

Impact of Stool Testing at Lehigh Valley Health Network with the Implementation of a New Comprehensive Stool PCR Test

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Impact of Stool Testing at Lehigh Valley Health Network with the Implementation of a New Comprehensive Stool PCR Test

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BACKGROUND / INTRODUCTION

The diagnosis and management of inpatients with diarrhea can be complex. Multiple tests are necessary to make a diagnosis and often tests are ordered sequentially and may be performed in different laboratories. Molecular polymerase chain reaction (PCR) stool testing is a new method of pathogen identification that has an improved detection rate over conventional testing with a faster turn-around time. Health Network Laboratories implemented the FilmArray molecular stool PCR test for inpatients hospitalized at Lehigh Valley Health Network's Cedar Crest and Muhlenberg campuses on January 5th, 2015, while concurrently discontinuing other routine stool tests.

OBJECTIVES

The purpose of the study is to see if the implementation of a new comprehensive stool PCR test has changed inpatient stool testing orders at LVHN Cedar Crest campus by evaluating:

1. If there is a difference in the total number of stool tests performed in the pre-intervention versus the intervention period
2. If there is a difference in the number of stool testing performed per patient in the pre-intervention versus the intervention period, such as duplicates or repeat testing;
3. If there is a difference in the number of *C. difficile* PCR testing performed in the pre-intervention versus the intervention period;
4. If there is a difference in gastrointestinal pathogens identified in the pre-intervention versus the intervention period, and are any co-detections identified.

METHODS

- A total of 4,505 patients from Lehigh Valley Cedar Crest (CC) and Muhlenberg (MHC) campuses underwent stool sampling and met the predefined study inclusion criteria.
 - 2,202 patients from January 1st 2014 to December 31st 2014, prior to the institution of the comprehensive stool PCR test.
 - 2,303 patients from January 5th 2015 to December 31st 2015, during the institution of the stool PCR test.
- Patients were identified from stool culture results provided by the microbiology laboratory and compiled into a spreadsheet.
- Patients were ordered numerically by medical record number and culture results were organized according to the dates they were reported and analyzed for quantity, positive and negative cultures, identification of pathogens, repeat and redundant testing, and co-detection.
- All variables were compared and analyzed using basic statistical tests.

RESULTS

Table 1: Introduction of Stool PCR Test Outcomes

	Pre-Intervention Period (n=2202)	Intervention Period (n=2303)
Total no. of stool tests processed	3878	3317
No. tests performed the same day, mean (median, range)	1.37 (1, 1-5)	1.12 (1, 1-5)
No. of patients that had a repeat test performed within 30 days	330 (15)	435 (18.9)
Positive result	362 (16.4)	616 (26.7)
Co-detection	5 (0.23)	47 (2)
<i>C. diff</i> test repeated < 3 days?	23 (1)	30 (1.3)
Redundant testing	--	55 (2.4)

Figure 1: Comparison of stool tests ordered between 2014 and 2015

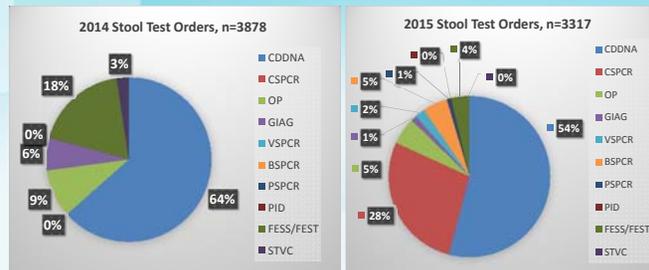


Table 2: Comparison of positive stool pathogens detected prior to and during introduction of the stool PCR test

Stool Pathogens	2014 (n=2202)	2015 (n=2303)
<i>Clostridium difficile</i>	325 (14.8)	440 (19)
<i>Campylobacter jejuni</i>	22 (1)	21 (0.91)
<i>Aeromonas sobria</i>	3 (0.14)	0
Salmonella	1 (0.05)	13 (0.56)
Adenovirus	2 (0.09)	13 (0.56)
Rotavirus	0	35 (1.5)
Norovirus	0	64 (2.8)
<i>Yersinia enterocolitica</i>	0	4 (0.17)
Astrovirus	0	9 (0.39)
Cryptosporidium	0	2 (0.09)
Sapovirus	0	9 (0.39)
<i>Giardia lamblia</i>	2 (0.09)	1 (0.04)
<i>Ascaris lumbricoides</i>	0	1 (0.04)
EAEC	0	20 (0.87)
EPEC	0	19 (0.83)
STEC	1 (0.05)	7 (0.30)
ETEC	0	4 (0.17)

Key: EAEC: Enterogaerogative *E. coli*, EPEC: Enteropathogenic *E. coli*, STEC: Shiga-like toxin-producing *E. coli*, ETEC: Enterotoxigenic *E. coli*

DISCUSSION

- There were fewer stool tests processed during the intervention period than prior to the introduction of the comprehensive stool PCR test (3878 vs. 3317, Table 1, Figure 1). This may be secondary to the comprehensive stool PCR test's ability to look for multiple pathogens, resulting in a decreased need for other routine stool studies.
- There was a decrease in the use of conventional *C. difficile* tests during the intervention period than prior to the implementation of the stool PCR test (54% vs. 64%, Figure 1). This may be secondary to a lack of understanding about when it is appropriate to use the comprehensive stool PCR versus *C. difficile* testing.
- There was an increase in the percentage of patients receiving repeat testing within 30 days of their initial stool test (15% vs. 18.9%, Table 1). This is likely secondary to confusion regarding the new comprehensive stool PCR test and lack of knowledge regarding when repeat testing is appropriate.
- Redundant stool testing occurred in 2015 which is likely secondary to lack of understanding and proper protocol for stool test ordering.
- More patients were identified with *C. difficile* infection in 2015 versus 2014 (440 vs. 325, Table 2). This may be related to inappropriate ordering of the comprehensive stool PCR which could have identified patients colonized with *C. difficile*.
- More pathogens were identified following the implementation of the comprehensive stool PCR test than prior to its institution (616 vs. 362, Table 1; Table 2). Again, this is likely attributable to the ability of the stool PCR test to detect multiple pathogens.
- More co-detections were identified in 2015 (47 (2%) vs. 5 (0.23%), Table 1). This is attributable to the introduction of the comprehensive stool PCR test and consistent with nationwide trends with the use of this test.

FUTURE ANALYSES

- The comprehensive stool PCR test is currently being used by Lehigh Valley Cedar Crest and Muhlenberg campuses in an ongoing effort to improve patient care and reduce cost.
 - This study warrants a new protocol in order to improve the usage of the comprehensive stool PCR
 - In particular, appropriate ordering needs to be addressed to help providers:
 - Choose *C. difficile* testing in patients hospitalized > 3 days
 - Avoid redundant testing
 - Understand when repeat stool testing is appropriate

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