

Efficacy and Cost Comparison Between a Rapid Multiplex Polymerase Chain Reaction (PCR) Gastrointestinal (GI) Pathogen Panel Versus Conventional Stool Analysis Techniques in Suspected Cases of Infectious Diarrheal Disease at a Tertiary Medical Center

Norman Beatty, MD¹, David E. Nix, PharmD², Kathryn Matthias, PharmD², Wanda Petty³, Mayar Al Mohajer, MD⁴

¹University of Arizona College of Medicine at South Campus, ²College of Pharmacy, ³Microbiology Laboratory Sciences, ⁴Division of Infectious Diseases, University of Arizona



Background

- Conventional methods for analyzing suspected infectious diarrhea:
 - Stool microscopy
 - Stool culture
 - Pathogen antigen detection
- FilmArray GI pathogen panel:
 - Multiplex real-time PCR
 - Detects **22 pathogens** (viral, bacterial, and parasitic)
 - Rapid results (1-2hrs)

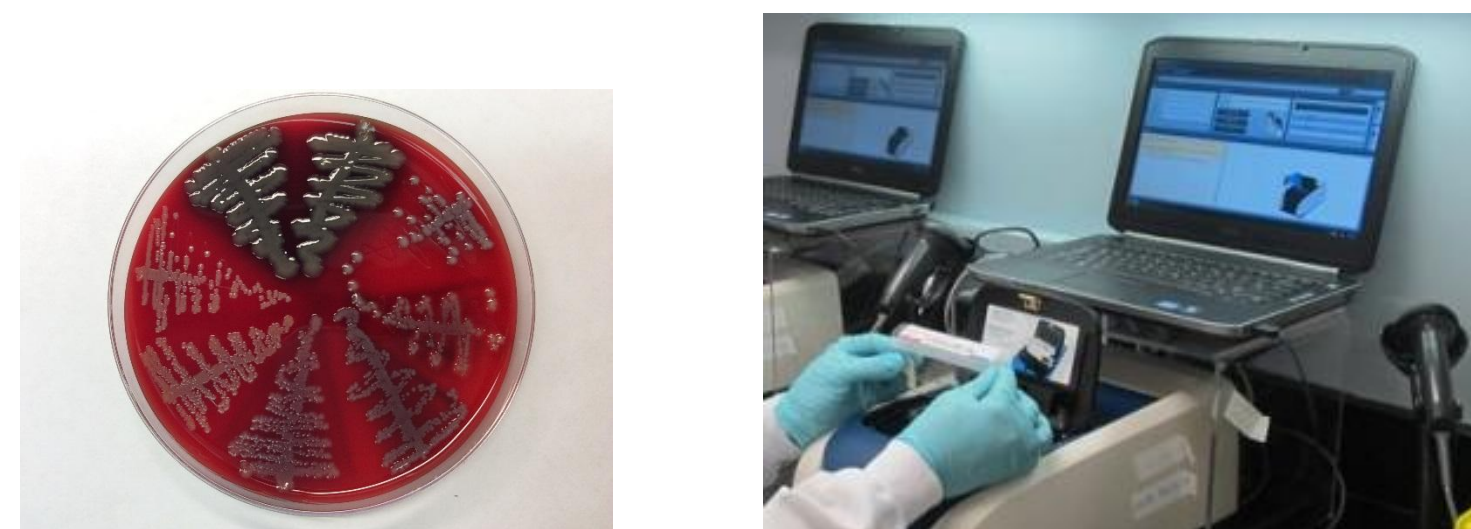


Methods

- Retrospective analysis
- Compared efficacy and cost analysis
- Conventional methods:
 - May 2014 through April 2015
- GI pathogen panel:
 - May 2015 through Dec 2015

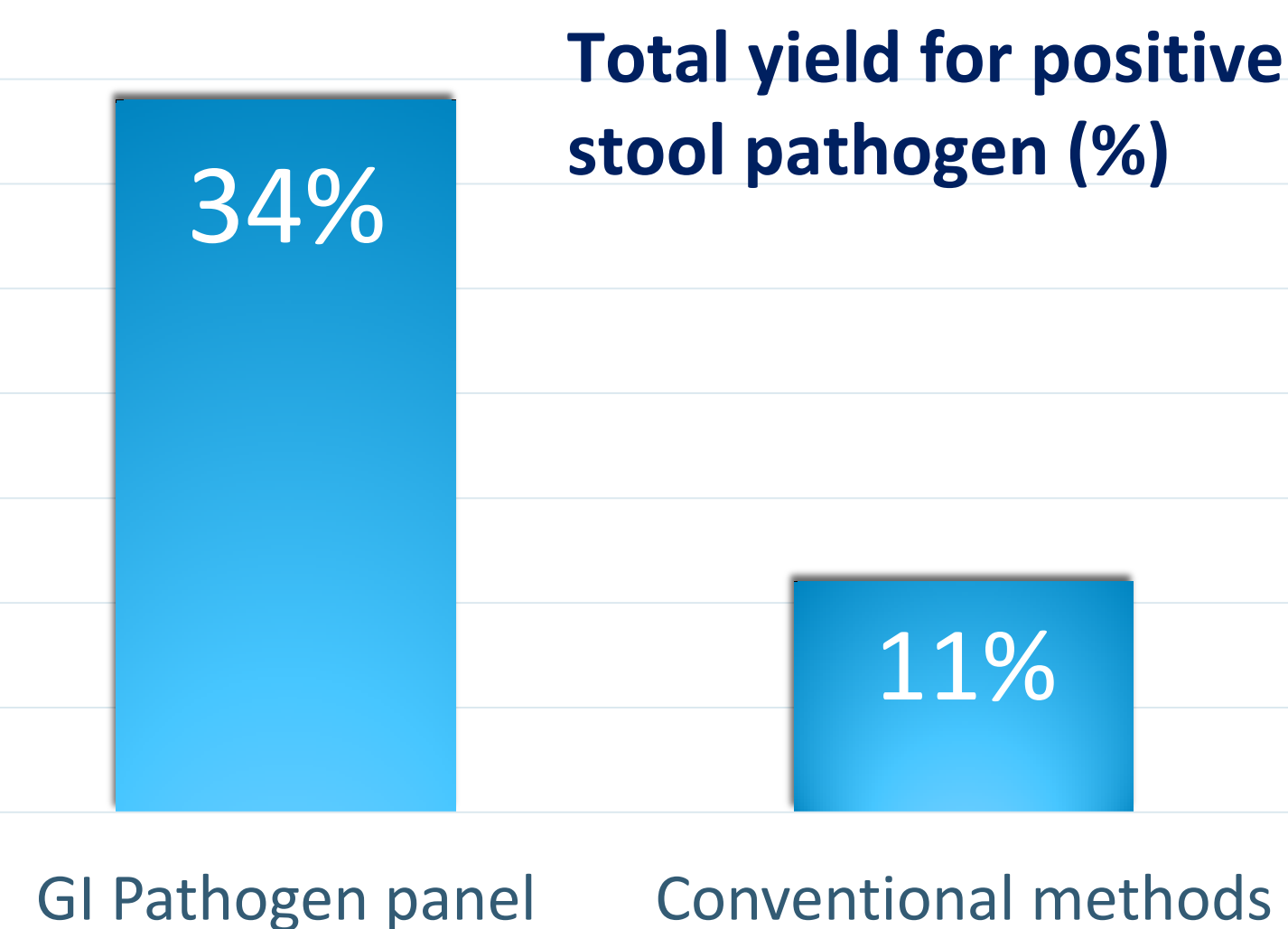
Objectives

- After **sole implementation** of the Biofire FilmArray GI pathogen panel at our tertiary medical center would we see a **higher yield of detected** pathogens when comparing to prior conventional techniques?



- What was the **overall cost difference** between these testing modalities?

Results



Results

Total tests – positive results:

GI pathogen panel: 341/946
 Stool culture: 73/1270, O&P: 34/959,
 Campy screen: 63/1387, Rotavirus: 1/18
 Shiga-toxin: 11/1192, Cyclospora: 0/23

Monthly Average Yield

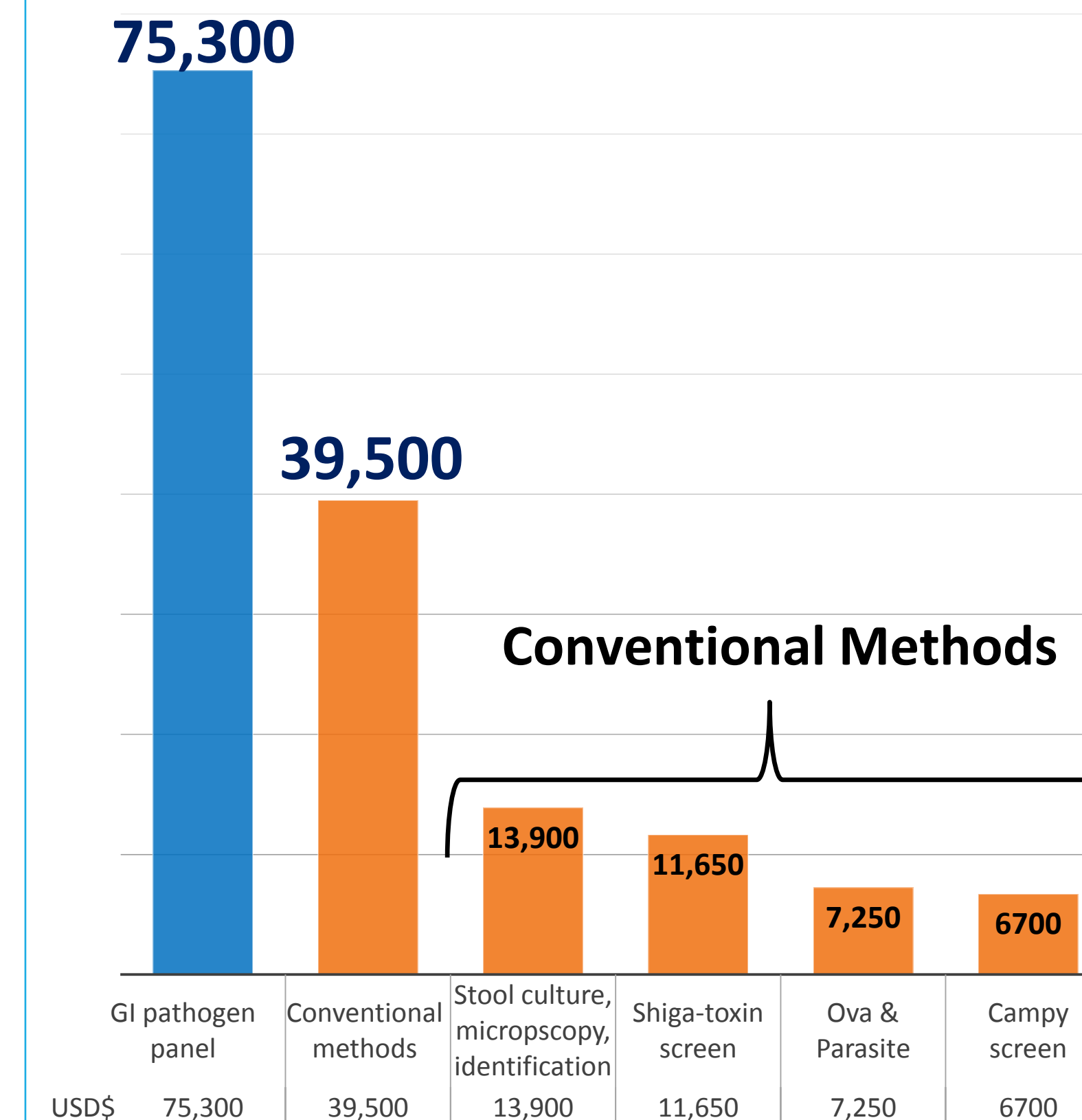
Pathogen(s) Detected	GI Pathogen Panel	Conventional Methods
Bacteria		
Enteropathogenic <i>E. coli</i>	13.7	0
Enteroadgregative <i>E. coli</i>		
Enterotoxigenic <i>E. coli</i>		
Shiga-like toxin-producing <i>E. coli</i>	2.13	0.92
Shigella / Enteroinvasive <i>E. coli</i>	1.63	2.50
<i>Salmonella</i> spp.	5.38	3.42
<i>Campylobacter</i> spp.	5.25	5.25
<i>Vibrio</i> spp.	0.13	1.00
<i>Aeromonas veronii</i>	0	0.08
Viruses		
Astrovirus	0.63	0
Adenovirus F40/41	0.38	0
Norovirus GI/GII	7.75	0
Rotavirus A	2.75	0.08
Sapovirus	1.75	0
Parasites		
<i>Blastocystis hominis</i>	0	1.00
<i>Cyclospidium cayetanensis</i>	0.13	0
<i>Cryptosporidium</i>	0.86	0
<i>Entamoeba</i> spp.	0.13	0.66
<i>Giardia</i> spp.	0.13	0.25
Other parasites (amoebic)	0	0.92

Results

Calculated costs (labor/reagents/supplies)

Negative for pathogen		Bacterial & Parasitic Diseases-Negative for pathogens	
Stool Culture	\$ 117.00	Stool Culture	\$ 117.00
Campy Screen	\$ 58.00	Campy Screen	\$ 58.00
Shiga-toxin Screen	\$ 116.00	Shiga-toxin Screen	\$ 116.00
	\$ 291.00	Giardia Screen	\$ 89.00
		Crypto Screen	\$ 72.00
		O&P	\$ 92.00
			\$ 544.00
Salmonella, Shigella		Salmonella, Shigella +Susceptibilities	
Stool Culture	\$ 117.00	Stool Culture	\$ 117.00
Identification 1 organism	\$ 92.00	Identification 1 organism	\$ 92.00
Agglutination	\$ 24.00	Agglutination	\$ 24.00
Campy Screen	\$ 58.00	Susceptibilities	\$ 99.00
Shiga-toxin Screen	\$ 116.00	Campy Screen	\$ 58.00
	\$ 407.00	Shiga-toxin Screen	\$ 116.00
			\$ 506.00
Parasite Exam		GI Panel	
Giardia Screen	\$ 89.00	GI Panel	\$ 600.00
Crypto Screen	\$ 72.00	GI Panel + Susceptibilities	\$ 802.00
O&P	\$ 92.00		
	\$ 253.00		
Viral Studies (Not performed by UMC Labs)		*GI Panel targets	
Norovirus PCR	\$ 200.00	Salmonella	Adenovirus
Rotavirus Ag	\$ 10.00	Campylobacter	Astrovirus
Electron Microscopy-Stool	\$ 295.00	Plesiomonas shigelloides	Norovirus
		Vibrio	Rotavirus
		Yersinia enterocolitica	Sapovirus
		diarrheagenic E. coli/Shigella	Cryptosporidium
			Cyclospora cayetanensis
			Entamoeba histolytica
			Giardia lamblia
Other Sendouts			
Cyclospora	\$ 24.96		

Monthly Average Costs (USD\$)



Discussion

- The FilmArray GI pathogen panel:
 - Higher monthly yield of GI pathogens (34% vs 11%)
 - 106 viral pathogens were detected (11% total tests run)
 - Detects *E.coli* virotypes
- Conventional methods:
 - 34 parasites identified via O&P testing as opposed to one case on the GI pathogen panel
 - More economical (half as expensive)

What is the clinical impact of utilizing more sensitive and specific testing?

- Decreased admission rate?
- Decreased length of stay?
- Improved antibiotic stewardship?
- Faster initiation on contact precautions?

Further data collection is underway to analyze these parameters