The Cost-effectiveness of a GI PCR panel in Detecting Necessary to Treat Infections

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- The authors have nothing to disclose

Background

- Infectious gastroenteritis (IGE) is the most common cause of diarrhea in children.
- In the developed world, most cases of IGE are self-limited and only rarely are identified pathogens necessary to treat.
- Historically, stool culture has been the test of choice to identify treatable bacterial pathogens.
- Recently, several multiplex GI PCR panels have become available, and in some settings, replaced the stool culture and other ancillary stool studies as a means of diagnosing IGE.
- The cost-effectiveness of this approach is not known.

Methods

- We conducted a cost-effectiveness analysis using a decision tree to compare two approaches to microbiological stool testing in otherwise healthy children 3 months- 17 years old with acute diarrhea.
  - Option 1: stool culture (plus c. diff toxin, giardia ag, acid fast stain for cyclospora and ova and parasites)
  - Option 2: GI PCR

Methods

GI PCR Pathogen List	Traditional Microbiologic Test	Necessary to Treat?
Vibrio cholera	Stool Culture	Yes
Clostridium Difficile	C. diff toxin	Yes
Shigella/EIEC	Stool Culture	Yes
Cyclospora cayetanensis	Acid fast stain of stool	Yes
Entamoeba histolytica	Stool ag or Stool O&P	Yes
Giardia lamblia	Giardia Ag	Yes
Salmonella	Stool Culture	No
Campylobacter jejuni/upsaliensis	Stool Culture	No
Plesiomonas shigelloides	Stool Culture	No
Vibrio parahaemolyticus	Stool Culture	No
Vibrio vulnificus	Stool Culture	No
Yersinia enterocolitica	Stool Culture	No
STEC including E coli O157	Shiga toxin/Culture	No
EAEC	none	No
EPEC	none	No
ETEC	none	No
Cryptosporidium	Cryptosporidium Ag	No
Adenovirus F 40/41	Adenovirus Stool PCR	No
Astrovirus	Electron Microscopy	No
Norovirus GI/GII	Norovirus Stool PCR	No
Rotavirus A	Rotavirus Ag	No
Sapovirus	Electron Microscopy	No

Methods

- We searched the literature and reviewed our institution's data to determine expected rates of test positivity and expected proportion of positive tests that identify a necessary to treat pathogen.
- Testing costs were obtained from our state's 2016 Medicaid Fee Schedule.
- Our primary outcome was cost per 100 patients and cost per case of necessary to treat pathogen identified.

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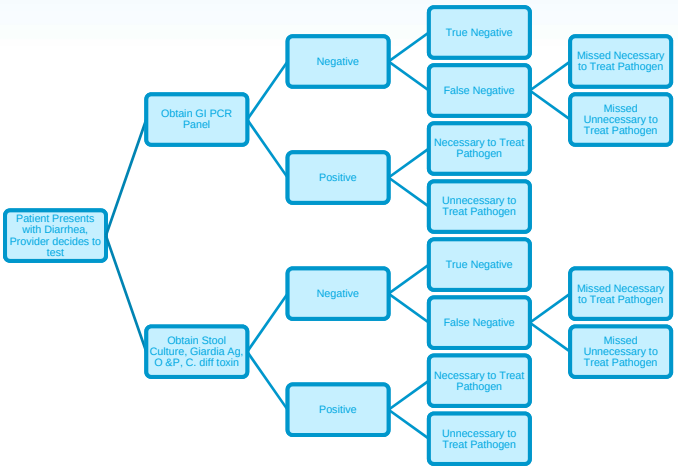
Methods



Methods

Model Input	Value	Source
Positivity Rate	65%	Internal Data
Proportion of identified Pathogens that are Actionable	32%	Internal Data
Stool Culture True Negative Rate	87%	Buss et al
Stool Culture True Positive Rate	99.99%	Buss et al
GI PCR True Positive Rate	97.6%	Buss et al
GI PCR True Negative Rate	99.1%	Buss et al
Stool Culture Cost	$10.09	SC Medicaid Fee Schedule
C. Diff toxin Cost	$12.83	SC Medicaid Fee Schedule
Giardia Ag Cost	$12.83	SC Medicaid Fee Schedule
Acid Fast Stain Cost	$7.14	SC Medicaid Fee Schedule
Ova and Parasite Exam Cost	$13.25	SC Medicaid Fee Schedule
GI PCR Panel Cost	$453.75	SC Medicaid Fee Schedule

Results

- The model predicts that in both testing approaches, there will 21 patients per 100 with a necessary to treat pathogen identified.
- Cost related to microbiological testing per 100 patients with acute diarrhea is 5,614 USD in the culture approach and 45,375 USD in the PCR approach, with a net difference of 39,761 USD per 100 patients tested.
- Cost per necessary to treat pathogen identified is 270 USD in the culture approach and 2,283 USD in the PCR approach.

Results

	Cost Per 100 Patients	Cost per Case of Necessary to treat Pathogen Identified	Missed Necessary to Treat Infections Per 100 Patients
GI PCR Panel	$45,375	$2,235	0.1
Stool Culture +Ancillary tests Approach	$5,614	$270	1.5

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Conclusions

- This decision analysis model suggests that there is a significantly higher cost attributable to testing in the PCR approach compared to the culture approach.
- Providers and institutions must be cautious when adopting costly new tests as these might drive up healthcare costs with little to no net clinical benefit.