

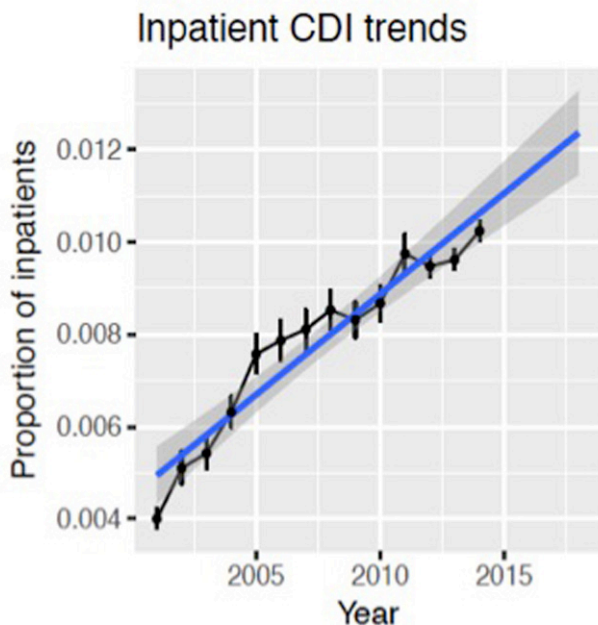
Session: 251. HAI: *C. difficile* - Epidemiology
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Background. *Clostridioides difficile* Infection (CDI) is a highly contagious bacterium that can be transferred from an infected surface. In this study, the Nationwide Readmissions Database was used to assess the risk of 30-, 60-, and 90-day readmissions in patients with comorbid CDI and renal failure (RF).

Methods. Using the Nationwide Inpatient Sample (NIS, 35 million hospitalizations/year) and the Nationwide Readmissions Database (NRD, 36 million/year), CDI in renal insufficient patients were identified. Years 2001–2014 of the NIS, as well as years 2010–2014 of the NRD were used for analysis. Chronic kidney disease (CKD) was based on the stage of the disease using ICD-9-CM coding (585.1–585.5). ICD-9-CM 585.6 was used for end-stage renal disease (ESRD). All analyses were done in R version 3.4.3.

Results. Over the 14 year period, the proportion of inpatients with CDI and RF increased from 0.004% (95% CI, 0.0038%-0.0042%) to 0.010% (95% CI, 0.0100%-0.0104%) in 2014. Inpatient RF and CDI increased a mean of 220,827 people over the 14 years. Inpatient CDI and RF prevalence is described as linearly increasing trend (Figure 1). Median age (2001–2014) for RF patients with CDI decreased 5 years to 68 (95% CI, 68–69). Using this model, expected CDI infections in RF to increase to 437,605.1 (95% CI, 427,984.2–447,380.8) hospital inpatients in 2018. In patients with CDI and CKD, ESRD is a significant predictor of 30-, 60-, and 90-day readmission.

Conclusion. Using the NIS and NRD identified ESRD patients as a significant predictor of readmission for 30-, 60-, and 90-days. CDI infections in ESRD are expected to increase substantially by 2018.



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2395. Analysis of Countywide *Clostridium difficile* Infection using Descriptive Statistics and Geographic Information Systems Mapping

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Background. *Clostridium difficile* infection (CDI) is now the most common pathogen causing nosocomial infectious diarrhea in the United States, and more than 500,000 people are estimated to have either healthcare-associated (HA) or community acquired (CA) CDI. The epidemiology of CDI is incompletely understood with more than 50% of all CDI cases occurring in the outpatient community and growing at a pace that is greater than HA-CDI.

Methods. Patients with CDI within Santa Barbara County, California were identified via three types of tests: *Clostridium difficile* PCR, gastrointestinal panel by PCR, and enzyme immunoassay (EIA) via local laboratory. Basic patient characteristics were analyzed using descriptive statistics. Changes with CA-CDI incidence were examined on a quarterly basis to identify and compare quarterly trends in CA-CDI incidence. Geographic Information Systems (GIS) mapping was utilized to provide better spatial understanding of disease distribution across communities.

Results. Over 2,000 unique patients with CDI were identified between January 1, 2013 and January 31, 2019. Median age of these patients was 64 years (interquartile range: 45 – 78) and 60% were female. Hot spots of CDI within Santa Barbara County were localized to three major cities: Santa Barbara, Goleta, and Lompoc. Our results show that based on seasonal quarterly data CDI occurred most frequently in winter months.

Conclusion. In conclusion, CDI hot spots occurred most frequently during winter months and could possibly be associated with increased antibiotic treatment during flu season. Using the results from this study, we believe that by utilizing spatial and seasonal trends associated with CDI, physicians may be able to identify, diagnose and treat patients with CDI more promptly in Santa Barbara County.

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2396. *Clostridium difficile* Infection is Children with Sickle Cell Disease: An Uncommon Entity

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Background. Children with sickle cell disease (SCD) have numerous risk factors for intestinal dysbiosis, including frequent hospitalization, iron overload, antibiotic exposure including penicillin prophylaxis, hypoxia, and altered gut permeability. Many of these conditions are also established risk factors for *C. difficile* infection (CDI); however, the incidence of CDI in children with SCD has not been characterized.

Methods. We performed a 10-year retrospective review from 1/2008–December 2017. Patients who qualified with CDI were either admitted or within 2 weeks of discharge from our site and had a positive test. A positive test was defined as a positive glutamate dehydrogenase 1 test in conjunction with either a positive ELISA or a positive PCR for toxin. Three investigators independently reviewed if patients had active diarrhea during the time of their positivity. Patients excluded were <2 years old and patients undergoing a stem cell transplant (SCT) or irritable bowel disease (IBD) at the time of a positive test. Chi-square test with Yates correction, descriptive statistics were used when comparing groups.

Results. Over a 10-year period (2008–2017), there were 5666 admissions for children with SCD, corresponding to 25,915 hospitalization days and 957 unique patients. The average age of this cohort at the time of admission was 10.6 ± 6.7 years; 51.7% were male. One patient qualified; a 12-year-old who developed diarrhea and abdominal pain after recent hospitalization for pneumonia (Figure 1). This yielded a CDI incidence of 0.39/10,000 patient-days or 0.18 cases per 1000 admissions (Table 1). There were 208 cases of CDI in non-SCD children, with an incidence of 5.53/10,000 patient-days ($P < 0.001$) or 2.77 cases per 1000 admissions ($P < 0.001$) (Table 2) during the study period. In 2015–2017, there were no cases of CDI in 957 SCD patients, of which 218 were on penicillin prophylaxis.

Conclusion. There is a very low incidence of CDI in children with SCD despite significant antibiotic exposure and other risk factors for intestinal dysbiosis. These findings are consistent with recent studies in adults (N Engl J Med 2019; 380:887–888) and suggest that sickle cell patients are somehow protected against CDI. Additional studies are needed to define the host and biome factors that confer this protection.

Figure 1. Identification of CDI among children with SCD

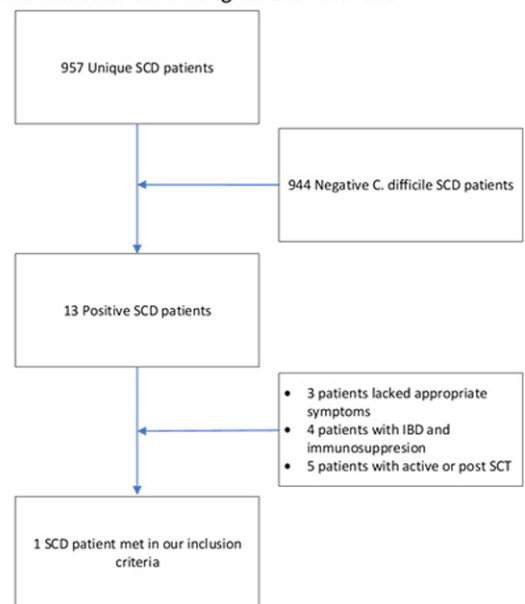


Table 1: Incidence of CDI in patients with SCD

Year	# CDI cases in SCD patients (n/1000 patient days)	Number of Admissions	Total number of Hospital Days	CDI Incidence Rate (Cases/10,000 patient days)	CDI Incidence Rate (Cases/1,000 patient admission)
2008	1	516	2,141	4.7	4.2
2009	0	588	2,846	0	0
2010	0	602	3,084	0	0
2011	0	577	2,759	0	0
2012	0	544	2,362	0	0
2013	0	536	2,317	0	0
2014	0	509	2,795	0	0
2015	0	584	2,977	0	0
2016	0	655	3,328	0	0
2017	0	595	2,306	0	0
TOTAL	1	5,666	25,915	0.4	0.18

Table 2: Incidence of CDI in all children excluding those with SCD

Year	# CDI cases in SCD patients (n/1000 patient days)	Number of Admissions	Total number of Hospital Days	CDI Incidence Rate (Cases/10,000 patient days)	CDI Incidence Rate (Cases/1,000 patient admission)
2008	18	6,299	35,845	5.0	2.9
2009	28	6,664	37,430	7.5	4.2
2010	28	6,599	36,546	7.3	4.2
2011	31	6,687	36,971	8.4	4.6
2012	14	6,740	37,667	3.7	2.1
2013	26	6,760	40,259	6.5	3.8
2014	5	7,078	35,828	1.4	0.7
2015	24	7,424	37,450	6.4	3.2
2016	25	8,703	38,846	6.4	3.9
2017	9	8,945	36,991	2.4	1.1
TOTAL	208	71,899	375,843	5.5	2.9

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2397. Effects of antimicrobial surgical prophylaxis on rates of Clostridioides difficile infection

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Background. Studies have demonstrated short courses of antibiotics, including surgical site infection (SSI) prophylaxis, can increase the risk of Clostridioides difficile infection (CDI). The purpose of this study was to evaluate the incidence of CDI associated with antibacterial perioperative prophylaxis.

Methods. In a retrospective analysis of affiliated hospitals from a large health-care system, aggregate data from 156 acute care facilities across the United States was analyzed for the time period of July 2017 through July 2018. Patients were included if they were 18 years and older, admitted to an inpatient unit, and underwent a surgical procedure requiring antibiotic prophylaxis. Patients were excluded if they received antibiotics more than 24 hours prior to procedure start, received antibiotics more than 72 hours after procedure stop, or had more than one procedure with antibiotic prophylaxis within 30 days. Patients were divided into three groups based on the duration of antibiotic prophylaxis received: preoperative only (Pre-op only), pre-op plus postoperative for 24 hours or less (Short Post-op), and pre-op plus post-op for 25 to 72 hours (Long Post-op). The primary outcome was the incidence of CDI within 30 days of surgical procedure. Study design was approved by the University of Tennessee Institutional Review Board.

Results. The final analysis included 230,524 patients: 68,307 Pre-op Only, 123,185 Short Post-op, and 39,032 Long Post-op. Overall, 195 cases of CDI were identified during the study period, for a rate of 0.8 cases per 1000 procedures. The highest incidence occurred in the Long Post-op group (1.3 cases per 1000 procedures). A pairwise comparison demonstrated the incidence of CDI is statistically higher in the Long Post-op group compared with both the Pre-op Only (P = 0.005) and the Short Post-op (P = 0.003) groups. There was no significant difference between the Pre-op Only and the Short Post-op groups (<p>

Conclusion. Patients who received antibiotics for more than 24 hours post-op had a higher incidence of CDI. No statistically significant difference in CDI between pre-op only and less than 24 hours post-op was found.

Disclosures. All authors: No reported disclosures.

2398. Effect of Eosinopenia and Binary Toxin on Clostridioides difficile Infection Clinical Outcomes

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Background. The ability of Clostridioides difficile to cause clinical disease in humans is dependent on toxin production. Significantly fewer eosinophils are seen in the peripheral blood of mice infected with a binary toxin positive (CDT+) C. difficile strain. Furthermore, the presence of CDT and eosinopenia have separately been associated with increased mortality in humans with C. difficile infection (CDI). We hypothesized that CDI due to a CDT+ C. difficile strain accompanied by peripheral eosinopenia would be associated with higher odds of inpatient mortality.

Methods. This multicenter, retrospective cohort study included all patients ≥ 18 years of age with toxigenic CDI in which specimen ribotype data were available as part of our ongoing surveillance study. The cohort was stratified by eosinophil count (0.0 cells/μL vs. > 0.0 cells/μL). The primary outcome was inpatient mortality. A logistic regression model was developed modeling inpatient mortality as a function of the available patient covariates. All P-values were from 2-sided tests, and results were deemed statistically significant at P < 0.05.

Results. A total of 688 patients from 13 institutions in six cities were included. Of those, 132 had a baseline eosinophil count of 0.0 cells/μL and 556 had a baseline eosinophil count > 0.0 cells/μL. While the odds of inpatient mortality were higher among patients with eosinopenia and those infected with a CDT+ ribotype, the combination of these variables remained an independent predictor of inpatient mortality after adjusting for CCI score, WBC count, and serum albumin level (OR, 7.84; 95% CI, 1.85–33.20; P = 0.005).

Conclusion. This is the first attempt to study the in vivo relationship between CDT presence, human immune response, and CDI clinical outcome. We identified an association between CDT presence with concomitant eosinopenia and worsened CDI outcomes. Healthcare facilities should consider identifying this important subset of patients at the time of CDI diagnosis. Future CDI drug development might benefit from targeting C. difficile properties that impair host immune response, which may in turn decrease adverse clinical outcomes associated with this disease.

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2399. Ribotype Diversity of Clostridioides difficile strains obtained during screening tests

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Background. Clostridioides difficile is an organism acquired not only in health-care settings but also in community settings. For the past several years our hospital has performed screening tests to detect asymptomatic carriage of C. difficile. We now aim to better understand the ribotypes and degree of diversity among these C. difficile strains obtained in a systematic screening.

Methods. This study was performed at a 600 bed teaching affiliated hospital in Milwaukee, WI, where surveillance testing is performed in selected units upon admission and weekly thereafter using nucleic acid amplification test (NAAT; Xpert[®] C. difficile; Cepheid, Sunnyvale, CA). Screening tests are obtained regardless of symptoms. NAAT positive samples underwent anaerobic cultures in C. difficile selective broth (CCMB-TAL) for 24–48 hr and then to Brucella blood agar plates (BA) for 48–72 hr to confirm C. difficile presence. PCR-ribotyping was performed as previously described by Stubbs et al. with minor modifications. The results were compared with a database containing >3,000 clinical isolates including C. difficile reference strains from the Cardiff ribotype collection.

Results. A total of 104 strains belonging to 93 unique patients were processed. Patients had a mean age of 60 years (range: 18 - 89) and 49% were females. Most patients were hospitalized in the hematology oncology units (55.7%) or in the solid-organ transplant step down unit (9.6%). A total of 25 different ribotypes were identified. The most common ribotype was 014/020 (23; 22%), followed by ribotype 56 (13; 12.5%), 106 (12; 11.5%), 027 (11; 10.5%), 002 (6; 5.7%), and 078/126 (5; 4.81).

Regarding the timing of admission, 70 strains were obtained within 4 days from hospital admission and the remaining 34 were obtained afterwards. Both groups had ribotype 014/020 as the most frequently detected ribotype but 027 were the second most commonly detected at the time of admission (table). A total of 7 patients had more than one stool sample processed and 5 of them had discordant ribotypes at different time points.

Conclusion. Systematic screening tests for C. difficile carriage in a single center showed a large heterogeneity of ribotypes with the majority not being 027. Additionally, most patients tested more than once carried different ribotypes.

Ribotype	Isolates obtained after 4 days of admission		Isolates obtained within 4 days of admission		All isolates	
	n	%	n	%	n	%
014/020	8	7.7	15	14.4	23	22.1
056	5	4.8	8	7.7	13	12.5
106	8	7.7	4	3.9	12	11.5
027	2	1.9	9	8.7	11	10.6
002	0	0.0	6	5.8	6	5.8
078/126	1	1.0	4	3.9	5	4.8
003	1	1.0	2	1.9	3	2.9
010	1	1.0	2	1.9	3	2.9
017	1	1.0	2	1.9	3	2.9
001	1	1.0	1	1.0	2	1.9
012	0	0.0	2	1.9	2	1.9
013	0	0.0	2	1.9	2	1.9
026	0	0.0	2	1.9	2	1.9
054	0	0.0	2	1.9	2	1.9
057	1	1.0	1	1.0	2	1.9
097	2	1.9	0	0.0	2	1.9
104	0	0.0	2	1.9	2	1.9
005	0	0.0	1	1.0	1	1.0
009	0	0.0	1	1.0	1	1.0
018/356	1	1.0	0	0.0	1	1.0
046	0	0.0	1	1.0	1	1.0
053	0	0.0	1	1.0	1	1.0
081	1	1.0	0	0.0	1	1.0
087	1	1.0	0	0.0	1	1.0
131	0	0.0	1	1.0	1	1.0
Not identifiable	0	0.0	1	1.0	1	1.0
Total	34	32.7	70	67.3	104	100.0

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