2392. Identifying Associations Between *Clostridium difficile* Infection Incidence and Cancer Patients Receiving Chemotherapy

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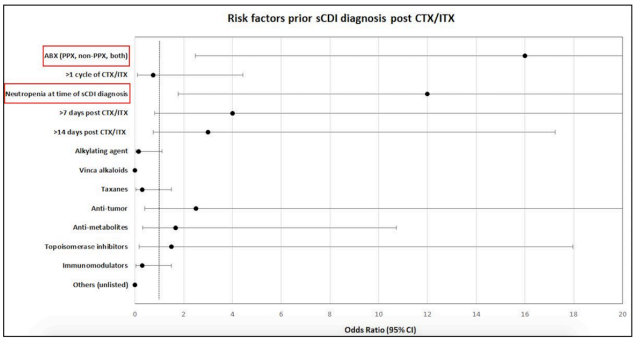
Background. *Clostridium difficile* infection (CDI) is a known major financial burden. In the cancer population, CDI, was identified to have a peak incidence of 17.2 per 1000 patients with increased morbidity, mortality and hospital length of stay. The need to further elucidate chemotherapy (CTX) with vs. without ABX usage as risk factors among other variables in *cancer* patients arises since this population is already baseline immunocompromised.

Methods. A retrospective case–control study (total of 1989 cancer patients who received CTX *and* had diarrhea at UTMB through 1/2016–1/2018) was completed. Subjects were screened using *extensive* inclusion and exclusion criteria, and assigned as CASES (with *symptomatic (s)* diarrhea from proven CDI) and as CONTROLS (had diarrhea but not attributed to CDI). A 1:1 subject matching using age, sex and past medical histories was completed and a total of 46 patients: 23 cases and 23 controls were compared and analyzed. McNemar's and independent *t* test of equal variance were used for association and comparing means/medians, respectively. Two-sided *P* value ≤ 0.05 was considered significant.

Results. The use of ABX (OR = 16, *P* = 0.0007) and having any degree of neutropenia at the time of diarrhea (OR = 12, *P* = 0.0055) among CTX patients had significant associations with having *s*CDI. Although no significant association between sCDI and # of days post CTX exposure (≥7 days (*P* = 0.1138) and ≥14 days post CTX (*P* = 0.1489) was identified, a mean of 12.83 ± 7.69 days passed before sCDI diagnosis in cases, compared with diarrhea diagnosis (7.46 ± 6.1 days) in controls (*P* = 0.0119). Meanwhile, receiving >1 CTX cycle (*P* = 1.000) and particular CTX types (*P* = ~ 0.0771–1.000) had no significant associations with sCDI diagnosis.

Conclusion. Any ABX usage post CTX exposure heavily predisposes to *s*CDI among cancer patients likely due to elimination of gut flora on an already predisposed population. Having any degree of neutropenia was also associated with having *s*CDI likely due to significant immunosuppression on top of being baseline cancer patients receiving CTX, and may have predictability benefits. The other variables may have not been significant due to expected limited cases because of low CDI incidence.



Graph 1. OR of possible associated risk factors with sCDI occurrence after CTX/ITX ± ABX exposure

Risk factor exposures prior sCDI diagnosis post CTX/ITX: exploratory	Odds ratio	95% CI	p-value
***Any ABX type given (PPX, non-PPX, both)	16.00	2.49-670.96	**0.0007**
>1 cycle of CTX/ITX	0.75	0.11-4.43	1.0000
Any degree of neutropenia at time of sCDI diagnosis	12.00	1.78-512.97	**0.0055**
>7 days post CTX/ITX exposure	4.00	0.80-38.66	0.1138
>14 days post CTX/ITX exposure	3.00	0.75-17.23	0.1489
Alkylating agent	0.14	0.03-1.11	0.0771
Vinca alkaloids	n/a	n/a	1.0000
Taxanes	0.29	0.03-1.50	0.1824
Anti-tumor	2.50	0.41-26.25	0.4497
Anti-metabolites	1.67	0.32-10.73	0.7237
Topoisomerase inhibitors	1.50	0.17-17.96	1.0000
Immunomodulators	0.29	0.03-1.50	0.1824
Others (unlisted)	n/a	n/a	n/a

Table 1. OR of explorative variables for possible CDI association after CTX/ITX ± ABX exposure

Patient characteristics	Cases (sCDI+) n=23	Controls (sCDI-) n=23
Median age (range)	63 (47-76)	63 (49-80)
Sex		
Male	11 (49%)	11 (49%)
Female	12 (51%)	12 (51%)

Table 2. Study population demographics at time of *symptomatic diarrhea

Comparison of characteristics using Two-sample independent *t* test of *equal variance*	Mean	Std. dev.	p-value	95% CI	Median
CTX/ITX total cycles received prior diarrhea					
Cases (sCDI+)	3.61	3.79	0.2956	-4.04-1.26	2
Controls (sCDI-)	5.00	5.03			4
Absolute neutrophil count at time of diarrhea diagnosis					
Cases (sCDI+)	3603.30	4641.23	0.2378	-4411.60-11 24.28	1200
Controls (sCDI-)	5246.96	4673.77			3950
# of days post CTX/ITX exposure prior diarrhea diagnosis					
Cases (sCDI+)	12.83	7.69	**0.01191**	1.25-9.49	11
Controls (sCDI-)	7.46	6.10			8

Table 3. Comparison of explorative variables analyzed for possible CDI association after CTX/ITX ± ABX exposure using two-sample independent t test of equal variance

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2393. Dimensions of Cumulative Antibiotic Exposure and Risk of Hospital Onset Clostridiodes Difficile

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Background. The association between antibiotic exposure (AE) and healthcare-associated *Clostridiodes difficile* infection (HA-CDI) has been mostly quantified using cumulative AE as the predictor. However, patients receive similar durations of antibiotics in a variety of ways. We examine the relationship between HA-CDI and other dimensions of AE.

Methods. Retrospective cohort study was conducted with pediatric and adult inpatients at three New York City hospitals between 2011- 2016 who were prescribed at least one dose of antibiotic, excluding those used to treat CDI. Patient data were collected until the first diagnosis of HA-CDI (a positive CDI test > 3 days after admission), or alternatively at the end of the study period. Four dimensions of AE were calculated: 1) duration – cumulative total calendar days of antibiotics use, 2) discontinuity – the number of separate antibiotic courses that contributed to the duration (a course defined as antibiotics given over ≥ 2 consecutive calendar days separated by at least 24 hours), (3) antibiotic free days – days without antibiotic use, and (4) use of 'high-risk' antibiotics – use of antibiotics known for increasing *C. difficile* risk. We measured the association between each AE dimension and HA-CDI, mutually controlling for each dimension, in a multivariable logistic regression model adjusted for age, sex, comorbidities (e.g., malignancy, transplant status), length of hospitalization, and use of proton pump inhibitors (PPI).

Results. Of 227,967 hospitalized patients, 104,705 (45.9%) received antibiotics and 1,618 had HA-CDI. In regression analysis, adjusted for cumulative duration, discontinuous antibiotic therapy (OR = 2.02, 95% CI: 1.49–2.74, *P* < .0001) and high-risk antibiotics (OR = 1.639, 95% CI: 1.45–1.85, *P* < .0001) both increased HA-CDI risk. A longer antibiotic free interval between courses decreased HA-CDI risk (OR = 0.998, 95% CI: 0.997–0.998, *P* < .0001). In addition, both PPI use and being immunocompromised were significantly associated with HA-CDI.

Conclusion. Multiple dimensions of AE in addition to cumulative duration were collectively associated with CDI risk. This has implications for designing accurate CDI prediction models implementing antibiotic stewardship interventions.

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2394. A Longitudinal Study of the Effect of Renal Failure on Readmission Rates of Patients with Clostridioides difficile

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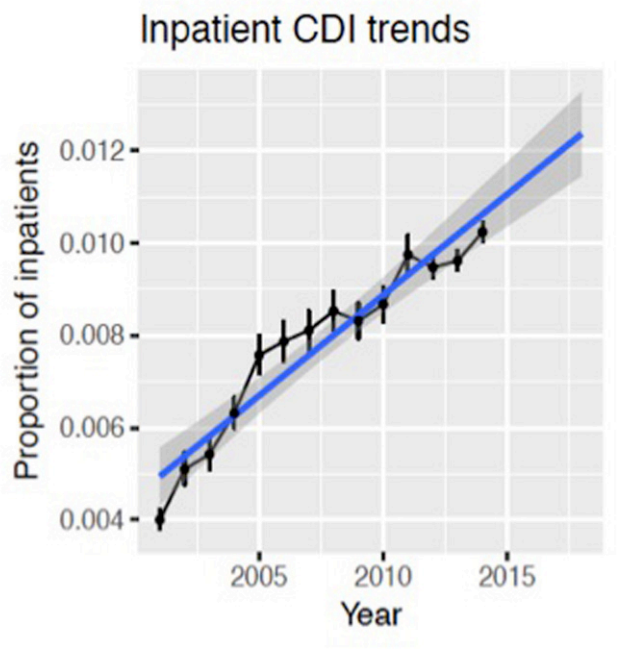
Background. *Clostridioides difficile* Infection (CDI) is a highly contagious bacterium that can be transferred from an infected surface. In this study, the Nationwide Readmissions Database was used to assess the risk of 30-, 60-, and 90-day readmissions in patients with comorbid CDI and renal failure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



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

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<./p>

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