Table 1. Characteristics of Patients Who Were Tested for COVID-19

Characteristic	Positive Test (n=48), No. (%)	Negative Test (n=98), No. (%)	*P* Value
Age, mean y (SD)	45.9 (19.0)	46.0 (16.0)	.98
Sex, male	26 (54)	61 (62)	.37
Healthcare worker	12 (25)	19 (20)	.94
Iatrogenic immunocompromise	2 (4.4)	5 (5.1)	1
Chronic pulmonary disease (asthma, COPD, or ILD)	6 (13)	30 (31)	.02
Congestive heart failure	1 (2)	4 (4)	.57
End-stage renal disease	0 (0)	1 (1)	.99
End-stage liver disease	0 (0)	0 (0)	1
Close exposure to lab-confirmed case of COVID-19	13 (29.5)	5 (5.6)	<.01
Recent travel to major metropolitan area	33 (73)	38 (44)	<.01
Cough	42 (93)	92 (94)	.90
Fever	36 (80)	83 (86)	.33

Note. COVID-19, novel coronavirus 2019; SD, standard deviation; COPD, chronic obstructive pulmonary disease; ILD, interstitial lung disease.

determining the appropriate patients to screen has been apparent; the CDC has revised its guidance several times. This study investigates the results of testing ambulatory patients in a relatively low prevalence area in early March 2020 and suggests that exposure to the disease is more predictive of a positive test than any examined symptom.

This retrospective analysis of the initial phase of our screening for COVID-19 had several strengths. A rigorous physician review of each medical record helped ensure accurate capture of patient information. Additionally, the short study period helped limit any major local factors that could have affected the results, such as changing screening guidelines or increasing community prevalence. Furthermore, all the tests were collected, transported, and analyzed within the same internal institutional laboratory process.

This study also had several limitations. First, this was a retrospective analysis; thus, it may have suffered from selection bias affecting the participants. To help avert this bias, our negative controls were matched for sex, age, date, and state of collection. In addition, very few asymptomatic patients were screened during this time, making it difficult to assess the predictive value of fever or cough. Moreover, at the time of this study, local disease prevalence was relatively low, thereby limiting the applicability of the findings to higher prevalence areas.

Although testing for COVID-19 remains supply constrained, strategies are needed to best utilize testing resources. Identifying patient factors that are strongly associated with positive results may help to identify those patients best suited for testing. In this analysis, exposure to confirmed SARS-CoV-2 and recent travel were both significantly more predictive of a positive test than the presence of any symptoms. In the effort to contain the pandemic, there may be a role for testing patients with these risk factors regardless of symptom presence.

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Outpatient *Clostridioides difficile* infections: An opportunity for antimicrobial stewardship programs

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Approximately 34% of adult *Clostridioides difficile* infections (CDIs) are community associated, and possibly many more are underdiagnosed or underreported.[1,2] Although many health

Table 1. Outpatient *C. difficile* Infection (CDI) Therapy and Outcomes (n = 126 patients)

CDI Therapy	Patients, No. (%)	Appropriate Duration Prescribed, No. (%)	Clinical Cure, No. (%)	Recurrent CDI, No. (%)	Unanticipated Healthcare Visit, No. (%)
Metronidazole	82 (65)	74 (90.2)	60 (73.2)	20 (24.4)	8 (9.8)
Vancomycin	42 (33.4)	40 (95.2)	39 (92.9)	5 (11.9)	2 (4.8)
Other	2 (1.6)	2 (100)	1 (50)	1 (50)	0

systems have developed inpatient antimicrobial stewardship programs (ASPs) to help optimize CDI care, little information is available regarding community-associated CDIs managed in ambulatory care. Outpatient ASPs in the United States have largely focused on improving antibiotic prescribing by targeting specific conditions (eg, upper respiratory tract, otitis media, and pharyngitis) for improvement.[3,4] An opportunity exists for outpatient ASPs to optimize CDI prescribing strategies within this setting. We evaluated the management of CDI in the outpatient setting.

Methods

This study was a retrospective cross-sectional study to evaluate the management of patients diagnosed with a first episode of CDI in an ambulatory care setting between January 1, 2018, and June 30, 2019. The study was conducted at the Henry Ford Health System, which comprises >40 ambulatory medical centers located in southeastern and south-central Michigan. Clinics were categorized as primary care or specialty clinics. Specialty clinics included visits to a nonprimary care, medicine subspecialty clinic (eg, gastroenterology). Patients included were 18 years or older; they had a clinical diagnosis of *C. difficile* infection; and treatment had been initiated by the ambulatory clinic. Exclusion criteria were patients with severe CDI,[5] fulminant CDI,[5] immunocompromised patients, or patients who had undergone a fecal microbiota transplant. Immunocompromised was defined as acquired immunodeficiency virus, solid organ transplant, hematopoietic stem cell transplant, leukopenia/neutropenia, immunosuppressant drugs, inflammatory bowel disease, or prednisone ≥20 mg/day for >2 weeks. Clinical diagnosis was defined as patients with ≥3 stools reported in 24 hours and a positive CDI test using a 2-step algorithm performed by the health system's core clinical microbiology laboratory.[5] Before patients were included, 3 pharmacy residents were trained and validated on data extraction, and they performed manual chart review to ascertain prescriber documentation of ≥3 stools in 24 hours. Demographic and clinical data were recorded, including age, sex, prior antibiotic exposure, CDI drug regimen and duration, clinical response, recurrent CDI within 14–60 days, and unanticipated emergency department or urgent care visits within 14 days after treatment initiation. Prior antibiotic exposure was defined as any systemic antibiotics within the previous 60 days. Clinical response was defined as symptom improvement or resolution and the absence of subsequent healthcare treatment within 14 days of treatment initiation (ie, telephone consultation for physician, revisit to physician). Appropriate management was defined as vancomycin 125 mg by mouth every 6 hours for 10–14 days per national practice guidelines.[5] Metronidazole 500 mg by mouth every 8 hours for 10–14 days was considered appropriate if medical record documentation specified that it had been prescribed as an alternative for cost, allergy, or limited resource availability. Data were analyzed using descriptive statistics: incidence, proportions, measures of central tendency, and dispersion. Our institution review board approved this study.

Results

We identified 126 patients with CDI diagnosed in an ambulatory clinic. Their median age was 58 years (IQR, 46–69) and 73% were women. The clinic most frequently visited was internal medicine (n = 50 patients, 39.7%), followed by specialty (n = 46 patients, 36.5%), family medicine (n = 24 patients, 19%), and walk-in (n = 6 patients, 4.8%). Furthermore, 49 patients (38.9%) had documented prior antibiotic exposure within 60 days, and the most common were amoxicillin/clavulanate (n = 16 patients, 32.6%), clindamycin (n = 7 patients, 14.2%), and ciprofloxacin (n = 6 patients, 12.2%). Table 1 provides a summary of CDI treatment and outcomes. Metronidazole (n = 82 patients, 65%) was prescribed most often for CDI treatment, followed by vancomycin (n = 42 patients, 33.4%). Also, 2 patients (1.6%) received regimens of either ciprofloxacin or ciprofloxacin and metronidazole for treatment. Overall, 37 patients (29.3%) were prescribed the appropriate antimicrobial therapy and duration. One patient had a documented cost barrier to receiving vancomycin therapy in their medical record. Among the subgroup of patients diagnosed with CDI in 2019, 13 of 33 (39%) were prescribed vancomycin.

Moreover, 26 patients (20.6%) experienced clinical treatment failure. Clinical response occurred in 34 of 37 patients (91.9%) who received appropriate treatment and in 66 of 89 patients (74.2%) who did not ($P = .025$). Also, 10 patients (8%) had unanticipated emergency department or urgent care visits within 14 days, and 26 patients (20.6%) experienced recurrent CDI. The average time to recurrence was 30 days.

Discussion

We report a high proportion of suboptimal CDI management in ambulatory care clinics. Metronidazole was the most commonly prescribed regimen; it was associated with a 73% clinical response. Not surprisingly, vancomycin resulted in superior outcomes with a 92.9% clinical response. Overall, these prescribing patterns resulted in preventable poor outcomes: 20.6% of patients experienced clinical treatment failure, 8% required revisit to the ED or clinic, and 21% experienced recurrent CDI.

This study had several limitations. We included patients diagnosed as early as January 2018. The system ASP maintains CDI guidelines, which were revised in early January 2018, consistent with national guidelines.[5] However, we did not observe any evidence of improved prescribing for patients treated in 2019, 1 year after the guideline change. Among patients treated in the first 3 months of 2018, 8 received vancomycin and 18 received metronidazole, consistent with the overall cross-section (40 of 126, 32% prescribed vancomycin). Notably, 61.1% of patients had no documented recent antibiotic exposure. The assessment of prior antibiotic exposure was limited to chart documentation and accessible insurance claims, and the 38.9% rate observed is likely an underestimate. Additionally, metronidazole was defined as inappropriate if chart documentation

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did not mention the rationale for alternative therapy, and this approach may overestimate inappropriate prescribing. This study was observational and retrospective in nature, but it provides useful insight on ambulatory CDI management. We hypothesize that ambulatory care providers are unfamiliar with the updated recommendation to prescribe oral vancomycin first. E-mail newsletter education regarding the revised guidelines was provided to inpatient and outpatient prescribers in the health system in early 2018, but it appears to have been ineffective to communicate this practice change.

Ambulatory CDI treatment may represent a missed opportunity for institutional ASPs to minimize associated morbidity. A focused effort is needed to improve the quality of CDI management in outpatient setting.

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Influenza vaccination medical waivers among healthcare workers at an academic health system

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Despite being a condition for ongoing employment, a smaller proportion of employees at the University of Wisconsin Hospitals and Clinics (UWHC) receive the annual influenza vaccine than at other large academic institutions.[1] This difference can be attributed to relatively high rates of personal conviction waiver and medical waiver submission among healthcare personnel (HCP). According to the Advisory Committee on Immunization Practices (ACIP), the only absolute medical contraindication to the influenza vaccine is a personal history of severe allergic reaction to any influenza vaccine components or the vaccine itself.[2] For the 2019–2020 influenza season, Employee Health Services (EHS) staff reviewed all medical waivers pertaining to the influenza vaccine, implemented ACIP-compliant standards for approval of new medical waivers, and provided HCP specific education pertaining to vaccine safety. The impacts of such measures on the annual influenza vaccination rate at UWHC were then evaluated.

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Methods

Medical waivers for the influenza vaccine were categorized according to the reason for requesting a medical exemption following the 2018–2019 and 2019–2020 seasons. A nurse practitioner or physician informed employees having prior medical waivers who were not in compliance with ACIP recommendations by telephone that they were required to submit a revised medical waiver, to receive the influenza vaccine, or to complete a personal conviction waiver for the 2019–2020 influenza season. In many cases, the employee also received an e-mail message from EHS with information about the safety of the influenza vaccine for specific populations. The primary outcome was the overall influenza vaccine compliance rate for employees at UWHC, and the secondary outcome was the change in vaccination rate of employees with previous medical waivers in 2019–2020 compared with 2018–2019.

Results

Of the 131 employees with a prior medical waiver on file, EHS approved 35 medical exemptions (27%) based on the updated ACIP guidelines. Of the remaining 96 employees, 14 were no longer employees of UWHC and 82 were required to take action to remain compliant with the seasonal influenza vaccination requirement (Table 1). Only 19 of the 82 individuals (23.1%)

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