	Historical N=30,621		Intervention-1 N=31,299		Intervention-2 N=31,960	
	Rate		Rate	P-value	Rate	P-value
C. diff orders (per 10,000 patient days)	131.3		86.6	<0.001	98.9	<0.001
C. diff infections (per 10,000 patient days)	16.7		13.4	0.30	14.1	0.40

Disclosures. All authors: No reported disclosures.

2345. Reduction in Testing and Change in Testing Algorithm Associated with Decrease in Number of Nosocomial *Clostridium difficile* Infections

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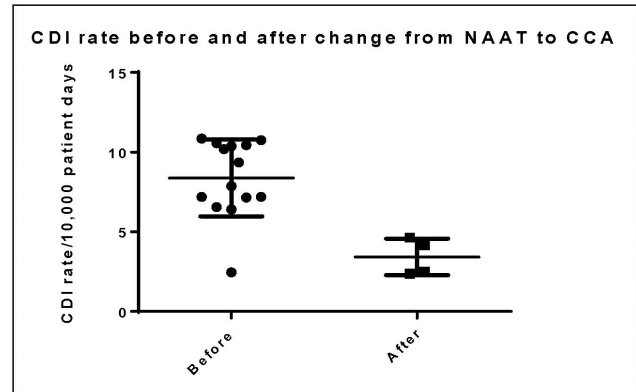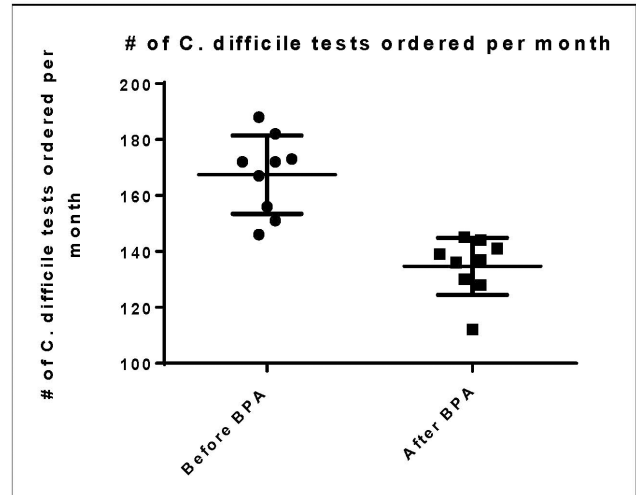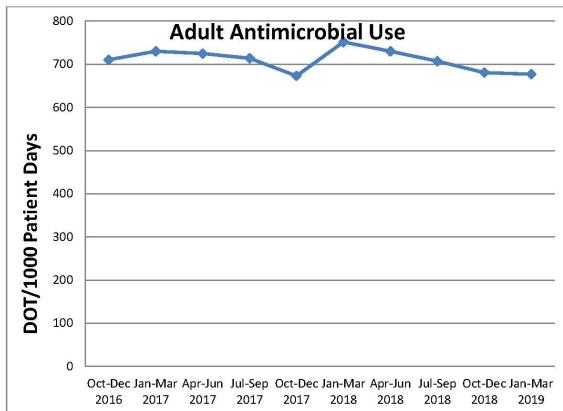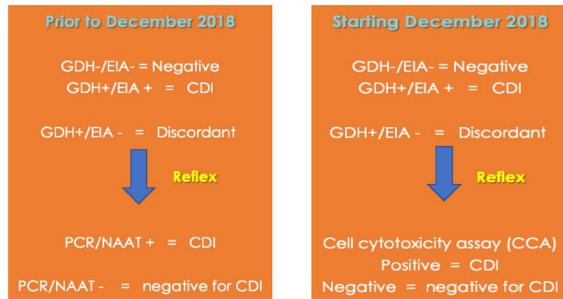**Session:** 249. HAI: *C. difficile* - Diagnostic Stewardship
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Background. Previous data at our facility indicated 37% of patients with *Clostridium difficile* infection (CDI) were receiving at least one laxative at the time of testing, suggesting the possibility of false-positive results. Nucleic acid amplification testing (NAAT) does not distinguish between colonization and infection with *C. difficile*. We implemented two interventions to address these issues and evaluated our rates of nosocomial CDI before and after these changes.

Methods. This was a retrospective study of all positive test results for adult patients with nosocomial *C. difficile* from October 1, 2017 through March 31, 2019 at Vidant Medical Center, a 911-bed hospital. In June, 2018, we implemented a best practice advisory (BPA) in our electronic health record to recommend against testing for CDI in patients receiving laxatives. We reviewed the number of *C. difficile* tests ordered before and after initiating the BPA. In December, 2018, we removed NAAT and replaced it with a cell cytotoxicity assay (CCA) for specimens that were enzyme immunoassay (EIA) negative and glutamate dehydrogenase (GDH) positive. Antimicrobial use was measured in days of therapy (DOT) per 10,000 patient-days (PD). Mann–Whitney *U* test was used for continuous variables. Linear regression was used to monitor antimicrobial use.

Results. The number of *C. difficile* tests ordered per month decreased 19.5% after implementing the BPA ($P < 0.0001$). There was a 44% reduction in the number of EIA+/GDH+ specimens per month after the BPA intervention ($P = 0.003$). Following substitution of CCA for NAAT on EIA-/GDH+ specimens, there was a 61% reduction in the rate of nosocomial CDI (8.6 cases/10,000 PD to 3.3 cases/10,000 PD; $P = 0.005$). Total antimicrobial use was unchanged over the course of the study (673 to 677 DOT/10,000 PD). Carbapenem use decreased 56% ($P = 0.009$); cefepime use increased 85% ($p = 0.002$); quinolone and clindamycin use were unchanged.

Conclusion. Laxative use in hospitalized patients is common and likely contributes to a false elevation in the CDI rate by identifying carriers in addition to those who have true infection. Implementing a BPA to reduce inappropriate testing and changing our testing algorithm for *Clostridium difficile* by substituting CCA for NAAT has resulted in a lower rate of nosocomial CDI.

Prior to December 2018

GDH-/EIA- = Negative
GDH+/EIA + = CDI

GDH+/EIA - = Discordant
↓ Reflex
PCR/NAAT + = CDI
PCR/NAAT - = negative for CDI

Starting December 2018

GDH-/EIA- = Negative
GDH+/EIA + = CDI

GDH+/EIA - = Discordant
↓ Reflex
Cell cytotoxicity assay (CCA)
Positive = CDI
Negative = negative for CDI

Adult Antimicrobial Use

# of C. difficile tests ordered per month

CDI rate before and after change from NAAT to CCA

Disclosures. All authors: No reported disclosures.

2346. Cost Savings Associated with Implementation of Clinical Decision Support for *Clostridioides difficile* Testing

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Background. Clinical decision support for *Clostridioides difficile* infection (CDI) diagnostics reduces inappropriate testing, leading to decreased need for isolation and antibiotic use. Our institution utilized manual discontinuation by laboratory staff of CDI testing for inappropriate specimens, including formed stool and age < 1 year. We aimed to assess the financial impact of instituting a CDI best practice alert at a quaternary care children's hospital.

Methods. A multidisciplinary team mapped inappropriate testing criteria identified from literature review with discrete fields in our electronic health record (EHR, EpicCare) to design an alert. The exclusion criteria identified included: (1) age < 1 year; (2) positive *C. difficile* test within past 14 days; (3) less than or equal to 3 unformed stools in past 24 hours; (4) current receipt of CDI-directed therapy; or (5) laxative use or barium exposure in prior 48 hours. 6 months of data prior to implementation were reviewed to estimate impact of the alert. At implementation, any exclusion criteria detected in the EHR at the time of order entry triggered an alert to deter CDI testing. Cost estimates for averted tests (Quick Check Complete Assay/Illumigene) included cost of test ($50), cost of isolation/personal protective equipment ($159/day), and cost of treatment with oral vancomycin in false-positives ($2250/treatment course).

Results. In a 6-month pre-implementation period, 586 tests for CDI were ordered; of which, 23% were identified by our criteria as inappropriate. During the first 3 months of alert implementation, 256 tests were ordered, of which 105 (41%) caused the alert to fire. Of those, 56 tests were not ordered, for a 22% reduction in testing. Laboratory staff continued to manually stop tests not meeting criteria, such as patient age <1 year when possible. Based on avoidance of testing, use of PPE, and 10 day antibiotic treatment for false-positives (assumed 25% by literature review), this translated to cost savings of $69,916, and an annual cost savings of $279,664.

Conclusion. Implementation of an alert for select patients using a bioinformatics algorithm reduced inappropriate CDI testing. Clinical decision support for CDI can lead to substantial cost savings for both antibiotic use and isolation precautions.

Disclosures. All authors: No reported disclosures.

2347. Impact of Multidisciplinary Review of *Clostridioides difficile* Testing

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Background. Minimizing *Clostridioides difficile* infections (CDI) is an important patient safety goal due to significant cost and disease burden with CDI causing 15,000 deaths annually in the United States. Diagnosis of CDI is complicated when DNA amplification assay will return positive for both colonization and active infection of *C. difficile*, so testing clinically symptomatic patients with at least 3 loose stools per day is paramount to obtaining accurate reporting rates and starting proper treatment for CDI.

Methods. Due to economic considerations, the study was a single-center retrospective review of inpatients ≥ 18 years old who had *C. difficile* tests ordered from November 2017 to February 2019. Baseline characteristics collected include age, sex, white blood cell (WBC) count, fever, past *C. difficile* infections, recent antibiotic use, recent laxative use, and tube feeding status. Data were analyzed using descriptive statistics. The primary objective of this study was to look at the appropriateness of *C. difficile* tests pre and post-implementation of multidisciplinary review. Criteria for appropriateness of testing included 3 or more loose stools in addition to one additional factor including fever, elevated WBCs, immunocompromised status, or severe sepsis/septic shock. Secondary objectives include evaluating hospital-onset CDI rates and cost analysis.

Results. Baseline characteristics were similar between the two groups with the exception of statistically fewer patients with 3 or more liquid stools found in the post-implementation group ($P = 0.0003$). After implementation of a multidisciplinary review, the number of *C. difficile* tests ran significantly declined from 79% to 56% ($P = 0.0001$). The number of negative tests also were significantly reduced from 60% to 43% ($P = 0.0001$), with patients who had less than 3 stools per day being tested less frequently in the post-implementation group. Inappropriate test avoidance resulted in an annual savings of $1,550 in testing supplies alone, not including isolation or labor costs. There was no significant difference in hospital-onset CDI.

Conclusion. Implementation of a multidisciplinary review of *C. difficile* testing avoids clinically inappropriate tests and results in cost savings with no effect on incidence of hospital-onset CDI.

Disclosures. All authors: No reported disclosures.

2348. Incorporating Electronic Medical Record Hard Stops to Reduce Inappropriate *Clostridioides difficile* Testing at an Academic Medical Center: A Quality Improvement Study

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Background. *Clostridioides difficile* is the most common pathogen causing healthcare-associated infections. This study highlights the multi-disciplinary efforts to reduce *C. difficile* infections (CDI) at a large, tertiary care teaching facility.

Methods. A quality improvement study was performed between March 2017 and April 2018, using six Plan-Do-Study-Act cycles that included transmission prevention, diagnostic stewardship, education, and antimicrobial stewardship. Process measures included hand hygiene, isolation precautions, low-level disinfection compliance, number of tests ordered, lab cancelation of tests, and compliance with the Electronic Medical Record (EMR) hard stop for patients with laxative use, and negative C.difficile test in the past 7 days.

Results. A total of 2,046 *C. difficile* tests were ordered during the initiative. Of the 124 patients with a positive *C. difficile* LabID event, 50% were male with a median age of 65 years (range: 11–92 years). A 53% reduction in *C. difficile* LabID events (7.5 to 4 events per 10,000 patient-days, $P < 0.001$), with a pronounced decrease between cycle 4 and 5 (5.4 to 2.9 events per 10,000 patient-days, $P < 0.001$) was achieved. The largest decrease in *C. difficile* lab tests ordered was seen after implementation of the EMR hard-stop (cycle 5), with fewer than 0.5 LabID events per 1,000 patient-days for each subsequent month after EMR hard-stop implementation. Frequent reasons for physician phone calls to Infection prevention department was related to chronic use of lactulose in patients with cirrhosis (30%) and unexplained diarrhea (70%). Based on provider feedback, EMR changes were made to remove lactulose from the hard-stop and offer infectious disease consultation upfront. There was 99% compliance with electronic medical record hard stop. There was a nonsignificant increase in lab cancelations due to inappropriate stool specimens over time (1.9% to 3.1% from cycle 1 to 6, $P = 0.28$) A 55% reduction in hospital-onset CDI surveillance events (from 6.9 to 3.2 per 10,000 patient-days, $P < 0.001$) was noted.

Conclusion. A multi-disciplinary Quality Improvement initiative is a successful strategy in reducing CDI events, with the largest decrease seen with introduction of EMR hard stops.

Table 1. Interventions to decrease hospital-acquired CDI and LabID events

Cycle number	Start date	Interventions
0	1/2015	Use an FDA-approved bleach disinfectant for environmental cleaning of all patient rooms Use ultraviolet disinfection for terminal cleaning of all patient rooms and equipment where contact isolation was ordered Change EMR *C. difficile* order with requirement for testing indication[1]
1	3/2017	Form interprofessional *C. difficile* QI team Determine consensus on evidence-based *C. difficile* practices
2	4/2017	Implement educational program for physicians, nurses, and TGH laboratory staff Empiric placement of any patient having a *C. difficile* EMR order placed on contact isolation precautions Change testing from PCR technique to two-step process[2] Implement a process for TGH lab staff to reject stool specimens that are not Bristol type 6 or 7 (i.e., stool that takes the shape of the specimen container)
3	5/2017	Implement new EMR hard-stop alert for use of high-risk antibiotics[3] that require a documented indication
4	6/2017	Review of all C. difficile orders by IP team
5	9/2017	Institute standardized EMR *C. difficile* order with a hard-stop alert that requires responses to 5 questions[4]
6	2/2018	Maximum duration for all high-risk antibiotics[3] set to 14 days in the EMR

[1] EMR indications for C. *difficile* testing included the following options: 1) ≥3 loose stools per day, for ≥1 day, and no laxative use for the past 48 hours; 2) Age <1 year with Hirschsprung disease or other severe motility disorder; 3) Other.
[2] The two-step process entails initial testing for *C. difficile* glutamate dehydrogenase (GDH) and toxin, which is arbitrated by NAAT testing for the *C. difficile* toxin producing gene.
[3] High-risk antibiotics considered include ceftriaxone, moxifloxacin, ciprofloxacin, levofloxacin.
[4] 5 questions are: 1) indication for *C. difficile* toxin PCR testing; 2) presence of clinically significant diarrhea (a minimum of one day with the presence of three or more loose stools per day and no history of laxative exposure within the previous two days); 3) laxative administration within the previous two days; 4) presence of a negative *C. difficile* test in the previous seven days; and 5) presence of a positive C. *difficile* test in the past 30 days. EMR hard-stop occurs if question 3, 4, or 5 have a "yes" response.

Figure 1. Key driver diagram
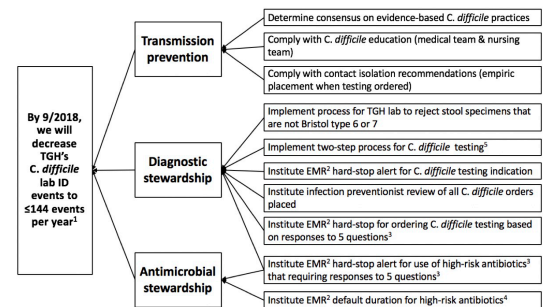
[1]This represents a 20% decrease from our baseline rate of 193 *C. difficile* lab ID events per year
[2] EMR: Electronic medical record
[3] 5 questions are: 1) indication for *C. difficile* toxin PCR testing; 2) presence of clinically significant diarrhea (a minimum of one day with the presence of three or more loose stools per day and no history of laxative exposure within the previous two days); 3) laxative administration within the previous two days; 4) presence of a negative *C.difficile* test in the previous seven days; and 5) presence of a positive *C.difficile* test in the past 30 days. EMR hard-stop goes into effect if a "yes" response for questions 3, 4, or 5.
[4] High risk antibiotics include ceftriaxone, moxifloxacin, ciprofloxacin, levofloxacin.
[5] Two step process for C. difficile testing: GDH and toxin, arbitrated by NAAT testing for C. difficile toxin producing gene

Figure 2. Statistical process control u-chart for *C. difficile* LabID events for PDSA cycles 0-6 (Table 1; cycle number denoted in white boxes) that demonstrates the following special causes of variation when applying the "Eight Nelson Rules" for control chart interpretation(18): one point beyond three standard errors (October 2017; cycle 5); two of three consecutive points between two and three standard errors on either side of the center line (September 2017-April 2018; cycles 5-6); four of five consecutive points on either side of the center line beyond one standard error from the center line (September 2017-April 2018; cycles 5-6); and eight consecutive points on either or both sides of the center line with none within one standard error of the center line (September 2017-April 2018; cycles 5-6).Please refer to Table 1 for details on each cycle.