**Table 2.**

| | Non-recurrent C Diff (58 episodes) | | | | | | Recurrent C Diff (48 first episodes) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | YES | % | NO | % | Not checked | % | YES | % | NO | % | Not checked | % |
| Admission | (32) | 55.2 | (26) | 44.8 | | | (24) | 50.0 | (24) | 50.0 | | |
| Abdominal pain | (25) | 43.1 | (33) | 56.9 | | | (29) | 60.4 | (19) | 39.6 | | |
| Fever (>38.5 C) | (9) | 15.5 | (49) | 84.5 | | | (5) | 10.4 | (43) | 89.6 | | |
| Hypoalbuminemia (<3 g/dL) | (7) | 12.1 | (26) | 44.8 | (25) | 43.1 | (7) | 14.6 | (19) | 39.6 | (22) | 45.8 |
| ICU admission | (4) | 6.9 | (54) | 93.1 | | | (3) | 6.3 | (43) | 89.6 | | |
| Abnormal CT abdomen | (5) | 8.6 | (5) | 8.6 | (48) | 82.8 | (8) | 16.7 | (6) | 12.5 | (34) | 70.8 |
| Leukocytosis (>15K) | (14) | 24.1 | (30) | 51.7 | (14) | 24.1 | (13) | 27.1 | (22) | 45.8 | (13) | 27.1 |
| AKI (Cr >1.5 times baseline) | (3) | 5.2 | (43) | 74.1 | (12) | 20.7 | (3) | 6.3 | (30) | 62.5 | (15) | 31.3 |
| Abdominal peritoneal signs | (1) | 1.7 | (57) | 98.3 | | | (0) | 0.0 | (48) | 100.0 | | |
| Need for vasopressors on hospitalization | (1) | 1.7 | (57) | 98.3 | | | (2) | 4.2 | (46) | 95.8 | | |
| Need for mechanical ventilation | (1) | 1.7 | (57) | 98.3 | | | (0) | 0.0 | (48) | 100.0 | | |
| Altered mental status | (5) | 8.6 | (53) | 91.4 | | | (1) | 2.1 | (47) | 97.9 | | |

medical record (Table 1), and 16S rRNA sequencing of the v4 region was carried out on the Illumina MiSeq using 2×250 paired-end reads. Sequences were binned into operational taxonomic units (OTUs) using mothur and were classified to the genus level whenever possible using the ribosomal database project data set version 16. Alpha diversity was calculated using the Shannon diversity index. B diversity was calculated using the Bray-Curtis dissimilarity matrix. Differential abundance testing was done using DESeq to assess taxonomic differences between groups. A *P* value of .05 was used to assess significance. **Results:** In total, 55 patients had rCDI (prior positive *C. difficile* polymerase chain reaction in last 7–365 days) and 58 had nonrecurrent CDI (Table 1). Patients with rCDI had a higher frequency of organ transplant and comorbidity. No differences in α not β diversity were observed between groups. Also, 4 OTUs were more abundant in those with rCDI: *Ruminococcus* (n = 2), *Odoribacter*, and *Lactobacillus*. Patients with rCDI had microbiomes with greater proportions of Bacteroidetes (27% of OTUs) compared to the nonrecurrent group (18%) as well as fewer OTUs belonging to the *Firmicutes phyla* compared to the nonrecurrent patients (56% vs 59%). Among the rCDI patients, those experiencing 2 or more recurrences had greater abundances of Bacteroides and *Ruminococcus*, while those experiencing only 1 recurrence had significantly greater abundances of *Akkermensia*, *Ruminococcus*, *Streptococcus*, *Roseburia*, *Clostridium* IV, and *Collinsella* compared to those with only 1 recurrence (Table 2). **Conclusions:** Patients with rCDI had a more impaired microbiome than those with initial CDI. *Ruminococcus* OTUs have been previously indicated as a risk factor for recurrence and treatment failure, and they were significantly more abundant in those with rCDI and among those with multiple recurrences. The greatest differences in the microbiome were observed between those with 1 recurrence compared to those with multiple recurrences. Interventions for gut microbiome restoration should focus particularly on those with recurrent CDI.

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**Subject Category:** *C. difficile*

**Impact of Two-Step Testing Algorithm on Reducing Hospital-Onset *Clostridioides difficile* Infections**

Bhagyashri Navalkele; Wendy Winn; Sheila Fletcher; Regina Galloway; Jason Parham; William Daley; Patrick Kyle; Vonda Clack and Kathy Sheilds

*Clostridioides difficile* infection (CDI) is one of the leading causes of hospital–onset infections. Clinically distinguishing true CDI versus colonization with *C. difficile* is challenging and often requires reliable and rapid molecular testing methods. At our academic center, we implemented a 2-step testing algorithm to help identify true CDI cases. The University of Mississippi Medical Center is a 700+ bed academic facility located in Jackson, Mississippi. Hospital-onset (HO) CDI was defined based on NHSN Laboratory Identified (LabID) event as the last positive *C. difficile* test result performed on a specimen using a multistep testing algorithm collected >3 calendar days after admission to the facility. HO-CDI data were collected from all inpatient units except the NICU and newborn nursery. HO-CDI outcomes were assessed based on standardized infection ratio (SIR) data. In May 2020, we implemented a 2-step testing algorithm (Figure 1). All patients with diarrhea underwent *C. difficile* PCR testing. Those with positive *C. difficile* PCR test were reflexed to undergo enzyme immunoassay (EIA) glutamate dehydrogenase antigen (Ag) testing and toxin A and B testing. The final results were reported as colonization (*C. difficile* PCR+/EIA Ag+/Toxin A/B−) or true CDI case (*C. difficile* PCR+/EIA +/Toxin A/B +) or negative (*C. difficile* PCR−). All patients with colonization or true infection were placed under contact isolation precautions until diarrhea resolution for 48 hours. During the preintervention period (October 2019–April 2020), 25 HO-CDI cases were reported compared to 8 cases in the postintervention period (June 2020–December 2020). A reduction in CDI SIR occurred in the postintervention period (Q3 2020–Q4 2020, SIR 0.265) compared to preintervention period (Q4 2019–Q1 2020, SIR 0.338) (Figure 2). We successfully reduced our NHSN HO-CDI SIR below the national average after implementing a 2-step testing algorithm for CDI. The 2-step testing algorithm was useful for antimicrobial stewardship to guide appropriate CDI treatment for true cases and for

Figure 1: Two-Step Testing Algorithm for Diagnosing *Clostridioides difficile* infection

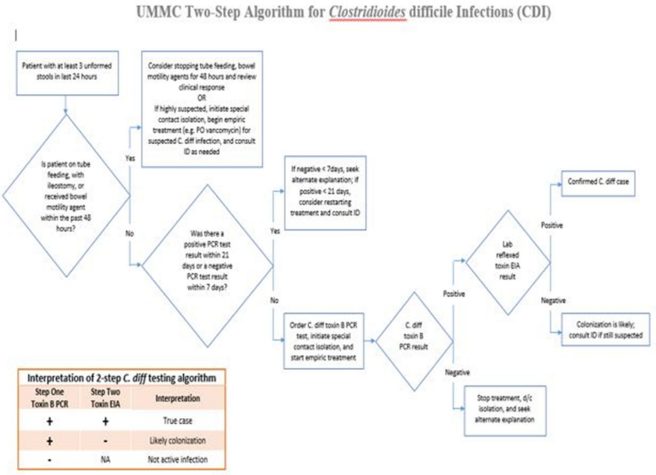
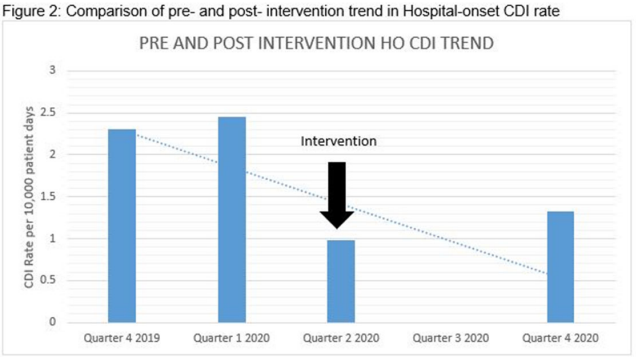



Figure 2: Comparison of pre- and post- intervention trend in Hospital-onset CDI rate



infection prevention to continue isolation of infected and colonized cases to reduce the spread of *C. difficile* spores.

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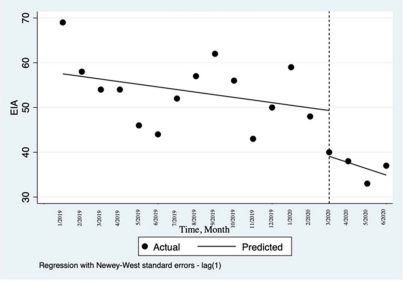
## Did *Clostridioides difficile* Testing and Infection Rates Change During the COVID-19 Pandemic?

Armani Hawes; Payal Patel and Angel Desai

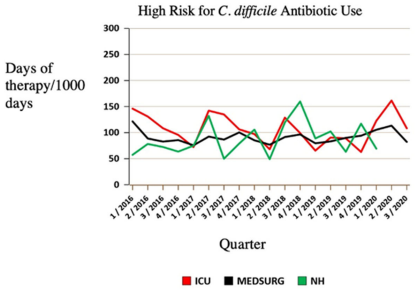
**Background:** The COVID-19 pandemic has underscored the importance of ongoing infection prevention efforts. Increased adherence to infection prevention recommendations, increased antibiotic use, improved hand hygiene, and correct donning and doffing of personal protective equipment may have influenced healthcare-associated infections (HAIs) in the United States during the pandemic. In this study, we investigated testing for *Clostridioides difficile* infection (CDI) and incidence during the initial surge of the pandemic. We hypothesized that strict adherence to contact precautions may have resulted in a decreased incidence of CDI in hospitalized patients during the first peak of the COVID-19 pandemic and that CDI testing may have increased even in the absence of directed diagnostic stewardship efforts. **Methods:** We conducted a single-center, retrospective, observational study at the Veterans' Affairs (VA) Hospital in Ann Arbor, Michigan, between January 2019 and June 2020. We compared data on CDI tests from January 2019 through February 2020 to data from March 2020 (the admission of the first patient with COVID-19 at our institution) through June 2020. Pre-peak and peak periods were defined by confirmed cases in Washtenaw County. No novel diagnostic or CDI-focused stewardship interventions were introduced by the antimicrobial stewardship program during the study period. An interrupted time series analysis was performed using STATA version 16.1 software (StataCorp LLC, College Station, TX). **Results:** There were 6,525 admissions and 34,533 bed days between January 1, 2019, and June 30, 2020. Also, 900 enzyme immunoassay (EIA) tests were obtained and 104 positive cases of CDI were detected between January 2019 and June 2020. A statistically significant decrease in EIA tests occurred after March 1, 2020 (the COVID-19 peak in our region) compared to January 1, 2019–March 1, 2020 (Figure 1). After March 1, 2020, the number of EIA tests obtained decreased by 10.2 each month (95% CI, −18.7 to −1.7; $P = .02$). No statistically significant change in the incidence of CDI occurred. The use of antibiotics that were defined as high risk for CDI increased in the months of April–June 2020 (Figure 2). **Conclusions:** In this single-center study, we observed a stable incidence of CDI but decreased testing during the first peak of the COVID-19 pandemic. Understanding local HAI reporting is critical because changes in HAI reporting structures and exemptions during this period may have affected national reporting. Further research should be undertaken to investigate the effect of COVID-19 on other HAI reporting within the US healthcare system.

**Figure 1: Impact on Incidence of Enzyme Immunoassay Tests Obtained for *Clostridioides difficile***




EIA: enzyme immunoassay
CDI: *Clostridioides difficile*

**Figure 2: High Risk for *Clostridioides difficile* Antibiotic Use**




High risk for *Clostridioides difficile* Antibiotics: clindamycin, cefotaxime, ceftriaxone, ceftazidime, cefepime, cefdinir, cefpodoxime, cefixime, ciprofloxacin, gemifloxacin, levofloxacin and moxifloxacin

ICU: intensive care unit
Medsurg: medical and surgical floors
NH: nursing home

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## Inequities in CLABSI Rates in a Children's Hospital by Race, Ethnicity, and Language Preference

Caitlin McGrath; Matthew Kronman; Danielle Zerr; Brendan Bettinger; Tumaini Coker and Shaquita Bell

**Background:** Systemic racism results in health inequities based on patient race, ethnicity, and language preference. Whether these inequities exist in pediatric central-line–associated bloodstream infections (CLABSIs) is unknown. **Methods:** This retrospective cohort study included patients with central lines hospitalized from October 2012 to June 2019 at our tertiary-care children's hospital. Self-reported race, ethnicity, language preference, demographic, and clinical factors were extracted from the electronic health record. The primary outcome was non–mucosal barrier injury (non-MBI) CLABSI episodes as defined by the NHSN. CLABSI rates between groups were compared using $\chi^2$ tests and Cox proportional hazard regression. We adjusted for care unit, age, immunosuppressed status, diapered status, central-line type, line insertion within 7 days, daily CLABSI maintenance bundle compliance, number of blood draws and IV medication doses, and need for total parental nutrition, extracorporeal membrane oxygenation, and renal replacement therapy. In mid-2019, we engaged stakeholders in each care unit to describe preliminary findings and to identify and address potential drivers of observed inequities. **Results:** We included 337 non-MBI CLABSI events over 230,699 central-line days (CLDs). The overall non-MBI CLABSI rate during the study period was 1.46 per 1,000 CLDs. Unadjusted CLABSI rates for black or African American (henceforth, "black"), Hispanic, non-Hispanic white, and Asian (the 4 largest race or ethnicity groups by CLDs) patients were 2.74, 1.53, 1.42, 1.24 per 1,000 CLDs, respectively ($P < .001$) (Table 1). Unadjusted CLABSI rates for patients with limited-English proficiency (LEP) and English-language preference were 1.98 and 1.38 per 1,000 CLDs, respectively ($P = .014$). After adjusting for covariates, the hazard ratio (HR) point estimate for CLABSI rate remained higher for black patients (HR, 1.50; 95% CI, 0.99–2.28) and patients with LEP (HR, 1.33; 95% CI, 0.87–2.05), compared to the reference group based on largest CLD. The differences in CLABSI rate by race or ethnicity and language were more pronounced in 2 of