



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

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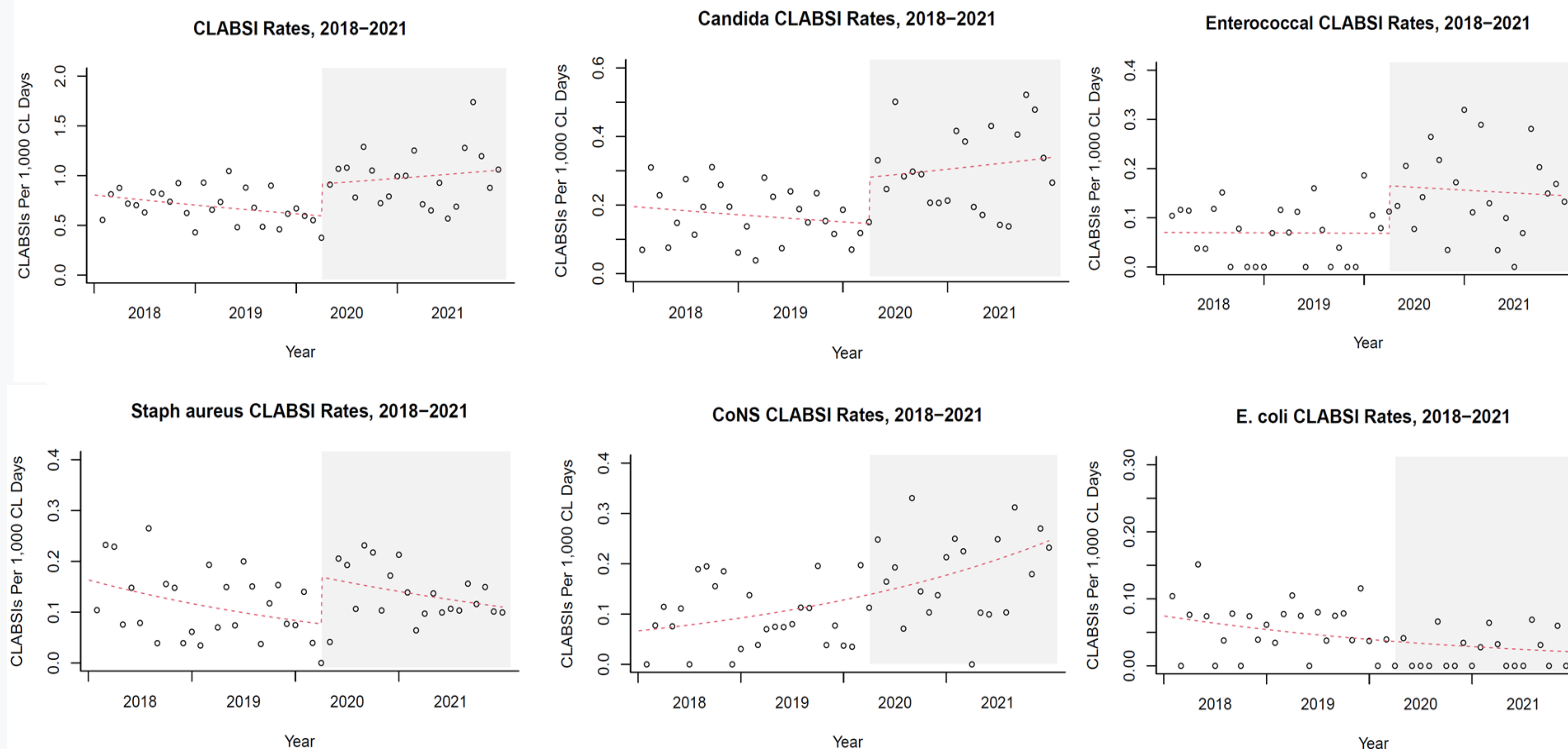
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Figure 1: Regression analysis of monthly CLABSI rates per 1,000 central line days. Gray areas denote COVID-19 pandemic period (4/1/2020-12/31/2021).



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.

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.

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)
<i>Candida</i> 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)
<i>Staphylococcus aureus</i>	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
<i>Enterococcal</i> 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
<i>Escherichia coli</i>	40 (8%)	15 (2%)	0.04	0.01	<0.001	0.97 (0.96-0.99)	N/A	N/A
<i>Klebsiella pneumoniae</i>	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)
<i>Pseudomonas aeruginosa</i>	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	-	-	-	-	-	-



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.

