Abstract # 2019

Understanding the impact of the COVID-19 Pandemic on Central Line-Associated Bloodstream Infections (CLABSI)s: Expanding Analysis to the Microbiologic Level

Jay Krishnan MD,
ID Fellow, Duke University
DUMC Box 103259
Room 174 Hanes House
Durham, NC 27710
Jay.Krishnan@duke.edu
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Jay Krishnan, MD[1]; Elizabeth Dodds-Ashley, PharmD, MHS[1]; Andrea Cromer, BSN, MT, MPH, CIC, CPH[1]; Deverick Anderson, MD, MPH[1]; Sonali D. Advani MBBS, MPH[1]; Melissa Johnson, PharmD, MHS[1]

1-Duke Center for Antimicrobial Stewardship and Infection Prevention, Duke University Medical Center, Durham, North Carolina

Duke Center for Antimicrobial Stewardship and Infection Prevention

Background

- Increases in central line-associated bloodstream infection (CLABSI) rates have been reported in association with the COVID-19 pandemic, particularly among *Candida* species and coagulase-negative *Staphylococcal* species (CoNS).
- We sought to validate the impact of the COVID-19 pandemic on CLABSI trends by organism.

Methods

- Retrospective analysis of CLABSIs among a network of 38 community hospitals across the southeastern USA
- Included all CLABSIs as defined by CDC/NHSN Criteria among adults ≥18 from 1/1/2018-12/31/2021
- Applied unequal variance t-tests to compare CLABSI rates between pre-pandemic and pandemic periods
- Developed regression models to evaluate CLABSI incidence over time
- Compared models that were exclusively time-dependent to segmented regression models that also accounted for COVID-19's impact

Results: Descriptive & Pre-Post Statistics

- Included 1,167 CLABSIs over 1,345,062 central line days (**Table 1A**)
- The mean monthly CLABSI rate per hospital increased during the pandemic period (**Table 1B**).
- *Candida*, CoNS, and *Enterococcus* species CLABSI rates increased, while *Escherichia coli* CLABSI rates decreased.

Figure 1: Regression analysis of monthly CLABSI rates per 1,000 central line days. Gray areas denote COVID-19 pandemic period (4/1/2020-12/31/2021).

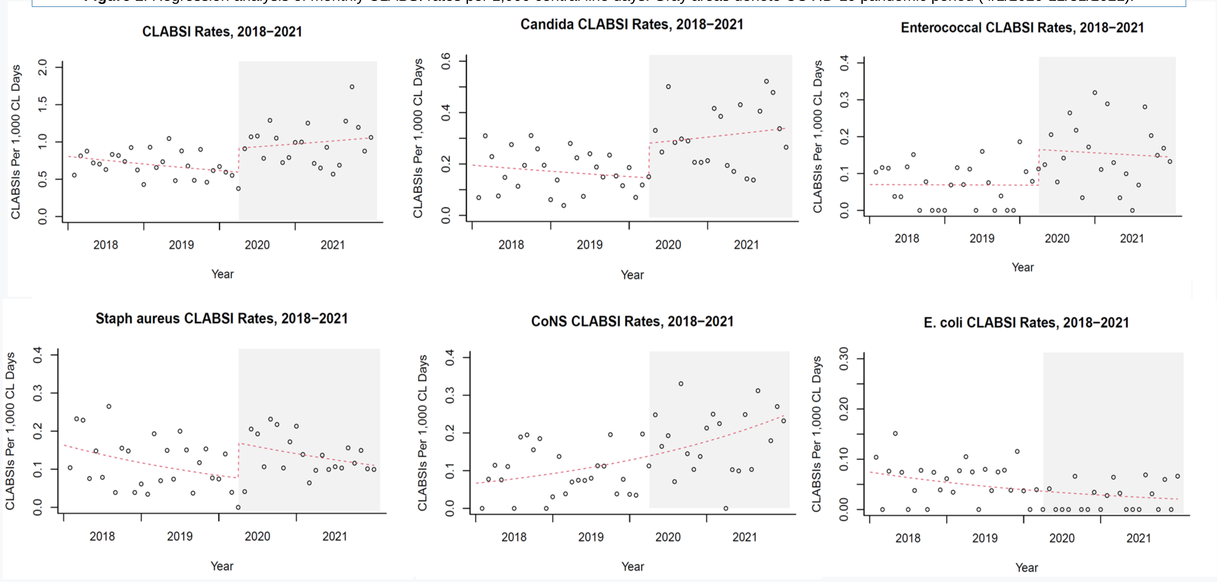

Table 1: Counts (A), mean monthly rates per 1,000 central line days (B), & coefficient table (C) for CLABSI rates by pathogen. Exclusively time-dependent models were compared to segmented regression models and, if no significant difference was noted between models, the exclusively time-dependent model was applied. Pre-pandemic period: 1/1/2018-3/30/2020, pandemic: 4/1/2020-12/31/2021.

	A) Counts		B) Mean Hospital Monthly Rate per 1,000 Central Line Days			C) Segmented Regression Analysis		
	Pre-Pandemic	Pandemic	Pre-Pandemic	Pandemic	*P value**	Baseline Trend (Slope, CI)	COVID-19 Level Change (RR, CI)	COVID-19 Trend Change (Slope, CI)
All Organisms	500	617	**0.63**	**1.01**	**<0.001**	0.99 (0.98-1.00)	**1.54 (1.13-2.09)**	1.02 (0.99-1.04)
Candida species	122 (24%)	194 (31%)	**0.16**	**0.33**	**<0.001**	0.99 (0.97-1.01)	**1.92 (1.16-3.20)**	1.02 (0.99-1.06)
Staphylococcus aureus	82 (16%)	84 (14%)	0.09	0.14	0.06	0.97 (0.95-1.00)	**2.20 (1.16-4.20)**	1.01 (0.96-1.06)
MRSA	41 (8%)	45 (7%)	0.06	0.07	0.27	1.00 (0.99-1.02)	N/A	N/A
CoNS	67 (13%)	125 (20%)	**0.09**	**0.22**	**<0.001**	**1.03 (1.02-1.04)**	N/A	N/A
Enterococcal species	50 (10%)	96 (16%)	0.06	0.18	0.00	1.00 (0.97-1.04)	**2.42 (1.09-5.38)**	1.00 (0.94-1.05)
VRE	26 (5%)	18 (3%)	0.04	0.03	0.44	0.98 (0.96-1.00)	N/A	N/A
Escherchia coli	40 (8%)	15 (2%)	**0.04**	**0.01**	**<0.001**	**0.97 (0.96-0.99)**	N/A	N/A
Klebsiella pneumoniae	36 (7%)	25 (4%)	0.05	0.04	0.23	1.02 (0.97-1.06)	**0.12 (0.29-0.47)**	**1.12 (1.02-1.22)**
Pseudomonas aeruginosa	19 (3%)	22 (4%)	0.03	0.02	0.64	1.01 (0.99-1.03)	N/A	N/A
Device Days	723,674	621,388	-	-	-	-	-	-
Device Utilization Ratio	0.15	0.16	-	-	-	-	-	-

Results: Regression Analysis

- The COVID-19 pandemic was associated with increases in monthly CLABSI rates, partly driven by *Candida* and *Enterococcus* species (**Table 1C; Figure 1**).
- The changes in CoNS and *E. coli* CLABSI rates noted by descriptive analysis were not better described by models that included the onset of COVID-19 (**Table 1C; Figure 1**).
- We observed non-sustained changes in *Staphylococcus aureus* and *Klebsiella pneumoniae* CLABSI rates, which only became apparent upon regression analysis (**Table 1C**).

Conclusions

- The COVID-19 pandemic was associated with substantial increases in CLABSI incidence, driven in part by increases in *Candida* and *Enterococcus* CLABSI rates in this hospital network.
- The observed increase in CoNS CLABSI rates and decrease in *Escherichia coli* CLABSI rates were not associated with the onset of COVID-19, which only became apparent upon regression analysis.
- Interpretation of pre-post statistics without assessment of pre-existing trends should be done cautiously.
- Additional analyses may help elucidate other factors influencing CLABSI trends specific to each pathogen.

Duke University School of Medicine

References
1. Fakih MG, Bufalino A, Sturm L, Huang RH, Ottenbacher A, Saake K, Winegar A, Fogel R, Cacchione J. Coronavirus disease 2019 (COVID-19) pandemic, central-line-associated bloodstream infection (CLABSI), and catheter-associated urinary tract infection (CAUTI): The urgent need to refocus on hardwiring prevention efforts. Infect Control Hosp Epidemiol. 2022 Jan;43(1):26-31. doi: 10.1017/ice.2021.70.