Evaluation of a 2-Step Testing Algorithm for *Clostridioides difficile* Infection

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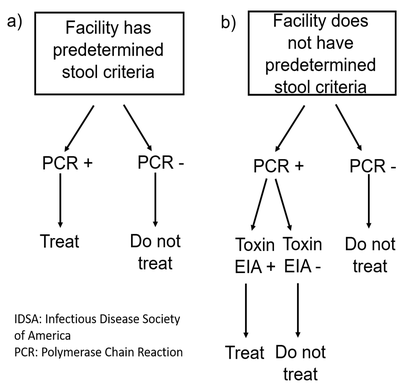
INTRODUCTION

- *Clostridioides difficile* infection (CDI) is a common health-care associated infection; causes significant morbidity and mortality; and contributes billions of dollars in healthcare costs annually.
- The Infectious Diseases Society of America (IDSA) recommends either of two testing algorithms (Figure 1) to limit over-diagnosis.
- The Antimicrobial Stewardship Program (ASP) at Brooke Army Medical Center implemented a 2-step CDI algorithm in August 2018 in an effort to improve clinical diagnosis of CDI and reduce unnecessary antibiotic treatment.
- Following implementation, we aimed to evaluate our intervention through treatment rates of CDI and assess for any clinical data that may drive treatment decisions.

Recommended predetermined criteria for testing stool for *C. difficile*

1. Patient is not receiving laxatives.
2. Symptoms are new in onset.
3. Patient has ≥ 3 unformed stools in a day.
4. There is no other explanation for symptoms.

Figure 1: IDSA Guideline Based *Clostridioides difficile* Testing a) One step b) Two step



IDSA: Infectious Disease Society of America
PCR: Polymerase Chain Reaction

METHODS

- PCR+ tests from August 2018 to September 2019 were included.
- Charts were reviewed for demographics, laboratory data, treatment, and clinical outcomes.
- Cases were grouped based on concordant (PCR+/EIA+) or discordant (PCR+/EIA-) results.
- A subgroup analysis of treated vs untreated discordant cases was performed to examine factors contributing to the decision to treat.
- Groups were compared by Chi-squared, Fisher's exact, or Mann-Whitney U tests.

RESULTS

- 216 PCR+ tests from 215 patients were recorded
  - 155 (71.8%) were discordant.
- Characteristics and outcomes of patients with concordant and discordant tests are listed in Table 1.
- Characteristics of discordant cases were similar among treated and untreated groups (Table 2.)
- A high proportion of discordant cases received treatment even when Infectious Disease (73.9%) or Gastroenterology (61.1%) were consulted.

Table 1: Characteristics and outcomes of patients with concordant and discordant tests.

	PCR+/EIA+ (n=61)	PCR+/EIA- (n=155)	P-Value
Gender, male	27 (44.3%)	79 (51%)	0.49
Median age (years)	60 (43-75)	55 (27-71)	0.08
Median WBC (10^3 cells/mL) (n=139)	11.3 (6.74-15.6) (n=48)	8.66 (5.76-12.5) (n=91)	0.13
Median serum albumin (g/dL) (n=120)	3.6 (3-4.1) (n=44)	3.6 (3.1-4.1) (n=76)	0.70
Median serum creatinine (mg/dL) (n=141)	0.85 (0.67-1.0) (n=50)	0.89 (0.66-1.25) (n=91)	0.29
Antibiotic use within 30 days (n=203)	36 (60.0%) (n=60)	71 (49.7%) (n=143)	0.18
Laxative use (n=205)	6 (10.3%) (n=58)	23 (15.6%) (n=147)	0.33
Median daily stool count (n=147)	5 (4-7) (n=42)	4 (2-6) (n=105)	0.03
Hospitalized	36 (59.0%)	68 (43.9%)	0.05
History of CDI	8 (13.1%)	19 (12.3%)	0.86
Severe CDI (n=139)	16 (33.3%) (n=48)	17 (18.7%) (n=91)	0.05
Treated for CDI	58 (95.1%)	103 (66.5%)	<0.01
Median length of stay (days) (n=104)	6 (4-11) (n=36)	9 (3.75-18.3) (n=68)	0.3
Mortality at 30 days (n=200)	3 (5.3%) (n=57)	6 (4.2%) (n=143)	0.74
Readmission for CDI at 30 days (n=214)	5 (8.3%) (n=60)	2 (1.3%) (n=154)	0.02

CDI, *Clostridioides difficile* infection; PCR+/EIA+, concordant tests; PCR+/EIA-, discordant tests; WBC, white blood cell count; All data expressed as number (%) or median (IQR)

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Table 2. Characteristics and outcomes of treated and untreated patients with discordant tests.

	Treated (n=103)	Untreated (n=52)	P-Value
Gender, male	50 (48.5%)	29 (55.8%)	0.40
Median age (years)	56 (27.5-71)	51 (26-69.5)	0.71
Median WBC (10^3 cells/mL) (n=91)	9.68 (6.32-13.2) (n=62)	7.61 (5.76-11.1) (n=29)	0.28
Median serum albumin (g/dL) (n=76)	3.6 (3-4.1) (n=45)	3.6 (3.25-4.1) (n=31)	0.76
Median serum creatinine (mg/dL) (n=91)	0.95 (0.68-1.42) (n=59)	0.84 (0.62-1.06) (n=32)	0.09
Antibiotic use within 30 days (n=143)	45 (48.9%) (n=92)	26 (51.0%) (n=51)	0.81
Laxative use (n=147)	16 (16.2%) (n=48)	7 (14.6%) (n=99)	0.81
Median daily stool count (n=105)	4 (3-7) (n=68)	3 (1-5) (n=37)	0.02
History of CDI (n=154)	12 (11.7%) (n=103)	8 (15.7%) (n=51)	0.60
Severe CDI (n=91)	14 (23.3%) (n=60)	3 (9.7%) (n=31)	0.16
Hospitalized	46 (44.7%)	22 (42.3%)	0.78
Gastroenterology consulted	33 (32.0%)	21 (40.4%)	0.30
Infectious disease consulted	17 (16.5%)	6 (11.5%)	0.48
Median length of stay (days) (n=69)	10 (4.5-25) (n=47)	6 (3.5-12.5) (n=22)	0.23
Mortality at 30 days (n=143)	3 (3.2%)(n=94)	3 (6.1%) (n=49)	0.67
Readmission for CDI at 30 days (n=154)	2 (2.0%) (n=102)	0 (0%) (n=52)	0.55

CDI, *Clostridioides difficile* infection, WBC, white blood cell count; All data expressed as number (%) or median (IQR); All data expressed as number (%) or median (IQR)

CONCLUSIONS

- Implementation of a 2-step CDI strategy reduced antibiotic treatment by nearly 30% in discordant cases.
- Concordant cases were more frequently observed in sicker patients and had a higher incidence of CDI-related readmission.
- The majority of discordant cases were deemed clinically significant and received treatment, even with expert consultation.
- There were no significant differences among discordant cases in risk factors for CDI, laboratory data, or severity of CDI that may have accounted for treatment decisions.
- We are continuing to refine our CDI diagnosis strategy.
- Further studies are needed to determine the unmeasured factors that guide treatment decisions in discordant cases.