Prevention Tool recommends consultation with specialty nurses including nurses certified in wound, ostomy, and continence care to decrease CAUTI rates. Within one hospital system, CWOCNs have collaborated with infection prevention nurses and nurse educators to implement the tool and reported a change in culture around indwelling urinary catheter insertion at the pilot hospital.[32]

Only 36.6% (n = 340) of the study NDNQI hospitals employed CWOCN, CWCN, CWON, CCCN, and COCNs. The finding is surprising given national focus on reducing HAPI and CAUTI rates. However, smaller hospitals may have shared a WOC certified nurse or contracted with an outside company for their service when needed. A 2012 survey conducted by the Wound, Ostomy and Continence Nurses (WOCN) Society showed that 61.5% of WOCNs are employed in the acute care setting.[33] In our study, NDNQI hospitals that employed WOC certified nurses employed 2 on average and at least 1 hospital employed 15 WOC certified nurses. CCCNs were employed in the smallest number (2.3%) by participating hospitals. Therefore, examination of the barriers to employing WOC certified nurses, and CCCNs in particular, is warranted. The role of COCNs in CAUTI for patients with an indwelling urethral catheter (urethral or suprapubic), urostomy, or nephrostomy tube is not well delineated but ostomy nurse scope of practice includes preventing periostomal/stomal complications.[30] Further research is needed to examine WOC certified nurse practice in hospitals that employ them. For example, how much of the role of CWOCNs and CCCNs is devoted to CAUTI prevention and protocols? Future studies also should include patient-level data on urinary diversions as well as UIC and investigate COCN practice related to CAUTI in the acute care setting. In addition, research is needed to examine the role of CCCNs in CAUTI prevention.

LIMITATIONS

Hospitals electively join NDNQI and are not representative of the overall US hospital population.[34] Specifically NDNQI is overrepresentative of large facilities, and it is underrepresentative of small hospitals. Although about half of US hospitals have fewer than 100 beds, only one-quarter of NDNQI hospitals are of that size. We included only those hospitals that completed the RN Survey in 2012, which is about half of NDNQI hospitals. Further, we included only 5 unit types (critical care, step-down, medical, surgical, and medical-surgical combined) that routinely collect nurse staffing, HAPI, and CAUTI data.

Within those unit types, not all collect nurse staffing, HAPI, or CAUTI data, so those units were not included in the study. Therefore, results may not be generalizable to other hospitals.

The NDNQI RN survey was the source of specialty certification data. The certifications of CWOCN, CWCN, CWON, CCCN, and COCN were included in the 2012 NDNQI Survey. The survey did not include certifications granted by multidisciplinary organizations to those other than RNs. Therefore, credentials such as certified wound specialist, certified wound care associate, and certified wound specialist physician were not included in our analysis. In addition, we do not know what proportion of CWOCN, CWCN, CWON, CCCN, and COCNs in our study were advanced practice nurses. Last, the small number of CCCNs in our study and the uncertainty of the role of CWOCN, CCCN, and COCNs versus infection control nurses and officers in the study hospitals may have influenced results.

CONCLUSIONS

Our study provides evidence that CWOCN, CWCN, and CWONs are an important factor in achieving better HAPI outcomes in acute care settings. Hospitals employing CWOCN, CWCN, and CWONs have lower rates of total HAPI, HAPI stage 2 or higher, and HAPI stages 3 and 4 than hospitals not employing these nurses. Also, the implementation of skin assessment, nutritional support, and moisture management interventions as well as pressure redistribution surface use and repositioning was higher among hospitals employing CWOCN, CWCN, and CWONs. WOC nurses with wound care specialty certification should be part of hospital strategies to reduce HAPI rates. In contrast, we found no significant relationships between hospital employment of CWOCN, CCCN, COCNs, and CAUTI rates. The role of CWOCN, CCCN, and COCN in CAUTI prevention warrants further investigation.

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