Presentation Type:
Oral Presentation

Comparing Automated Cluster Detection Methods for Carbapenem-Resistant Enterobacteriaceae (CRE): Rule-Based Versus Statistical

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Background: The Tennessee (TN) Department of Health (TDH) has been identifying clusters of reportable conditions using the Electronic Surveillance System for Early Notification of Community-Based Epidemics (ESSENCE), a cluster detection method using space-time scan permutation statistics based on patient ZIP code. CRE are reportable in Tennessee; isolate submission is required for carbapenemase (CP) production and resistance mechanism (eg, KPC gene) testing. The Council for Outbreak Response: Healthcare-Associated Infections (HAI) and Antimicrobial-Resistant (AR) Pathogens (CORHA) released proposed thresholds of reporting CRE to public health. Thresholds vary by healthcare facility type and regional epidemiology. The TDH HAI/AR program currently runs a daily automated SAS code using the CORHA reporting threshold to help public health identify suspect KPC clusters. We evaluated our rule-based CORHA method against 2 space-time statistic-based methods for KPC cluster detection in Tennessee. **Methods:** Simulations for each cluster detection method were performed using retrospective CP-CRE surveillance data for 2018. Simulations were conducted using (1) CORHA reporting thresholds by facility case count to flag clusters of 2 or more cases within 28 days, (2) ESSENCE using patient residence ZIP code and the earliest of collection date or symptom onset date as is used for other reportable conditions in Tennessee, and (3) a modified space-time statistical method using SaTScan in which reporting facility, rather than a geographic location, was used as space variable to detect within-facility clusters within 1–28 days. We compared the number and overlap of cases and clusters identified with each method. Univariate logistic regression with CORHA flagging as predictor and flagging by each ESSENCE or CORHA method as outcome variables, were used to compare cases tagged by each method pair, respectively. **Results**: Of 183 KPC CP-CRE cases, 54 (30.6%) were flagged as part of suspect clusters by at least 1 method. Simulations generated 16 alerts (36 cases) using CORHA, 10 clusters (25 cases) using modified SaTScan, and 10 clusters (20 cases) using standard ESSENCE protocol. Among KPC CP-CRE cases flagged by CORHA, 12 (33.3%) were also flagged by modified SaTScan and 2 (5%) by ESSENCE. A case flagged using CORHA method has 5.15 (95% CI, 2.10–12.64) times higher odds of also being flagged by the modified SaTScan method compared to cases not flagged by CORHA. **Conclusions:** An algorithm based on CORHA thresholds for reporting CRE to public health had strong agreement with modified SaTScan, a space-time method. We intend to explore the extension of the time interval for ESSENCE.

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Venn Diagram of Overlap of CP-CRE Cases Flagged by Three Cluster Detection Methods, 2018

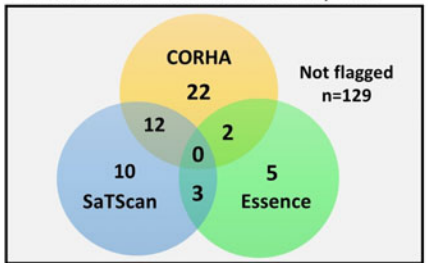

Fig. 1.

Presentation Type:
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Contamination of Healthcare Worker Personal Protective Equipment with MRSA Outside the Intensive Care Unit Setting

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Background: Estimates of contamination of healthcare personnel (HCP) gloves and gowns with methicillin-resistant *Staphylococcus aureus* (MRSA) following interactions with colonized or infected patients range from 17% to 20%. Most studies were conducted in the intensive care unit (ICU) setting where patients had a recent positive clinical culture. The aim of this study was to determine the rate of MRSA transmission to HCP gloves and gown in non-ICU acute-care hospital units and to identify associated risk factors. **Methods:** Patients on contact precautions with history of MRSA colonization or infection admitted to non-ICU settings were randomly selected from electronic health records. We observed patient care activities and cultured the gloves and gowns of 10 HCP interactions per patient prior to doffing. Cultures from patients' anterior nares, chest, antecubital fossa and perianal area were collected to quantify bacterial bioburden. Bacterial counts were log transformed. **Results:** We observed 55 patients (Fig. 1), and 517 HCP–patient interactions. Of the HCP–patient interactions, 16 (3.1%) led to MRSA contamination of HCP gloves, 18 (3.5%) led to contamination of HCP gown, and 28 (5.4%) led to contamination of either gloves or gown. In addition, 5 (12.8%) patients had a positive clinical or surveillance culture for MRSA in the prior 7 days. Nurses, physicians and technicians were grouped in "direct patient care", and rest of the HCPs were included in "no direct care group." Of 404 interactions, 26 (6.4%) of providers in the "direct patient care" group showed transmission of MRSA to gloves or gown in comparison to 2 of 113 (1.8%) interactions involving providers in the "no direct patient care" group ($P = .05$) (Fig. 2). The median MRSA bioburden was 0 log $_{10}$CFU/mL in the nares (range, 0–3.6), perianal region (range, 0–3.5), the arm skin (range, 0-0.3), and the chest skin (range, 0–6.2). Detectable bioburden on patients was negatively correlated with the time since placed on contact precautions ($r_s = -0.06$; $P < .001$). Of 97 observations with detectable bacterial bioburden at any site, 9 (9.3%) resulted in transmission of MRSA to HCP in comparison to 11 (3.6%) of 310 observations with no detectable bioburden at all sites ($P = .03$). **Conclusions:** Transmission of MRSA to gloves or gowns of HCP caring for patients on contact precautions for MRSA in non-ICU settings was lower than in the ICU setting. More evidence

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