2425. Correlating Use of High-Risk Antimicrobials and the Incidence of Hospital-Onset *Clostridium difficile* Infection: Targeting Prescribing Trends for Antimicrobial Stewardship

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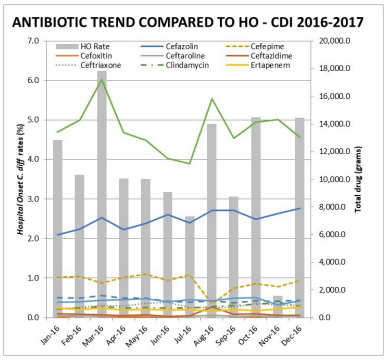
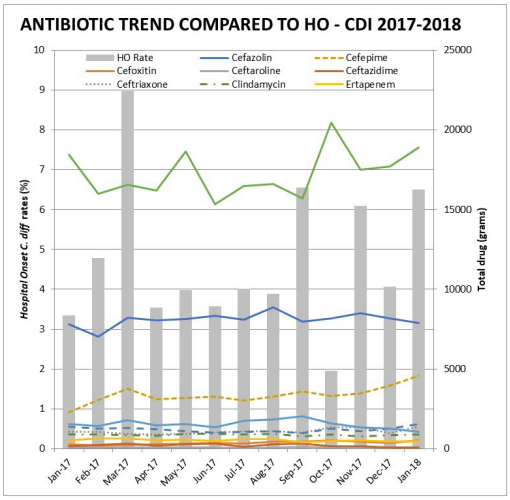
Background. Hospital-onset Clostridium difficile infection (HO-CDI) has a significant morbidity and mortality risk. It also poses increasing financial strain on the healthcare system. Certain antibiotics have been associated with increased HO-CDI incidence and novel strategies are needed to determine what modifiable risk factors exist. Choices of antibiotic have changed overtime time to overcome potential side effects, leading to a possibility that changed prescribing trends could be linked to significant differences in the rate of HO-CDI.

Methods. This study took place at a 971-bed community hospital from January 2016 to January 2018. Monthly utilization (grams) of 11 antimicrobials considered high risk of HO-CDI was collected, along with monthly HO-CDI rate. Antimicrobials included cephalosporins, carbapenems, fluoroquinolones and clindamycin. Correlational (Pearson's) and logistic regression analyses were completed to identify association with HO-CDI. A P-value of < 0.05 was considered statistically significant.

Results. 215 cases of HO-CDI were identified during the study period with 30 being classified as severe. The average HO-CDI rate was 4.3 cases/1000 patient-days. There were no significant correlations identified for any antimicrobials and HO-CDI rate ($p > 0.05$ for all interactions). Pearson's correlation coefficients were not significant for any antimicrobial. The multivariable logistic regression model including all antimicrobials, indicated that only ceftazidime had a statistically significant positive effect on the HO-CDI rate. Bearing in mind that only a small number of ceftazidime was prescribed, additional univariate analysis was performed indicating that there was no significant linear association between the HO-CDI rate and ceftazidime utilization ($P = 0.3527$).

Conclusion. Our study shows that there is no significant correlation between specific antimicrobial use and HO-CDI rates, even though there has been a general increase in HO-CDI rates. Additional analysis involving control groups of antibiotic use in patients without HO-CDI as well as incidence of HO-CDI in patients without antibiotic use at all is required to further assess possible modifiable risk factors in the inpatient population.





Disclosures. **All authors:** No reported disclosures.

2426. Performance of Statistical Process Control Charts for Detecting Clinically-Significant Increases in *Clostridium difficile* Infection Rates

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Session: 253. HAI: *C. difficile* - Surveillance
Saturday, October 5, 2019: 12:15 PM

Background. *Clostridium difficile* infections (CDIs) are the most common type of healthcare-associated infection in the United States, with an estimated annual incidence of 500,000 cases and excess healthcare costs of $5 billion per year. The prevalence and severity of CDIs have been increasing in recent years, making it of vital importance to detect outbreaks sufficiently early to minimize negative health outcomes. Statistical process control (SPC) methods have proven to be a versatile tool in healthcare, enabling near real-time monitoring of adverse events rates and thereby improving patients' health. The aim of this study was to investigate the performance of SPC in detecting clinically significant increases in CDI rates.

Methods. We retrospectively analyzed monthly CDI rates at 6 community hospitals in the Duke Infection Control Outreach Network from 2009–2017. Detected CDIs were stratified by surveillance system (LabID or traditional), infection source, recurrence type, and diagnostic test (nucleic acid amplification or enzyme-linked immunosorbent assay). Recurrent and community-associated CDIs were excluded from all analyses. Several variations of Shewhart and exponentially-weighted moving average (EWMA) u-charts were applied to each hospital (Figure 1), including using different baseline types (global, fixed, or rolling) and baseline data streams (hospital or network-wide). To help assess chart performance, epidemiologists determined the clinical relevance (yes/no) of 167 statistical signals generated using earlier iterations of these charts. Performance was quantified via sensitivity, specificity, and accuracy.

Results. EWMA u-charts with global network-wide baselines performed the best (Figure 2), detecting the largest number of clinically relevant signals (56% sensitivity) with high specificity (96%). Charts utilizing network-wide baselines were generally more accurate than those using local hospital data for that purpose (accuracy of 46–72% vs. 43–45%). Similarly, charts with fixed baselines performed better than those with rolling ones (accuracy of 43–62% vs. 43–47%).

Conclusion. SPC charts are easily applicable to CDI surveillance; however, their parameters would need to be optimized to maximize utility.

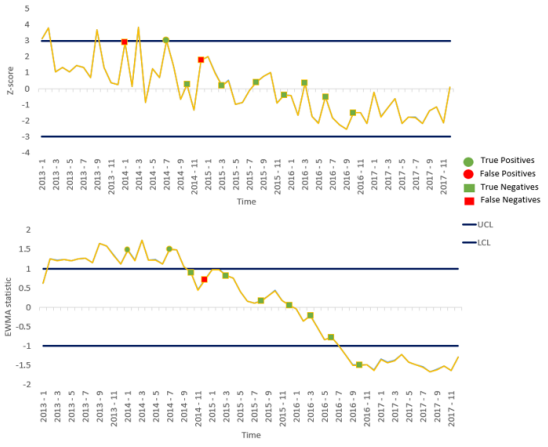

Figure 1. Example Shewhart and EWMA u-charts with global baselines for one hospital after switching to NAAT diagnostic testing and adoption of the LabID system to categorize infection types. Top graph shows normalized CDI rate over time, while bottom plot shows the corresponding EWMA statistic. True positives (green) and false positives (red) are marked by circles, while true negatives (green) and false negatives (red) are marked by squares. UCL and LCL = upper and lower control limits, set at ± 3 standard deviations from the expected rate.

Chart Type	Data	Baseline Type	Window Size	Sensitivity	Specificity	Accuracy
Shewhart U Chart	Local	Global	------	3%	100%	**43%**
	Local	Fixed	6 months	3%	100%	**45%**
	Local	Rolling	6 months	3%	100%	**45%**
	Network	Global	------	8%	100%	**46%**
	Network	Fixed	6 months	15%	96%	**50%**
	Network	Rolling	6 months	3%	100%	**45%**
EWMA U Chart	Local	Global	------	6%	100%	**44%**
	Local	Fixed	6 months	0%	100%	**43%**
	Local	Rolling	6 months	0%	100%	**43%**
	Network	Global	------	56%	96%	**72%**
	Network	Fixed	6 months	42%	88%	**62%**
	Network	Rolling	6 months	6%	100%	**47%**

Figure 2. SPC chart performance for different chart parameters. Sensitivity, specificity, and accuracy in identifying clinically relevant signals across the 6 hospitals analyzed in the present study.

Disclosures. **All authors:** No reported disclosures.