Assessment of the impact of multiplex PCR panels in sepsis evaluations of young febrile infants

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Purpose

To determine if multiplex respiratory and meningitis/encephalitis PCR panels decreased **antibiotic duration of therapy (DOT)** and hospital **length of stay (LOS)** when used in sepsis evaluations of febrile infants less than 90 days of age

Background

- The management of febrile infants under the age of 3 months has long been a controversial topic, often requiring them to be subject to a battery of tests, antibiotics, and hospitalization.
- Multiplex polymerase chain reaction (PCR) panels can provide a rapid diagnosis, but their role in managing these patients is still unknown.

Methods

Design: Retrospective chart review

Setting: Single academic institution from January 2015 to September 2019

Inclusion criteria: Infants (< 90 days old) admitted to pediatric ward for concerns of fever or sepsis

Exclusion criteria: Patients with a documented bacterial infection or patients with underlying medical conditions (e.g. urologic abnormalities)

Exposure: We compared patients admitted before and after PCR panels became available at our institution (Pre-PCR era [n=52] and PCR era [n=66], respectively)

Primary outcomes: Differences in (1) DOT and (2) LOS between patients admitted in the Pre-PCR era vs PCR era

Statistical analysis: Multivariate Poisson regressions adjusting for age, sex, birth weight, blood culture results, and infectious diagnosis (fever of unknown origin [FUO] vs viral etiology).

Due to the high number of patients (during both eras) who did not receive any antibiotics, we used a zero-inflated Poisson regression for DOT. This models combines two processes:

- The chance of a patient receiving ***any antibiotics***
- How many ***hours of antibiotics*** were given to those who received antibiotics

1. Contact me at https://www.hunterratliff1.com/#contact
2. Additional information via the QR code or at https://www.hunterratliff1.com/project/pedi_pcr/

Results

KEY FINDINGS

- Febrile infants being evaluated for sepsis received **1.95 times more hours of antibiotics** before implementation of PCR panels (**Table 2**)
- **Length of stay was 1.16 times longer** during the Pre-PCR era (**Table 2**)

Table 1: Baseline demographics

	Pre-PCR (n = 52)	PCR era (n = 66)
Age at admission, days (95% CI)	31.1 (25.2 - 37.0)	28.4 (23.0 - 33.9)
Birth weight, grams (95% CI)	3134 (3010 - 3258)	3086 (2963 - 3209)
Gestational age, weeks (95% CI)	38.3 (37.9 - 38.7)	38.3 (37.9 - 38.8)
Race (%)		
Black	12 (23.1%)	8 (12.1%)
White	26 (50.0%)	47 (71.2%)
Other	14 (26.9%)	11 (16.7%)
Sex (%)		
Female	19 (23.1%)	31 (47.0%)
Male	33 (63.5%)	35 (53.0%)

No significant differences in baseline covariates existed between the eras

Figure 1

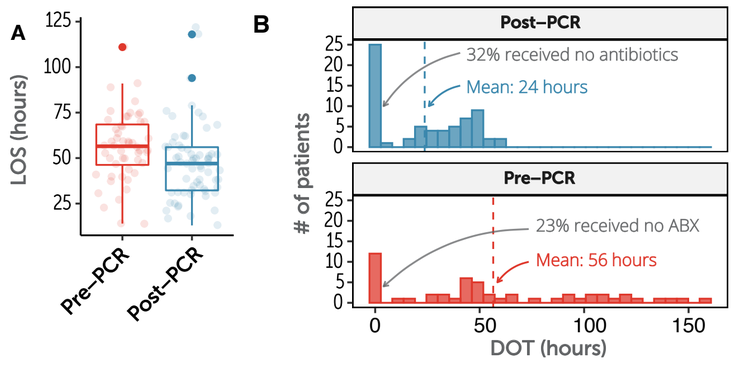


Fig 1: Decreases observed following PCR implementation:

- **LOS:** 8.5 hours (p = .003), **Figure 1A**
- **DOT:** 32.8 hours (p < .001), **Figure 1B**

Table 2: LOS and DOT regressions

	LOS		DOT	
	IRR	95% CI	IRR	95% CI
Era: Pre-PCR	1.16 ***	(1.10 - 1.22)	1.95 ***	(1.55 - 2.46)
Birth weight: SGA	1.06	(0.99 - 1.14)	0.94	(0.70 - 1.26)
Dx: Viral infection	0.96	(0.91 - 1.02)	0.77 *	(0.61 - 0.98)
Age (per week of age)	0.99 **	(0.98 - 1.00)	---	---
BCx: Contaminant	1.13 **	(1.04 - 1.23)	1.56 **	(1.13 - 2.15)
Sex: Male	1.03	(0.98 - 1.09)	1.14	(0.91 - 1.44)

*** p < 0.001, ** p < 0.01, * p < 0.05
Note: Age was not included in the conditional regression for DOT (presented above)
Abbreviations: IRR = Incidence rate ratio; SGA = Small for gestational age; Dx = Diagnosis; BCx = Blood culture
Reference groups: Birth weight (appropriate for gestational age), Diagnosis (fever of unknown origin), BCx (no growth), Sex (female)

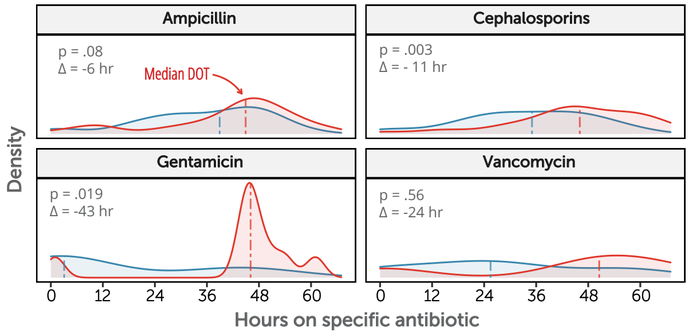
Table 2 (above) presents the multivariate results for LOS and DOT. In addition to the results presented in the **KEY FINDINGS** box:

- **Contaminant BCx:** ↑ both LOS & DOT
- **Dx of FUO:** Similar LOS, but ↑ DOT

Fig 2: For those receiving antibiotics, PCR era saw quicker discontinuation

- During Pre-PCR era, median DOT (dotted lines) was around 48 hours

Figure 2



Discussion

- Multiplex PCR panels can potentially influence the management of young febrile infants admitted for sepsis evaluations by rapidly diagnosing viral infections and thus decreasing DOT and LOS.
- In turn, that may improve patient outcomes and satisfaction, as well as possibly decrease costs. Multiplex PCR panels should be considered as part of routine sepsis evaluations in young febrile infants.
- Larger studies are needed, including in-depth cost analysis and longer follow up after hospital discharge.