Association Between Multiplex PCR Stool Diagnostic Testing and Pathogen Detection, Healthcare Resource Use, and Cost Among Adult Outpatients Treated in US Health Systems for Acute Infectious Gastroenteritis

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BACKGROUND

Multiplex polymerase chain reaction (PCR) gastroenteritis testing panels simultaneously detect multiple pathogens with rapid turnaround time, allowing more accurate and timely diagnosis and treatment. This study assessed the association between stool test type (i.e., Multiplex PCR panel with <12 target pathogens [PCR<12], Multiplex PCR panel with ≥12 target pathogens [PCR12], Traditional work-up [TW]) and healthcare resource use (HRU), cost, and diagnostic yield in adult outpatients treated in United Status (US) hospitals for acute infectious gastroenteritis (AGE).

METHODS

Study Design and Data Source

- Retrospective cohort study using the Premier PINC AI™ Healthcare Database (PHD)

Study Population

- Adults (aged ≥ 18 years) who had an outpatient visit with a principal discharge diagnosis of AGE between January 1, 2016 – June 30, 2021
- First visit during the study period was considered "index" visit
- Only patients who had stool test performed at the hospital during index visit were included
- Pathogen detection analysis was performed for patients with microbiology data available

Outcomes

- AGE-related hospitalizations and outpatient visits within 30 days of index visit
- Healthcare cost for index and 30-day follow-up visits (adjusted to 2021 US dollars per Consumer Price Index)

Statistical Analysis

- Kruskal-Wallis test was used for continuous variables, and Pearson's Chi-square test was used for categorical variables
- Bonferroni correction was performed when the null hypothesis was rejected

RESULTS

- **Mean total cost of index plus 30-day follow-up visit was lowest for patients with PCR12, followed by TW and PCR<12 patients**
- **PCR12 was associated with fewer number of stool tests per patient (mean: 1.6 vs 1.3), faster turnaround time (mean: 6.3 vs. 25.7 hours), and lower likelihood of receiving in-hospital antibiotics (39% vs. 47%) than TW (all p<0.001)**

Table. Mean (std) healthcare cost (in 2021 USD) among AGE patients with a stool test, stratified by the type of stool test

	PCR<12 (N = 4,726)	PCR12 (N = 11,098)	TW (N = 20,963)	p
Index visit cost	$2,632 ($3,706)	$2,529 ($3,399)	$2,428 ($3,298)	<0.01
30-day follow-up visit cost	$298 ($2,316)	$323 ($3,573)	$453 ($3,392)	<0.01
Total cost (index + 30-day)	$2,930 ($4,417)	$2,852 ($5,054)	$2,881 ($4,823)	<0.01

Fig. Results among patients with microbiology data during index visit, stratified by the type of stool test

a. Number of detected pathogens

b. Commonly detected pathogens
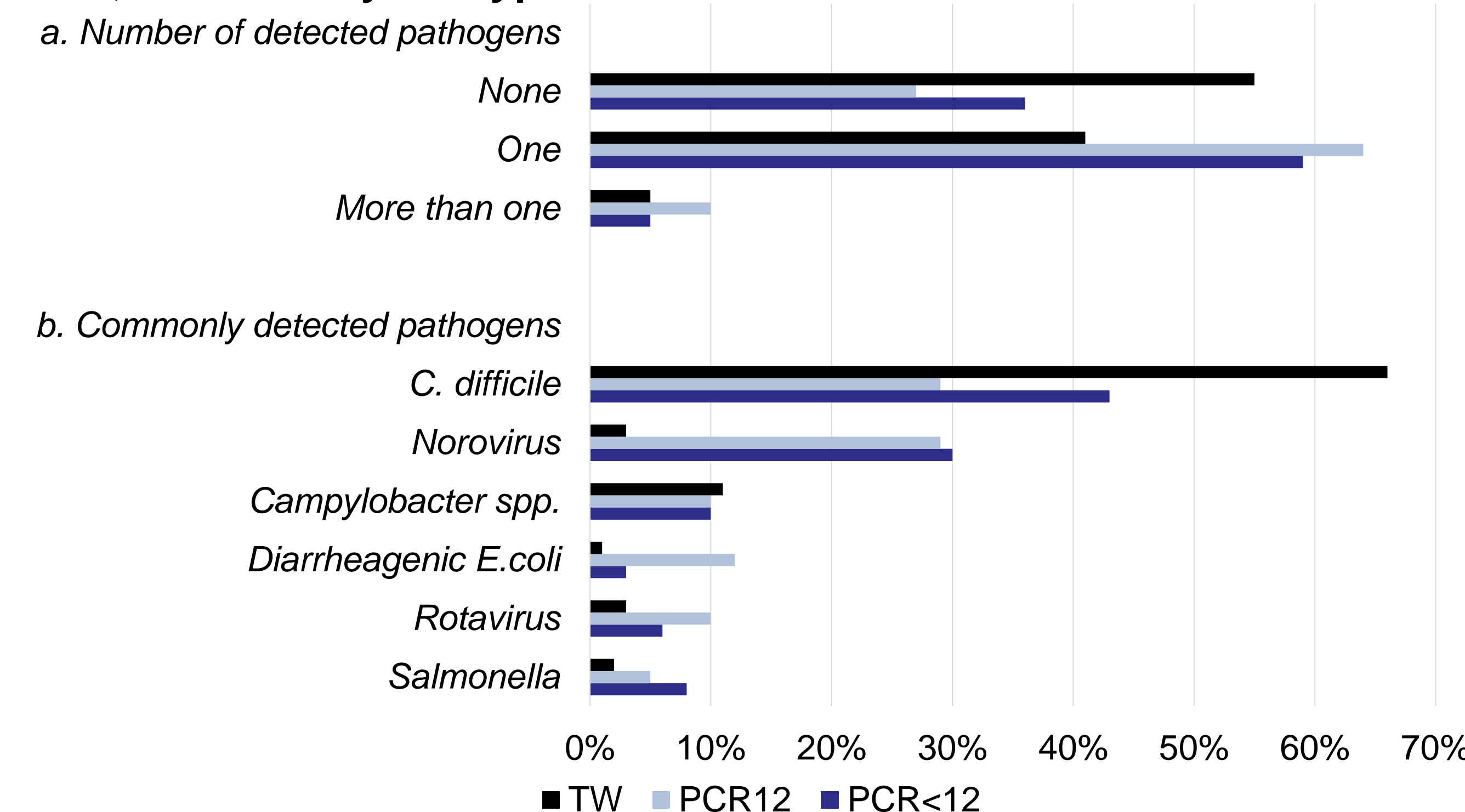
- Among 36,787 patients analyzed, mean age was 51.2 (20.0) years, 60% were women and 80% were White
- TW was most often performed (57%), followed by PCR12 (30%), and PCR<12 (13%)
- PCR12 patients were younger (49.7 vs. 52.1 years), more likely to be Hispanic/Latino (16% vs. 10%), and uninsured (9% vs. 7%) compared to TW patients (all p<0.001)
- PCR12 was more common in patients from large (500+), teaching, and urban hospitals than TW (all p<0.001)
- A higher percentage of patients undergoing PCR12 tests had a history of transplantation (1.4% vs. 0.9%) or HIV/AIDS (1.2% vs. 0.7%) than patients undergoing TW (both p<0.001)
- Patients with PCR12 were more likely to be discharged home (96% vs. 94%) and less likely to be hospitalized for AGE within 30 days (2% vs. 3%) than TW patients (both p<0.001)
- PCR12 was associated with a higher mean index visit cost (by $101) but lower mean 30-day follow-up cost (by $130) than TW (Table, all p<0.001)
- Among 8,451 patients with microbiology data, 73% of PCR12 patients had a target pathogen detected, compared to fewer than half (45%) of TW patients (Fig, p<0.001)

CONCLUSIONS

- PCR12 was associated with lower 30-day follow-up cost and risks of AGE-related hospitalization, less secondary testing, and increased diagnostic yield compared to TW.

References
1. Cybulski RJ, et al. *Clin Infect Dis* 2018;67:1688-96
2. Torres-Miranda D, et al. *BMC Gastroenterol* 2020;20:246
3. Skyum F, et al. *BMC Infect Dis* 2019;19:133
4. Collins JP, et al. *Infect Control Hosp Epidemiol* 2022 PMID 36017721