SATURDAY-290

Missed Opportunities for Treatment: Implementation of a Molecular Diagnostic for Pediatric Acute Gastroenteritis (GE): The FilmArray® GI Panel IMPACT Study

Kevin M. Bourzac,[1] Kristen Holmberg,[1] Chris Stockmann,[2] Daniel Cohen,[3] Amy Leber,[3] Judy A Daly,[4] Jami T Jackson,[5] Neena Kanwar,[5] Rangaraj Selvarangan,[5] Jeffrey M Bender,[6] Jennifer Dien Bard,[6] Ara Festekjian,[6] Susan Duffy,[7] Andrew T. Pavia,[2] and Kimberle C. Chapin.[7]

[1]BioFire Diagnostics, LLC, Salt Lake City, UT, [2]University of Utah, Salt Lake City, UT, [3]Nationwide Children's Hospital, Columbus, OH, [4]Primary Children's Medical Center, Salt Lake City, UT, [5]Children's Mercy Hospital, Kansas City, MO, [6]Children's Hospital of Los Angeles, Los Angeles, CA, [7]Rhode Island Hospital, Providence, RI

BioFire Diagnostics
kevin.bourzac@biofiredx.com | 801-736-6354

BACKGROUND

- Causes of pediatric gastroenteritis and the need for multiple tests with suboptimal turnaround time makes the etiologic diagnosis challenging.
- It is unknown if more rapid and comprehensive diagnosis will improve patient outcomes.
- The FilmArray® Gastrointestinal (GI) Panel is a fully automated ~1 hr sample-to-answer PCR-based test for identification of 22 different pathogens, including bacteria, diarrheagenic *E. coli*, parasites, and viruses from stool specimens in Cary Blair transport media.
- Previous clinical studies have demonstrated excellent sensitivity (>95%) and specificity (>98%) compared to reference methods.

TABLE 1. ENROLLMENT STATISTICS FOR PRE-INTERVENTION PHASE

Site Name *Location*	Subjects Enrolled (with specimen obtained)	Pre-Intervention Start End
Children's Hospital of Los Angeles *Los Angeles, CA*	32	Apr-15 Sep-15
Nationwide Children's Hospital *Columbus, OH*	76	Apr-15 Sep-15
Primary Children's Hospital *Salt Lake City, UT*	81	May-15 Oct-15
Children's Mercy Hospital *Kansas City, MO*	106	Jul-15 Nov-15
Hasbro Children's Hospital *Providence, RI*	80	Sep-15 Feb-16
Total	**375**	**10 months**

MATERIALS/METHODS:

- GI IMPACT is a multicenter study at five pediatric EDs in the United States
- Stepped wedge pre- and post-intervention study comparing standard practice with routine use of FilmArray GI Panel for children <18 years presenting with acute gastroenteritis
- All children approached during hours of coverage
- Stool in Cary Blair enteric transport media submitted in ED or within 48 hrs of enrollment
- Baseline and day 7-10 questionnaires
- Detailed medical chart abstraction
- During pre-intervention, physicians ordered standard of care (SOC) tests at their discretion
- FilmArray GI Panel results not reported during pre-intervention

TABLE 2. DEMOGRAPHICS

		Overall
Sex	Male	186 (50%)
	Female	189 (50%)
Age	≤ 1 mo	6 (2%)
	2-23 mo	150 (40%)
	2-4 years	103 (27%)
	5-12 years	80 (21%)
	13-17 years	36 (10%)
Total		375

TABLE 4. NUMBER OF SUBJECTS WITH DETECTIONS BY FILMARRAY AND CONVENTIONAL TESTING

Detections	Conventional	FilmArray
Negative	45 (70.3%)	113 (30.1%)
Positive	19 (29.7%)	262 (69.9%)
1 Analyte	19 (100%)	171 (65.3%)
2 Analytes	0 (0%)	66 (25.2%)
3 Analytes	0 (0%)	20 (7.6%)
4 Analytes	0 (0%)	5 (1.9%)
Total Subjects Tested	64	375

TABLE 6. FREQUENCY OF RECORDED ANTIMICROBIAL ADMINISTRATION AMONG PATIENTS SUBSEQUENTLY FOUND TO HAVE PATHOGENS DETECTED USING SOC OR FILMARRAY GI PANEL

Organism detected	Antimicrobials administered (%)	
	Conventional (reported)	FilmArray (not reported)
Campylobacter	1/4 (25%)	1/13 (8%)
Clostridium difficile[a]	-	1/21 (5%)
Enteroaggregative *E. coli*	-	4/21 (19%)
Enterotoxigenic *E. coli*	-	1/10 (10%)
Salmonella	-	2/11 (18%)
Shigella	4/8 (50%)	6/33 (18%)
STEC	1/4 (25%)	3/14 (21%)
Cryptosporidium	-	1/10 (10%)
Giardia lamblia	-	0/9 (0%)
Adenovirus only	-	1/17 (6%)
Astrovirus only	-	0/6 (0%)
Norovirus only	-	0/32 (0%)
Rotavirus only	1/2 (50%)	0/9 (0%)
Sapovirus only	-	2/17 (12%)
No Pathogen Reported	25/354 (7%)	11/113 (10%)

[a]Only includes subjects >1 yr of age

TABLE 3. SUMMARY OF CONVENTIONAL TESTING (STANDARD OF CARE) ORDERED FOR 64/375 (17%) SUBJECTS

Conventional Test	Number Performed	Number Positive
Stool Culture	58	16[a]
Shiga Toxin	27	3[a]
O&P Exam	15	0
Crypto/Giardia DFA	14	0
Virology	8	0
Toxigenic *C. difficile*	22	2
Rotavirus Antigen	14	2
Total Tests	158	22[b] (13.9%)

[a]4 STEC O157 were detected in culture, 3 of which were positive by Shiga Toxin assay
[b]22 positive results representing 19 different organisms; see footnote a.

TABLE 5. POTENTIALLY TREATABLE OR TREATMENT-MODIFYING PATHOGENS DETECTED BY SOC OR FILMARRAY GI PANEL

Pathogen	SOC	FilmArray
POTENTIALLY TREATABLE		
Campylobacter	4	13
EAEC	0	21
ETEC	0	10
Shigella/EIEC	8	33
Giardia	0	9
Cryptosporidium	0	10
Total	**12**	**96**
MANAGEMENT MODIFYING[a]		
Salmonella	0	11
STEC	4	14
Total	**4**	**25**

[a] Antibiotics generally felt to have adverse impact

FIGURE 1. COMPARISON OF CONVENTIONAL AND FILMARRAY DETECTIONS DURING PRE-INTERVENTION PERIOD (375 SUBJECTS)

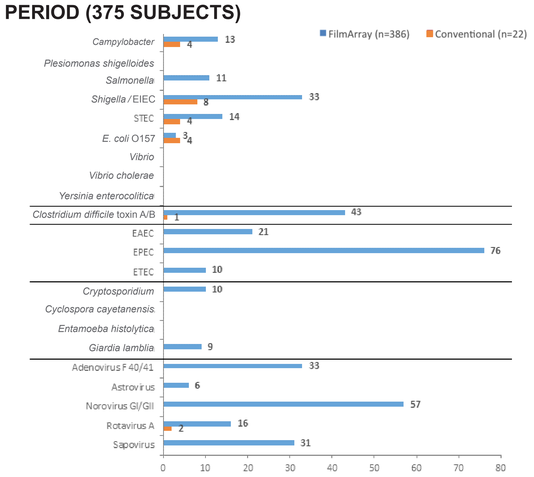


FIGURE 2. PERCENT OF SUBJECTS WHERE A CLOSE CONTACT REPORTED ILLNESS (OTHER DEC: EAEC, ETEC, EPEC)

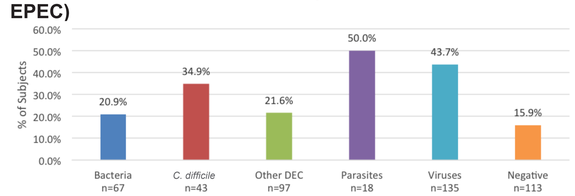
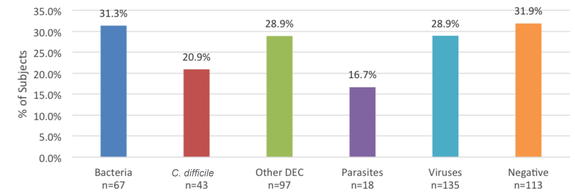


FIGURE 3. PERCENT OF SUBJECTS WITH AT LEAST ONE RETURN VISIT (OTHER DEC: EAEC, ETEC, EPEC)



CONCLUSIONS

- Among 375 children with gastroenteritis, 158 physician-selected SOC tests on 64 subjects resulted in 22 detections (19 potential pathogens in 19 subjects); no co-detections were observed.
- FilmArray GI Panel tests on 375 subjects resulted in detection of 386 potential pathogens; 262 (69.9%) subjects were positive for at least one potential pathogen. Nearly 35% of positive detections were co-detections of two or more organisms.
- Physician-ordered SOC testing identified 12 subjects with potentially treatable pathogens of which 5 were administered antibiotics whereas FilmArray GI Panel testing identified 84 additional subjects with potentially treatable pathogens (96 total; 7-fold increase over SOC)
- Half of study participants with FilmArray-identified parasitic infections and 46% of those with viral pathogens reported illness in additional close contacts.
- Nearly 30% of subjects with FilmArray-identified viral infections reported additional healthcare encounters related to their GI illness.
- Antimicrobials were given to several subjects found to have viral infections as well as those where no etiological agents were identified by SOC or FilmArray testing, likely reflecting overtreatment.
- Intervention phase will compare patient outcomes and costs when FilmArray results are reported to clinicians

This study is funded by NIH/NAID grant R01AI104593 to BioFire Diagnostics with additional funding from BioFire Diagnostics.