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83. During A Million Patient-Days of Surveillance, Low Levels of Infection Prevention Staff Correlated with Higher Rates of Some Healthcare-Associated Infections
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Background. Reports regarding the correlations between infection preventionist (IP) staffing levels and healthcare-associated infections (HAI) are scarce, conflicting, and crucial for resource allocation and effort prioritization. We evaluated such correlations from January 1, 2012 to March 1, 2019 at a 528-bed teaching hospital in Rochester, NY; a period when IP staffing levels fluctuated between the recommended ratio of 1 IP: 80 patients and a critically low of 1 IP: 375.

Methods. Standardized National Health Safety Network (NHSN) definitions, along with laboratory events, re-admissions, interactions with surgical teams, and an independent data management company were used for case finding of catheter-associated urinary tract infection (CAUTI), Clostridiodes difficile (CDI), central line-associated bloodstream infection (CLABSI), carbapenem-resistant Enterobacteriaceae, and methicillin-resistant Staphylococcus aureus (MRSA). Colon, prosthetic knee and hip joint, hysterectomies, and coronary artery bypass graft surgical site infections (SSI) were also studied. Standardized infection ratios (SIR) were extracted from NHSN. Staffing levels were grouped into low (< 7 FTE). Correlations between HAI rates, SIR, and staffing levels were examined using Poisson and T-tests with the R statistical package.

Results. The average daily census of 451 resulted in 1.18 million total patient-days of surveillance. Periods of low and recommended IP levels occurred at similar seasons and for similar durations. There were fewer CDI, CAUTI, CLABSI, and MRSA infections when IP staff were at recommended levels than when IP staff were at the lowest levels (P ≤ 0.003 and 0.005, respectively). CLABSI SIR was 1.07 and 0.64 during periods of low and recommended staffing levels, respectively (P = 0.004). No significant differences occurred in SSI, either by type or by combined.

Conclusions. Hospitals often cannot achieve or maintain recommended IP staffing levels. Our findings suggest that, during critical personnel shortages, IP may have more impact by focusing on the types of HAI that correlated with preventionist staffing levels. This is among the largest such study to date, and uniquely includes the most types of HAI.

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84. Evaluation of the NHSN Standardized Infection Ratio (SIR) Risk Adjustment for HO-CDI in Oncology and ICU Patients in General Academic Hospitals
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Background. The NHSN healthcare-facility onsets Clostridioides difficile infectie (CDI) standardized infection ratio (SIR) is used to compare hospital quality and set hospital reimbursement but inadequate risk adjustment could penalize hospitals unnecessarily. We hypothesized that general hospitals with large oncology and/or ICU populations were not fully adjusted in the 2015 NHSN acute care hospital CDI Laboratory-Identified (LabID) event prediction model and SIRs would be biased.

Methods. We validated a negative binomial regression HO-CDI event prediction model identical to the 2015 published model and used FY2016 data from eight general hospitals in California to test our hypothesis. We compared HO-CDI events and SIR values, with and without oncology/hematopoietic stem cell transplant or ICU events, patient-days, admissions, bed counts, and adjustment parameters included.

Results. Seven major teaching and one non-teaching general acute care hospitals were included (see Table). Eight had oncology/hematopoietic stem cell transplant units but only 4 had ≥43 ICU beds (median: 134; interquartile range [IQR]: 94–161). The median facility unmodified FacileInSIR was 1.23 [IQR: 1.15, 1.29]. Removal of oncology unit data resulted in a 15% median facility decrease in HO-CDI events (IQR: 14%, 21%) and 8% median facility decrease in SIR (IQR: –2%, 14%). Removal of ICU unit data resulted in a 22% median facility decrease in HO-CDI events (IQR: 16%, 26%) and 97% median facility increase in SIR at each facility (IQR: 78%, 105%).

Conclusion. The ICU bed adjustment in the 2015 NHSN SIR is a powerful correction that fully adjusted for ICU HO-CDI events at all hospitals in the study. However, the lack of risk adjustment for oncology/hematopoietic stem cell transplant unit HO-CDI events suggests that the current model unfairly penalizes general acute facilities, many of which also provide specialized oncologic care. Thus, the model needs to be re-adjusted to account for this important specialty care population in general acute care facilities.

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85. Use of Dual Statistical Process Control Charts for Early Detection of Surgical Site Infection Outbreaks at a Community Hospital Network
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Background. We recently showed that the empirical use of a combination of 2 moving average (MA) statistical process control (SPC) charts was highly sensitive and specific for detecting potentially important increases in surgical site infection (SSI) rates. We performed this follow-up study to examine the performance of these same SPC charts when applied to known SSI outbreaks.

Methods. We retrospectively applied 2 MA SPC charts to all 30 SSI outbreaks investigated from 2007 to 2015 in a network of over 50 community hospitals. These outbreaks were detected via routine SSI surveillance activities that occurred in the network. We reviewed prior outbreak investigation documentation to determine the estimated time of outbreak onset and time of traditional surveillance outbreak detection. The first SPC chart utilized procedure-specific, composite SSI data from the hospital network for its baseline; the baseline for the second chart was calculated from SSI data from the outbreak hospital undergoing analysis. Both charts used rolling baseline windows but varied in baseline window size, rolling baseline lag, and SPC chart control limits. SPC chart outbreak detection occurred when either chart had a data point above the upper control limit of 1 standard deviation. Time of SPC detection was compared with both time of outbreak onset and time of traditional surveillance detection.

Results. With the dual chart approach, SPC detected all 30 outbreaks, including detection of 25 outbreaks (83%) prior to their estimated onset (Figure 1). SPC detection occurred a median of 16 months (interquartile range, 12–21 months) prior to the date of traditional outbreak detection, which never occurred prior to outbreak onset. Both individual SPC charts exhibited at least 90% sensitivity in outbreak detection, but the dual chart approach showed superior sensitivity and speed of detection (Figure 2).

Conclusion. A strategy that employed optimized, dual MA SPC charts retrospectively detected all SSI outbreaks that occurred over 9 years in a network of community hospitals. SPC outbreak detection occurred earlier than traditional surveillance detection. These optimized SPC charts merit prospective study to evaluate their ability to promote early detection of SSI clusters in real-world scenarios.
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86. Ventilator-Associated Pneumonia in Trauma Intensive Care Unit, a Dilemma in Quality Metrics

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Background. Ventilator-associated pneumonia (VAP) definition remains controversial. Ventilator-associated event (VAE) and probable/possible VAPs are reported to the National Healthcare Network (NHSN). In trauma patients, VAPs are also reported to the Trauma Quality Improvement Project (TQIP) utilizing the National Trauma Data Bank (NTDB) definition.

Methods. We reviewed all VAPs reported to NHSN and TQIP in trauma patients at the University of Nebraska Medical Center between January 1, 2015 and June 30, 2018. The primary objective was to determine the discordance rates between NHSN and NTDB definitions. VAPs identified by both NHSN+NTDB considered concordant; if identified by only one definition, considered discordant. Secondary objectives were mortality, intensive care unit (ICU) length of stay (LOS), and ventilator (vent) days. Fisher's exact test and the Kruskal–Wallis test were used where appropriate; P < 0.05 = statistical significance.

Results. In total, 998 patients had 5,624 days of vent support during the study period. One hundred and one patients were diagnosed with VAP. The median age was 43 years (range 2–92), median vent days were 14 days (range 3–128), and median ICU LOS was 16 days (range 6–47). Of the 101 patients, 28 (27%) met VAP definition by NHSN and 88 (87%) by NTDB. Of the 101 patients, 15 (15%) were concordant and 85 (85%) were discordant. Cumulative all-cause mortality was 23%/101 (23%). Composite analysis showed mortality 5/13 (33%) in concordant group, 3/13 (23%) in NHSN group, and 15/73 (20%) in NTDB group (P = 0.52). Median vent days between concordant, NHSN, and NTDB groups were 14 days, 16 days, and 14 days, respectively (P = 0.71). Median ICU LOS was 17 days in concordant, 21 days in NHSN, and 14 days in NTDB group (P = 0.094). Similarly, comparison of NHSN VAE with NTDB VAP definition showed 67/101 (66%) were discordant. There was no statistically significant difference in mortality between concordant (NHSN VAE+NTDB VAP) 9/34 (26%), NHSN VAE 3/13 (23%), and NTDB VAP 11/54 (20%) (P = 0.84).

Conclusion. Our study showed very high discordant (85%) reporting of VAP to different agencies. No difference in mortality, ICU LOS, and vent days was noted. The high discordance of reported VAPs results in inconsistency in quality metrics and hinders initiatives to decrease VAPs depending on which definition is followed. Improved standardization is needed.

88. Public Health Service (PHS) Increased-Risk Factors in Organ Donors: A Review of the OPTN Ad hoc Disease Transmission Advisory Committee (DTAC)

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