



Factors Associated with Actionable Results on Gastrointestinal Panel Testing for Children Hospitalized with Acute Diarrhea

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BACKGROUND

- Gastrointestinal multiplex PCR panels (GIP) are a popular testing modality for evaluating the etiology of acute gastroenteritis (AGE)
- It remains unclear which patients benefit from GIP testing as most AGE is due to a viral or unknown etiology, and treatment is supportive
- Finding a bacteria or parasite (**an actionable result**) on GIP may impact patient management and outcomes through faster initiation or targeting of antimicrobial therapy

OBJECTIVE

To assess which clinical reasons for testing (**order indication**) and patient factors are associated with actionable GIP results for hospitalized children with acute diarrhea

METHODS

- Cross-sectional study of hospitalized children ≤ 18 years with AGE, diarrhea, or dehydration and at least one GIP (FilmArray, BioFire Diagnostics) performed
- Study included 1,124 GIPs performed across 967 hospital encounters between 2015-2018 at 5 Children's Hospital Colorado sites
- Patients grouped based on underlying medical history: **CCC** (≥ 1 complex chronic condition) vs. **non-CCC** (previously healthy)
- GIP results categorized as **actionable** (bacteria or parasite detected), **non-actionable** (virus only), or **no organism detected**
- Performed multivariable regression analyses to evaluate which order indications and patient factors (demographics, ICU status, number of stools) were associated with actionable results
- Excluded detection of *C. difficile* in patients < 1 year and EAEC/EPEC/ETEC in all ages due to high rates of asymptomatic carriage

RESULTS

Table 1: Characteristics of study population

	All Encounters N = 967	Non-CCC N = 478	CCC N = 489
Age (years)	3.7 (1.2-10.7)	3.0 (1.0-11.2)	4.5 (1.4-10.4)
Female gender	446 (46.1%)	221 (46.2%)	225 (46.0%)
Ethnicity*			
Not Hispanic/Latino	641 (66.3%)	316 (66.1%)	325 (66.5%)
Hispanic/Latino	292 (30.2%)	137 (28.7%)	155 (31.7%)
Unknown	34 (3.5%)	25 (5.2%)	9 (1.8%)
ICU stay*	238 (24.6%)	60 (12.6%)	178 (36.4%)
Length of stay (hours)*	90.8 (47.4-196.6)	65.0 (41.6-109.1)	140.5 (69.3-382.6)
> 1 GIP performed*	94 (9.7%)	27 (5.6%)	67 (13.7%)
Time to first GIP (hours)*	17.5 (5.5-48.6)	13.4 (4.7-27.2)	24.2 (7.0-92.4)
< 72 hours to first GIP*	777 (80.4%)	430 (90.0%)	347 (71.0%)

N represents the number of hospital encounters; values as N(%) or median (interquartile range)

* Indicates p-value < 0.05 between CCC and non-CCC

Table 3: Multivariable regression analysis – factors assoc. with actionable results

Variable ^a	Non-CCC		CCC	
	RR (95% CI)	p-value	RR (95% CI)	p-value
Age (years)				
1-2 (vs. < 1)	4.53 (2.56 - 7.99)	<0.001	7.38 (2.68 - 20.37)	<0.001
2-5	3.43 (1.92 - 6.13)	<0.001	7.14 (2.59 - 19.69)	<0.001
≥ 5	3.72 (2.16 - 6.42)	<0.001	5.62 (2.07 - 15.24)	<0.001
Male gender	0.73 (0.57 - 0.94)	0.014	0.78 (0.57 - 1.06)	0.11
Season				
Spring (vs. winter)	1.57 (1.03 - 2.39)	0.037	0.84 (0.55 - 1.27)	0.41
Summer	1.91 (1.27 - 2.87)	0.002	0.94 (0.61 - 1.46)	0.79
Fall	1.49 (0.96 - 2.3)	0.074	1.12 (0.75 - 1.68)	0.58
ICU Admission	0.92 (0.62 - 1.38)	0.70	0.66 (0.48 - 0.92)	0.015
≥ 4 stools per day	1.24 (0.92 - 1.67)	0.15	0.74 (0.55 - 1)	0.052
Order Indication^b				
Diarrhea with blood or pus	1.53 (1.09 - 2.13)	0.013	1.3 (0.86 - 1.96)	0.22
Severe water-loss diarrhea	0.79 (0.52 - 1.19)	0.25		
International travel	1.54 (0.9 - 2.62)	0.11		
Epi/surveillance testing	0.39 (0.1 - 1.46)	0.16		
Other	0.98 (0.66 - 1.47)	0.92		

^a Variables age, gender, season, ICU admission, and number of daily stools were determined a priori

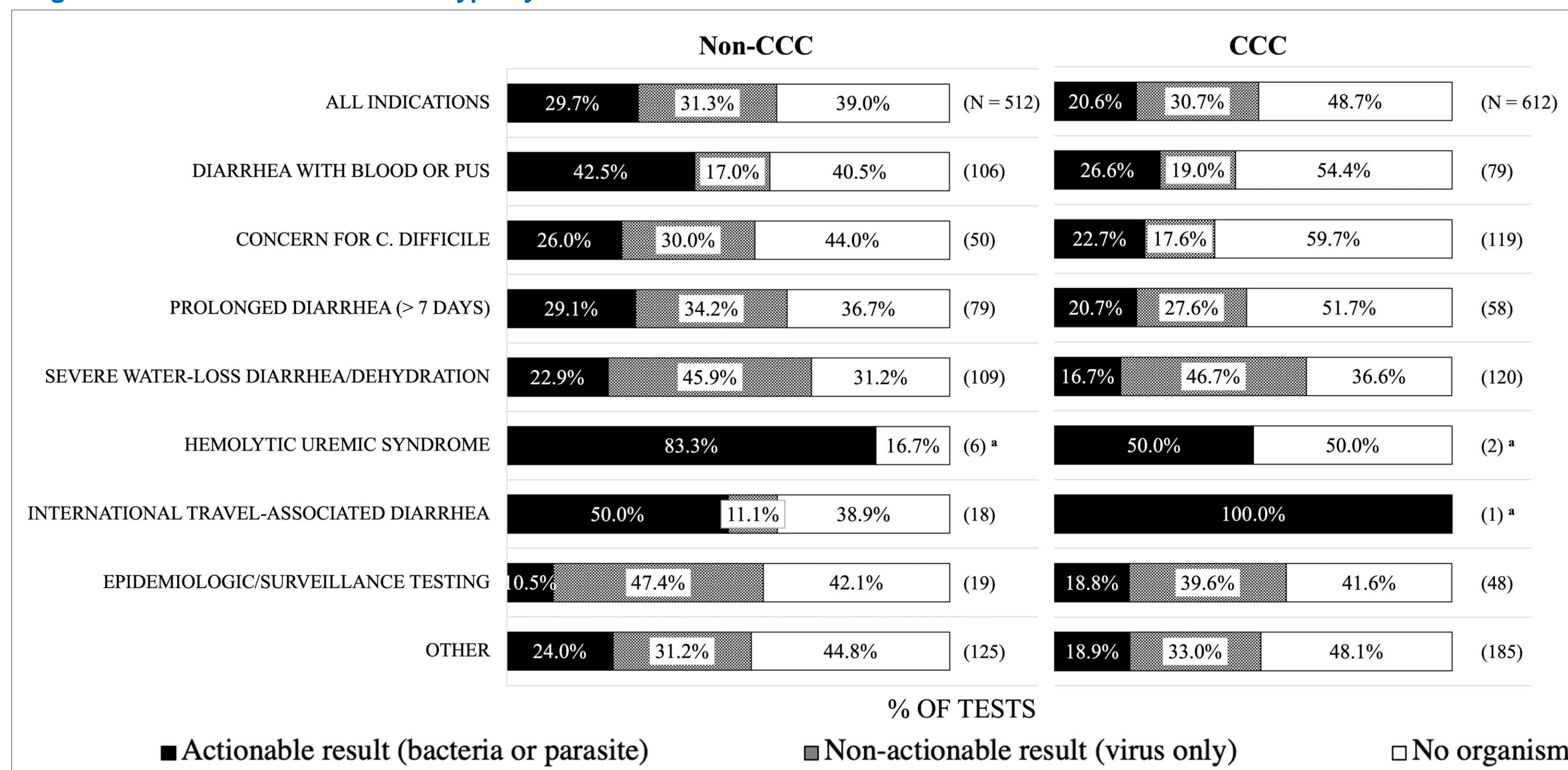
^b Individual GIP order indications were included only if associated with actionable results in bivariate analyses with a p-value < 0.2.

Table 2: Prevalence of provider-reported GIP order indications

GIP Order Indication	Non-CCC N = 512	CCC N = 612
Diarrhea with blood or pus**	106 (20.7%)	79 (12.9%)
Concern for <i>C. difficile</i> **	50 (9.8%)	119 (19.4%)
Prolonged diarrhea (>7 days)**	79 (15.4%)	58 (9.5%)
Severe water-loss diarrhea/dehydration*	109 (21.3%)	120 (19.6%)
Hemolytic uremic syndrome*	6 (1.2%)	2 (0.3%)
International travel-associated diarrhea**	18 (3.5%)	1 (0.2%)
Epidemiologic/surveillance testing**	19 (3.7%)	48 (7.8%)
Other**	125 (24.4%)	185 (30.2%)

N represents the number of GIP tests; values as N(%); * Indicates p-value < 0.05

Figure 1: Prevalence of GIP result type by order indication



Proportion (%) of GIP result types for each order indication, by CCC status; N represents the number of GIP tests. ^a N < 10

CONCLUSIONS

- Age > 1 year** was strongly associated with actionable results for both non-CCC and CCC cohorts
- For non-CCC (previously healthy) patients, **bloody stools, international travel, and non-winter season** were associated with actionable results
- For CCC patients, no order indications were associated with actionable results; **ICU admission** was negative associated

IMPLICATIONS

There are some identifiable factors (e.g., age < 1 yr) and order indications, especially for previously healthy children, that may be useful for improving diagnostic stewardship of GIP testing