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Impact of Two-Step Testing on the Diagnosis and Management of *Clostridium difficile* in a Multi-Hospital Healthcare System

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Abstract

Background: Distinguishing active *C. difficile* infection (CDI) from asymptomatic colonization remains a significant challenge. A multi-step testing algorithm can improve the diagnostic accuracy of CDI and associated antibacterial prescribing. This study evaluated the impact of two-step testing on CDI rates and management in a multi-hospital community health system.

Methods: Two-step *C. difficile* testing (PCR for initial screening followed by EIA for toxin detection) was implemented in 6 acute care community hospitals in April 2018. EIA testing was automatically performed on all stool samples with a positive *C. difficile* PCR result. Prior to implementation, PCR alone was used to identify CDI. Messaging attached to the PCR laboratory report alerted prescribers of discrepant results (PCR +/EIA -). Anti-*C. difficile* therapy was at the discretion of the prescriber.

We performed a retrospective cohort analysis over a 2 year period to evaluate the effect of two step testing on system-wide hospital onset CDI (HO-CDI) per 10,000 patient days (PD) and anti-CDI antimicrobial use (AU) in days of therapy (DOT) per 1,000 PD. Segmented negative binomial regression with hospital clustering was used to estimate predicted HO-CDI rate for the baseline period between April 1, 2017 through March 31, 2018 and the post-intervention between May 1, 2018 through March 31, 2019. The implementation date at all sites in April 2018 was unknown, therefore this month was removed from the analysis. Anti-CDI agents included fidaxomicin, metronidazole and oral vancomycin, but may have included non-CDI indications for metronidazole.

Results: A total of 115 HO-CDI cases were identified; 91 (79%) before and 24 (21%) after. Prior to implementation of two-step testing, CDI rates declined at 4% per month (p=NS). The rate immediately dropped by 36% (p=0.004) after two-step testing was implemented, but the trend did not significantly change (p=0.52, Figure 1). Community onset CDI rates also decreased during this time period. Combined facility-wide anti-CDI agent use was 824.87 before and 838.21 DOT/1,000 PD after and did not significantly change.

Conclusion: Use of a two-step approach for CDI testing reduced HO-CDI rates, but did not have a significant impact on anti-CDI antibiotic use in a multi-hospital community health system.

Background

- Distinguishing active *C. difficile* infection (CDI) from asymptomatic colonization remains a significant challenge.
- A multi-step testing algorithm can improve the diagnostic accuracy of CDI and associated antibacterial prescribing.
- This study evaluated the impact of two-step testing on CDI rates and management in a multi-hospital community health system.

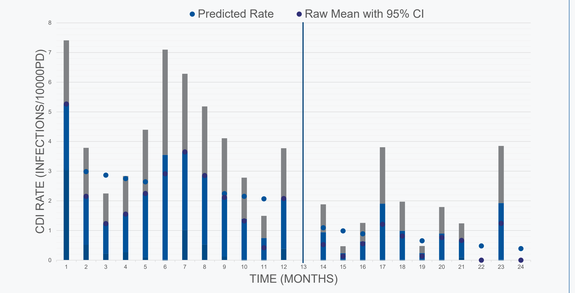
Methods

- Retrospective cohort analysis over a 2 year period to evaluate the effect of two-step testing on system-wide hospital onset CDI (HO-CDI) per 10,000 patient days (PD) and anti-CDI antimicrobial use (AU) in days of therapy (DOT) per 1,000 PD.
- Two-step *C. difficile* testing (PCR for initial screening followed by EIA for toxin detection) was implemented in 6 acute care community hospitals in April 2018.
  - EIA testing was automatically performed on all stool samples with a positive C. difficile PCR result.
  - Messaging attached to the PCR laboratory report alerted prescribers of discrepant results (PCR +/EIA -).
- Prior to implementation, PCR alone was used to identify CDI.
- Anti-*C. difficile* therapy was at the discretion of the prescriber.
  - Anti-CDI agents included fidaxomicin, metronidazole and oral vancomycin, but may have included non-CDI indications for metronidazole.
- Segmented negative binomial regression with hospital clustering was used to estimate predicted HO-CDI rate for the baseline period between April 1, 2017 through March 31, 2018 and the post-intervention between May 1, 2018 through March 31, 2019.
  - The precise implementation date at all sites in April 2018 was unknown, therefore this month was removed from the analysis.

Results

- A total of 115 HO-CDI cases were identified; 91 (79%) before and 24 (21%) after two-step testing implementation.
- Prior to implementation of two-step testing, CDI rates declined at 4% per month (p=NS). The rate immediately dropped by 36% (p=0.004) after two-step testing was implemented, but the trend did not significantly change (p=0.52, Figure 1).
- Community onset CDI rates also decreased during this time period.
- Combined facility-wide anti-CDI agent use was 824.87 before and 838.21 DOT/1,000 PD after and did not significantly change (Figure 2).

Figure 1. Predicted *C. difficile* Infection Rate



LABEL	MEAN ESTIMATE	CONFIDENCE LIMITS		P VALUE
TREND BEFORE INTERVENTION	0.96	0.8759	1.0522	0.3832
IMMEDIATE CHANGE IN APRIL 2018	0.6356	0.4673	0.8646	0.0039
CHANGE IN TREND AFTER INTERVENTION	0.9398	0.7763	1.1378	0.5245
TREND AFTER INTERVENTION	0.9023	0.8155	0.9983	0.0463

Figure 2. PHC Facility-wide CDI Agent Use (System)

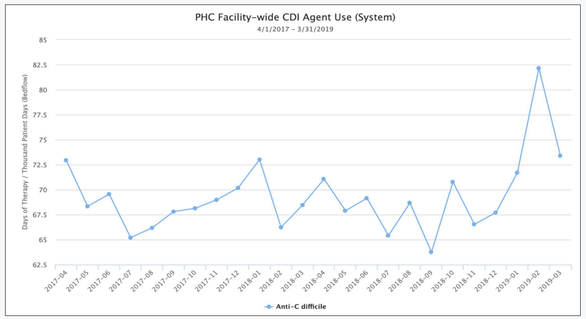


Figure 3. Example of EPIC *C. difficile* Reporting

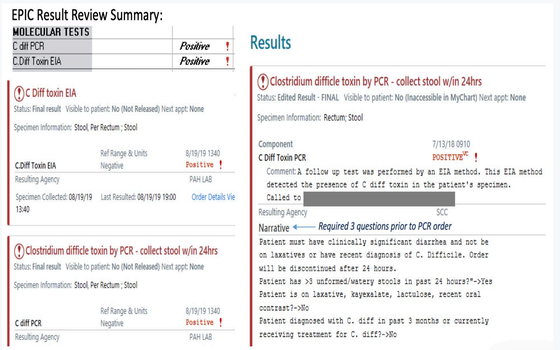
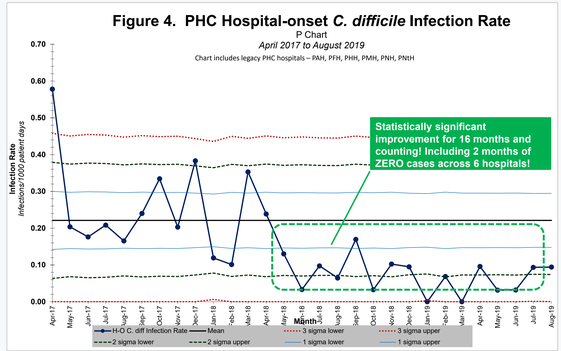


Figure 4. PHC Hospital-onset *C. difficile* Infection Rate



Conclusions

- Use of a two-step approach for CDI testing reduced HO-CDI rates, but did not have a significant impact on anti-CDI antibiotic use in a multi-hospital community health system.
- Further evaluation of CDI agent utilization trends is warranted.

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