pharmacist-led, pre-authorization process. The antimicrobial stewardship team prospectively reviewed all adult CDI-PCR cases sent to the laboratory prior to specimen processing twice daily, 7 days a week to assess for clinical appropriateness based on guideline criteria. Bone marrow transplant and pediatric patients were excluded. If a patient lacked appropriate CDI clinical criteria, the provider was contacted to discontinue the PCR. CDI-PCR appropriateness was assessed for all patients with a CDI-PCR during the preceding year as a retrospective, comparative cohort. The primary objective was to assess appropriateness of the CDI-PCR pre- and postintervention. Secondary objectives included intervention sensitivity, specificity, safety, total CDI-PCRs processed, and protocol adherence.

Results. A total of 714 patients were included (n = 360, preintervention; n = 354, postintervention). There were significantly more hospital-onset CDI cases and antimicrobial use within the past 30 days in the preintervention group [(248 vs. 133, respectively; $P < 0.001$) and (277 vs. 197, respectively; $P < 0.0001$)]. Appropriateness of the CDI-PCR significantly improved postintervention [n = 138 (38.3%) *vs.* n = 209 (59.1%), respectively; $P < 0.001$]. Prospective pharmacist intervention was required for 146 inappropriate CDI-PCRs resulting in 79 discontinued and 66 processed CDI-PCRs (n = 1 positive; n = 65 negative). No patient with a cancelled CDI-PCR required additional testing or escalation of care. When compared with the preintervention, the CDI-PCRs with pharmacist intervention demonstrated a significant increase in the sensitivity (64.7% vs. 98%; $P < 0.0001$) and decrease in specificity (66% vs. 48.3%; $P = 0.015$) with an improved NPV (91.9% vs. 99.3%; $P = 0.035$) and PPV (23.9% to 24.6%; $P = 0.869$).

Conclusion. Implementation of a pharmacist-led prospective CDI-PCR review improved PCR appropriateness and had no adverse clinical consequences although the PPV criteria remain low.

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482. Association between Socioeconomic Status Factors and Incidence of Community-Associated *Clostridium difficile* Infection Utilizing Factor Analysis—United States, 2014–2015

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Background. Traditionally a healthcare-associated infection, *Clostridium difficile* infection (CDI) is increasingly emerging in communities. Health disparities in CDI exist, but the social determinants of health that influence community-associated (CA) CDI are unknown. We used factor analysis and disparate data sources to identify area-based socioeconomic status (SES) factors associated with CA-CDI incidence.

Methods. CDC's Emerging Infections Program conducts population-based CDI surveillance in 35 US counties. A CA-CDI case is defined as a positive *C. difficile* specimen collected as an outpatient or within 3 days of hospitalization in a person aged ≥1 year without a positive test in the prior 8 weeks or an overnight stay in a healthcare facility in the prior 12 weeks. 2014–2015 CA-CDI case addresses were geocoded to a 2010 census tract (CT) and incidence rates were calculated. CT-level SES variables were obtained from the 2011–2015 American Community Survey. The Health Resources and Services Administration provided medically underserved area (MUA) designations. Exploratory factor analysis transformed 15 highly correlated SES variables into threefactors using scree plot and Kaiser criteria: "Low Income," "Foreign-born," and "High Income." To account for CT-level clustering, a negative binomial generalized linear mixed model was used to evaluate the associations of these factors and MUA with CA-CDI incidence, adjusting for age, sex, race and diagnostic test.

Results. Of 13,903 CA-CDI geocoded cases, 63% were female, 80% were white, and 36% were aged ≥65 years. Annual CA-CDI incidence was 63.4/100,000 persons. In multivariable analysis, "Low Income" (rate ratio [RR]: 1.09; 95% confidence interval [CI]: 1.05–1.13) and "High Income" (RR: 0.90; CI: 0.87–0.93) were significantly associated with CA-CDI incidence.

Conclusion. Factor analysis was instrumental in identifying key drivers of disparities among interrelated SES variables. Low-income areas were surprisingly associated with higher CA-CDI incidence, given that known CDI risk factors include increased access to healthcare. Understanding how SES factors might impact CA-CDI incidence can inform prevention strategies in low-income areas.

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483. Clinical Characteristics of Military Trauma Patients With *Clostridium difficile* Infections

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Background. *Clostridium difficile*-associated diarrhea (CDAD) is an important cause of nosocomial diarrhea with increasing morbidity, mortality, and healthcare costs. There is growing recognition that critically ill trauma patients comprise a unique at risk population. This study describes the clinical epidemiology of CDAD in military trauma patients.

Methods. Through the Trauma Infectious Disease Outcomes Study (TIDOS), patients with a diagnosis of confirmed (laboratory supported) or presumptive (diarrhea with treatment for CDAD in absence of lab confirmation) CDAD (September 2009–February 2014) were analyzed. Patient demographic, injury, and infection data were evaluated. CDAD severity was defined per 2017 IDSA guidelines.

Results. Of 2,660 patients, 19 and four patients with confirmed and presumptive CDAD, respectively, were identified with an incidence of 2.76/10,000 (95% CI: 1.75–4.15) occupied bed days. Sixteen (70%) had blast injuries, four had gunshot wounds, and threehad other injuries. Median age was 24 years (IQR 23, 31). Median injury severity score was 38 (IQR 26, 47). Severe and fulminant CDAD was diagnosed in 8 (35%) and six (26%), respectively. Patients had a median hospitalization of 12 days (IQR 9.5, 34) and threeOR visits (IQR 2, 6) prior to CDAD diagnosis. Nineteen (83%) patients were in the ICU and 17 (74%) were intubated prior to or upon diagnosis. Seventeen patients had ≥1 infection before CDAD diagnosis, largely pneumonia (47%) and skin and soft-tissue infections (47%). Most patients (96%) were on antibiotics pre-CDAD diagnosis: first generation cephalosporins (1GC; 96%), tetracyclines (87%), vancomycin (74%), carbapenems (70%), and fluoroquinolones (FQ; 57%). Five (22%) received clindamycin. Of the 2637 patients without CDAD, 91% received antimicrobials during hospitalization (86% a 1GC, 47% FQ, and 16% clindamycin). Median length of hospital stay after CDAD diagnosis was 34 days (IQR 16, 55). Treatment included only oral metronidazole in 15 patients, IV metronidazole in 2, and some combination of oral vancomycin, metronidazole, and IV metronidazole in 6. No patients died.

Conclusion. Despite high rates of antimicrobial usage in this severely injured population, CDAD was uncommon. Though CDAD was severe or fulminant in >50%, no patients died.

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

484. A Severity Score for Predicting In-Hospital Death in Patients With *Clostridium difficile* Infection: A Hospital-Based Cohort Study

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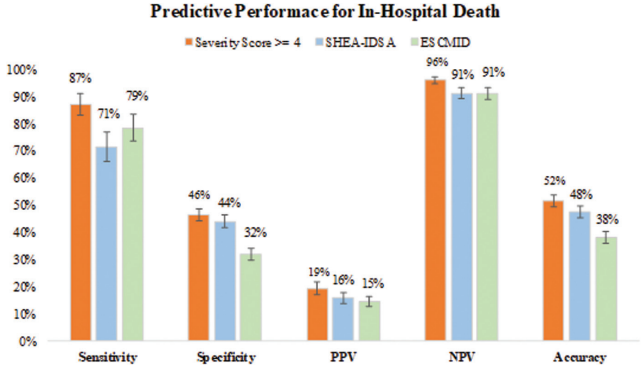
Background. Current definitions for severe *C. difficile* infection (CDI) are based on populations of Western countries. We examined the predicting performance of existing definitions in Taiwanese population and developed a new severity score.

Methods. We included adult patients who were admitted to China Medical University Hospital and had first-time positive *C. difficile* culture or toxin test during 2012–2016. The index date was the sampling date of the specimen. Data were pulled from the electronic medical records. The primary outcome was in-hospital death during the index admission. Variables that were significantly associated with in-hospital death in the bivariable analyses were included in a multivariable logistic regression model. We assigned weight for each variable using the adjusted odds ratio (aOR) and summed up the weights to obtain a severity score.

Results. Of 544 patients, median age was 71 years old and 70 patients (12.9%) died during the index admission. Patients did not differ in: gender, age, prior infection (−30 to 0 day of index date), prior admission, prior anti-peptic ulcer medication use, index (−3 to 3 days) glucose and kidney function except for blood urea nitrogen (BUN). Variables included in the multivariable model were: complicated diabetes (aOR 2.0; 0.8–5.2), malignancy (2.0; 1.1–3.7), prior use of second-generation cephalosporins (1.8; 0.9–3.7), use of loperamide (1.8; 1.0–3.4) or probiotics within −14 to 14 days (2.4; 1.0–5.5), index white blood cell count (WBC) > 15,000 cells/μL (1.9; 1.0–3.6), index serum creatinine (sCr) ≥1.5 times premorbid level (1.1; 0.6–2.1), index BUN >30 mg/dL (1.7; 0.9–3.5), and index BUN/sCr ratio > 20 (1.3; 0.7–2.5). The severity score was

significantly higher among patients who died during admission than those who survived (median 6 vs. 4). A score of ≥4 was defined as severe. The performance of severity score was better than that of SHEA-IDSA or ESCMID definition (see figure).



PPV = positive predictive value; NPV = negative predictive value.

Conclusion. Current guidelines use WBC, sCr increase, sCr, or albumin to define the severity of CDI. Our severity scoring system improved the predictive performance by adding novel indicators of comorbidities, BUN, BUN/sCr, and anti-diarrhea medications use.

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485. On- and Post-Antibiotic Effects on the Risk of Hospital-Acquired *Clostridium difficile* Infection (CDI)

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Background. *Clostridium difficile* infection (CDI) is one of the most common nosocomial infections worldwide. While exposure to antimicrobials is the most important risk factor for CDI, the magnitude of the risk from different antimicrobials has not been well quantified through big data analysis of large healthcare systems.

Methods. We conducted a retrospective cohort study of all inpatients with no recent history of CDI in the US Department of Veterans Affairs Health Care System admitted between January 1, 2008 and December 31, 2013. For patients with multiple hospitalizations, only the first hospitalization during the study period was considered. Patients were followed until the development of hospital-acquired CDI (HA-CDI), death, or discharge, whichever came first. HA-CDI was defined as a laboratory test indicating the presence of toxin or toxin genes from a stool sample collected on hospital day 4 or later. Antimicrobial exposures were assessed daily for current ("on") or recent ("post") exposures by class. The impact of time-varying antimicrobial exposure on the risk of HA-CDI was assessed using multivariable Cox proportional hazards regression models with robust covariance estimation. Patient factors, such as age and comorbidity, were included as adjustors. Only patient-days at risk for HA-CDI (i.e., day 4 or later) were included.

Results. Approximately 2.8 million patient-days from 476,679 patients were included in the analysis. Table 1 shows the impact of on- and post-antibiotic exposures by class on the risk of HA-CDI after accounting for patient factors, including concomitant antimicrobial exposures.

Conclusion. We observed risks of HA-CDI associated with cephalosporins and fluoroquinolones lower than previously reported. Tetracycline exposure appears to be protective. This big data analysis from the nationwide VA healthcare system helps to better quantify the risk of CDI during and after receiving different categories of antimicrobials. This work could better guide antimicrobial selection and antimicrobial stewardship efforts, potentially reducing the risk of CDI among patients

Class	On-Antibiotic aHR (95% CI)	Post-Antibiotic aHR (95% CI)
Carbapenems	2.0 (1.8 - 2.2)	0.77 (0.62 - 0.96)
Penicillins	1.7 (1.6 - 1.8)	1.4 (1.2 - 1.5)
Tetracyclines	0.61 (0.49 - 0.76)	0.56 (0.41 - 0.78)
1st + 2nd Gen Cephalosporins	0.51 (0.44 - 0.59)	1.0 (0.94 - 1.1)
3rd + 4th Gen Cephalosporins	1.8 (1.6 - 1.9)	1.5 (1.3 - 1.6)
Fluoroquinolones	1.1 (1.0 - 1.1)	1.3 (1.2 - 1.4)
Clindamycin	0.63 (0.52 - 0.77)	0.91 (0.76 - 1.1)

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486. Endemic Corridors: A Useful Tool for the Approach of *Clostridium difficile*: A 5-Year Epidemiologic Surveillance Program in a Teaching Hospital of a Middle-Income Country

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Background. *Clostridium difficile* infection (CDI) is a healthcare-associated infection causing morbidity, mortality, and increase in the economic burden of health. Accurate and accesible methods to predict the epidemiologic trends of CDI are scarce. The systematic collection of data contributes to the development of an endemic corridor which estimates the expected cases in a period of time, facilitating the identification of outbreaks. In Guatemala, no obligatory report is required and no national surveillance programs for CDI exist. Therefore, understanding local epidemiologic trends of CDI is important in order to make future predictions.

Methods. All consecutive primary CDI eopisodes (January 2012–December 2017) obtained from active surveillance in the surgery department were included. CDI was defined as diarrhoea and a positive stool PCR test for *C. difficile* toxin A and/or B. An endemic corridor was developed to describe trends. The geometric mean and a 95% confidence interval were used to calculate upper and lower limits of weekly incidence. Demographics, clinical characteristics, antimicrobial treatment, and outcome of CDI were analyzed.

Results. A total of 208 CDI episodes were included in the study (9 healthcare workers). The incidence of CDI cases increased from 12.85/1,000 discharges (2016) to 18.53/1,000 discharges (2017). CDI was higher among male (54.8%) adults (18–64 years; 72.23%). NAP1 strain was identified in 38% of all cases, with a constant increase from 2012 to 2017. All cases were treated according to guidelines. No recurrences or deaths occurred during the studied time period. The highest incidence of CDI was observed between epidemiologic weeks 7, 8, and 42. Eleven outbreaks were identified in the studied time period, the first and major outbreak occurred in 2013; 2015 had the most outbreaks with 4. Both 2016 and 2017 had threeoutbreaks each.

Conclusion. Owing to the active and systematic surveillance of CDI, an endemic corridor was created. This will be a useful tool to develop interventions according to the epidemiologic trends of local CDI. Prompt identification of cases and strict adherence to patient isolation and treatment guidelines resulted in null mortality rates despite the alarming increase in NAP1 strains.

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487. Severity and Clinical Outcomes of *Clostridium difficile* Infection Based on Toxin B Assay Results

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Background. *Clostridium difficile* infection (CDI) remains a major health problem in the United States. The IDSA guidelines recommend using stool toxin assay as part of a multistep algorithm rather than nucleic acid amplification test (NAAT) alone. However, the clinical significance of toxin negative tests remains a subject of debate. We performed a prospective study in our institution to describe clinical outcomes of CDI based on the results of the stool toxin assay.

Methods. Our laboratory utilizes a 2-step algorithm, using glutamate dehydrogenase plus detection of toxin B by enzyme immunoassay (EIA) arbitrated by NAAT for testing stool samples submitted for *C. difficile* testing. The study was conducted between January and December 2017. Patients diagnosed with CDI based on laboratory results were divided into two groups based on toxin B assay results. Shotgun metagenomics was performed directly on stool specimens using Illumina NextSeq in a subset of patients. Chart reviews were performed to assess clinical outcomes. Our primary outcome was incidence of severe CDI and 30-day mortality.

Results. A total of 2,823 samples were submitted to the laboratory for testing for suspected CDI. Three hundred thirty-eight samples in 290 discrete patients were considered positive using the two step algorithm. Whole genome sequencing was performed on samples from 57 patients (Figure 1). Clinical outcome data were available for 53 patients. Thirty percent were on active chemotherapy. Thirty-four patients were toxin B positive (group 1), 19 were toxin B negative (group 2) by EIA. Hospital onset disease was seen in 10 (27%) of patients in group 1 vs. 7 (37%) in group 2 ($P = 0.57$). Thirty-day mortality was 3% in toxin positive vs. 5% in toxin negative groups ($P = 0.67$). Severe CDI was seen in 14 (41%) in group 1 vs. 8 (42%) in group 2 ($P = 0.94$). NAP 1 strain was detected in 10.5% of patients in group 2. Percentage of *C. difficile* reads on sequencing in fecal samples in group 1 (0.17%) was not significantly different from group 2 (0.24%) ($P = 0.70$, Figure 2).