RESEARCH BRIEFS

The Relationship Between Infection Prevention Staffing Levels, Certification, and Publicly Reported Hospital-Acquired Condition Scores

The Study on the Efficacy of Nosocomial Infection Control (SENIC) demonstrated success in infection prevention and control programs when led by physicians and staffed with what are now called infection preventionists (IPs). The Study recommended 1 IP for every 250 beds.[1,2] A recent survey of nearly 300 hospitals participating in the National Healthcare Safety Network (NHSN) reported a staffing ratio of 1 per 167 beds.[3] Recent data on the relationship between IP staffing and outcomes are scarce. In a systematic review, 82% of published reports demonstrated significant associations between more nursing staff and lower healthcare-associated infection (HAI) rates.[4] Board certification in Infection Prevention and Control (CIC) is valued and has been associated with more critical review of the evidence of infection prevention practices and in some cases, lower rates of methicillin-resistant *Staphylococcus aureus*.[5–7]

Hospital-acquired conditions (HACs) as defined by the Centers for Medicare and Medicaid Services include a domain (Domain 2) with central-line–associated bloodstream infections (CLABSIs), catheter-associated urinary tract infections (CAUTIs), and surgical-site infections (SSIs) following colon or abdominal hysterectomy procedures (expressed as infections per 1,000 device days or infections per 100 procedures, respectively). The higher the rate of infection, the higher the HAC score. The Illinois Hospital Report Card Act (IHRCA) went into effect in 2004 and has evolved into a statewide mandatory public reporting system that includes HAI rates for some HAC conditions and surgical site infection (SSI) for coronary artery bypass graft operations (CABG) and knee prosthesis (KPRO) per 100 procedures. The IHRCA also collects and reports information pertaining to facility bed size, self-reported IP staffing ratios and certification status (ie, CIC) via an annual survey. HAI data are reported by the facility through the National Healthcare Safety Network (NHSN). The Illinois Department of Health audits a sample of facilities annually for accuracy in reporting HAIs, but the survey results have not been audited to date.

We examined the correlation between IP staffing levels and outcomes including HAC Domain 2 scores and SSI rates following CABG and KPRO in Illinois. The HAC Domain 2 score for each hospital was extracted from CMS data[8] for the period available (October 1, 2013 through December 31, 2014), while the remaining IHRCA data were extracted for the period January 1, 2014 through December 31, 2014.[9] All data are publicly available; thus, we did not seek approval from our institutional review board for this study. Descriptive statistical analyses and linear regression were performed utilizing STATA statistical software, version 14 (StataCorp, College Station, TX).

In total, 120 hospitals reported IHRCA data. Hospital size averaged 259 beds, and overall, 208 IPs were included in this study. Of these 208 IPS, 126 (61%) were CIC. No facilities were excluded. Infection preventionist staffing ranged widely, from 0.22 to 3.0 per 100 beds with an average of 1 IP for every 149.5 beds. The statewide average for the HAC Domain 2 score was 5.1 and ranged from the minimum to the maximum (ie, 1–10). In the regression model, every additional IP full-time equivalents (FTE) netted a 0.005 reduction in the HAC Domain 2 score ($P = .14$), but for every additional FTE that was board certified, the HAC score increased 0.005 ($P = .08$). However, the r^2 value for the model was 0.13 (indicating poor fit). A similar disconnect was detected between staffing levels and CABG ($P = .35$ and $P = .18$ for IP and CIC, respectively; $r^2 = 0.23$) and between staffing levels and KPRO SSIs ($P = .20$ and $P = .82$ for IP and CIC, respectively; $r^2 = 0.26$). For every 100-bed increase in the number of licensed beds of a facility, the HAC score increased by 0.536, which was statistically significant ($P = .02$). However, standardized infection ratios for KPRO (−0.00004; n = 58; $P = .96$) and CABG (0.0008; n = 37; $P = .38$) were unaffected.

In this cross-sectional study, we did not find a positive correlation between HAC Domain 2 scores or state-reported SSIs and IP staffing ratios, regardless of board certification. Having more beds (presumably including academic, teaching, or referral centers) was associated with higher HAC rates. This finding supports a recent report that hospitals that received HAC penalties were more likely to be major teaching facilities with higher case-mix indices.[10] Although board certification was not significantly associated with a change in HAC scores, IPs with CIC may be more apt at finding HAIs or accurately reporting them, and they may be less likely to overreport adherence to screening protocols in multidrug-resistant organism (MDRO) control.[7] The average staffing ratio in the state of a single IP for nearly 150 beds was similar to a recent report.[3] A review of 42 studies found 3 reports evaluating IP staffing levels and infection rates, of which 2 studies demonstrated improved rates and 1 found no association. Both affirming studies focused on a single HAI in fewer facilities than were used in the present study.[4]

Our study has several limitations. The number of variables available was limited, and we were not able to adjust for confounding factors. Also, the periods for the data sets do not fully overlap; however, this is limited to 3 months (October 1, 2013 through December 31, 2013). Generalizing the limited findings of this report would oversimplify a more complex research question. NHSN participants are required to complete an annual survey and to report academic affiliation, IP staffing, and the estimated number of hours per week spent on surveillance. Adding to this report the number or proportion of staffing that are CIC certified would allow for a broader examination of the relationships among resources, their utilization, certification, and adverse patient outcomes.

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Self-monitoring by Environmental Services May Not Accurately Measure Thoroughness of Hospital Room Cleaning

The hospital environment and environmental contamination are increasingly emphasized in the prevention of healthcare-associated infection.[1] Appropriate cleaning and disinfection of the hospital environment has emerged as a key infection prevention strategy, yet environmental services (EVS) personnel often fail to clean and disinfect all surfaces in hospital rooms.[2] Consequently, the Centers for Disease Control and Prevention (CDC) recommends that all hospitals perform objective monitoring of environmental cleaning and disinfection.[3] More specifically, the CDC tool kit emphasizes that monitoring should be performed by hospital epidemiologists or infection preventionists who are not part of EVS to reduce the likelihood of surveillance bias and to assure the validity of results. To date, however, few if any studies have compared monitoring results of EVS and non-EVS personnel.

We performed this study to compare cleaning compliance data collected by EVS supervisors with parallel cleaning compliance data collected by study personnel. This study was completed during the Benefits of Enhanced Terminal Room (BETR) disinfection study, a large, multicenter randomized controlled trial comparing terminal disinfection strategies.[4] As part of the BETR disinfection study, EVS supervisors placed a fluorescent mark (DAZO, Ecolab, St Paul, MN) on 5–7 "high-touch" room surfaces prior to terminal cleaning in 10–15 rooms per week in each study hospital and examined the marks with a black light after cleaning.[5] If the fluorescent mark was no longer visible or had been smeared, the surface was considered to have been cleaned. Otherwise, the surface was considered not to have been cleaned.

While EVS supervisors performed this routine monitoring with fluorescent markers during the trial, study personnel independently collected parallel cleaning data at 2 study hospitals (1 tertiary care center and 1 community hospital). Study personnel tested a convenience sample of rooms from April through June 2014 (hereafter called the validation data). These rooms were then matched to rooms tested by EVS supervisors by unit (or type of unit), date of cleaning (same week), and EVS shift (time of day). Both the overall proportion of cleaned surfaces and the cleanliness of the 6 most-tested surfaces (bathroom handrail, door knobs, light switches, toilet seat, sink and chair) were compared between the EVS group and the validation group. Proportions were compared using the 2-tailed χ^2 test.

Study personnel collected cleaning thoroughness data in 56 rooms at the 2 study hospitals during the study period. EVS supervisors performed objective monitoring of room cleaning in 256 rooms in the 2 study hospitals during this period; 56 of these rooms were matched to compare monitoring by study personnel. Significant differences in surveillance results