

Rethinking the 48-Hour Rule-Out: Time to Positivity in Blood Cultures at a Pediatric Hospital

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Background

- Empiric antimicrobial agents are often used to treat children suspected of sepsis
- Antimicrobials submit patients to risks and contribute to antimicrobial resistance
- Usage lasts about 48-72 hours^{1,2}
- Recent studies show that most blood cultures will be positive within 24 hours^{3,4}
- *Aim:* Determine time to positivity (TTP) of blood cultures based a variety of factors
- *Goal:* **Reduce unnecessary antimicrobials** used on hospitalized children

Methods

- *Study Type:*
 - Single-center, retrospective cohort study
- *Patients:*
 - All hospitalized patients with positive blood cultures at Children's Hospital Colorado
- *Inclusions:*
 - Pos blood cultures between Jan '13 - Dec '18
 - First positive: New organism or two weeks between positive cultures
 - Unimicrobial (separate study)
 - Not rapid blood culture identification (BCID)
- *Data:*
 - Chart review in Epic and demographic data, microbiological data, source and primary team
- *Stats:*
 - TTP and means compared with T-tests and one-way analysis of variance (ANOVA)
 - Kaplan-Meier curves constructed

Results

- *Numbers:*
 - Blood Cultures:
 - 6,184 + blood cultures/89,663 total cultures (6.9%)
 - After exclusions: 2,130 (2.9%)
- *TTP Stats:*
 - Overall TTP mean:
 - **21.26 hours** (95%CI of 20.77;21.77)
 - TTP Range:
 - Bacteria: 1-266 hours
 - Yeast: 7-109 hours
 - Gram+ absolute pathogens (AP) TTP mean:
 - **16.73 hours** (95%CI of 16.18;17.3)
 - Gram- AP TTP mean:
 - **15.99 hours** (95%CI of 15.06;16.97)
 - Yeast TTP mean:
 - **31.29 hours** (95%CI of 26.46;37.01)
- Common contaminants TTP mean:
 - **28.21 hours** (95%CI of 27.22;29.24)
- *Peripheral vs. Central Venous Catheter (CVC):*
 - **Not statistically significant** (p = 0.27)
- *Primary Teams:*
 - **Not statistically significant** (p = 0.30) when comparing NICU, PICU, CI/CPCU
- *Gram+ and Gram- AP vs. common contaminants:*
 - **Not statistically significant**
- *TTP Select Pathogen Stats:*
 - MRSA TTP mean:
 - 18.64 hours (95%CI of 16.66;20.85)
 - Pseudomonas species TTP mean:
 - 22.53 hours (95%CI of 19.24;26.38)
 - Coag-neg Staph (contaminant) TTP mean:
 - 26.18 hours (95%CI of 25.43;26.95)

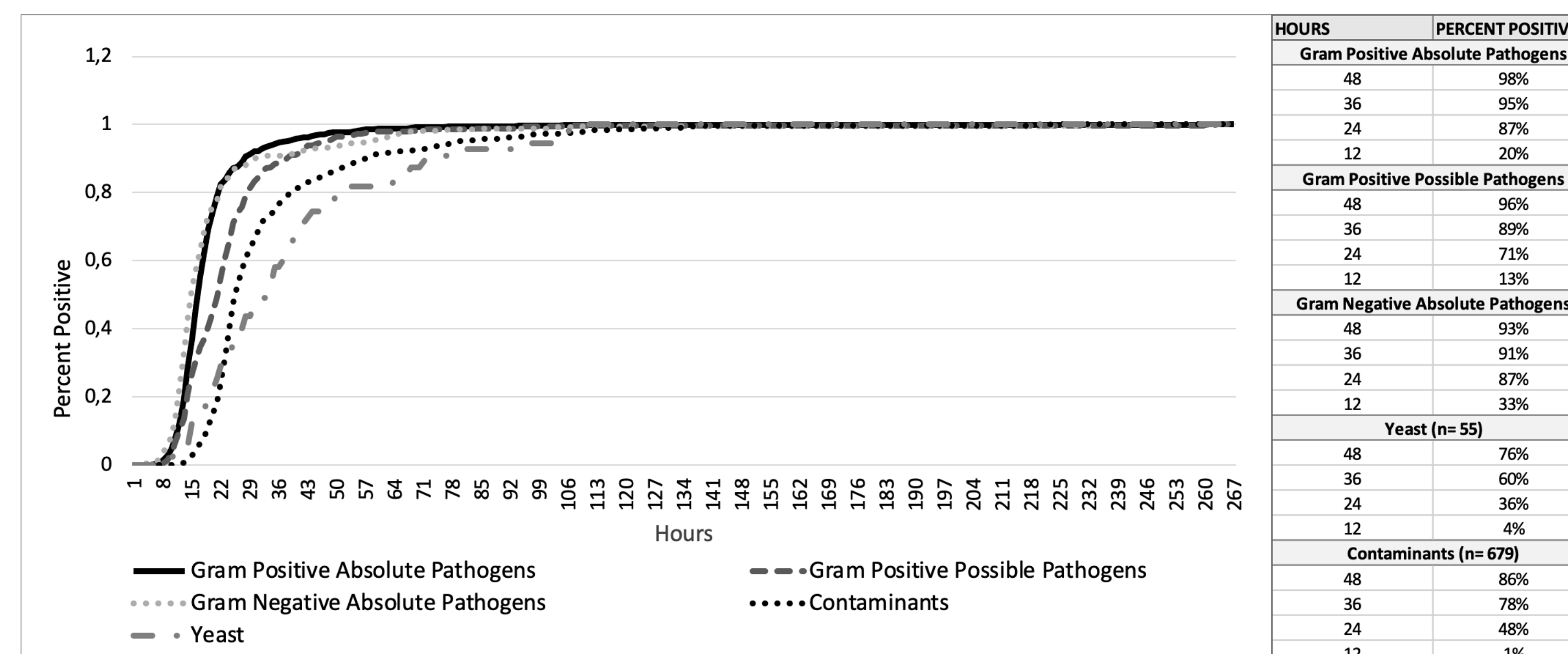


Figure 1: Kaplan-Meier curve comparing gram+ AP, gram- AP, yeast, gram+ possible pathogens, and contaminants in regard to percent positive over time

Conclusions

- **36 hours or less may be a sufficient period of observation** for empiric antimicrobials in suspected sepsis
- *TTP Comparisons:*
 - No statistically significant difference between **peripheral or CVC**
 - No statistically significant difference between **primary teams**
 - No statistically significant difference between **AP and common contaminants**

Implications

- Data **suggests antimicrobials may be discontinued or deescalated sooner** than previously thought in clinically stable patients
- Prolonged use of **vancomycin** and **cefepime** are largely driven by absolute gram+ and gram- pathogens but these were among the lowest TTPs
- *Future Directions:* Analyzing polymicrobial data, BCID, and implementing institutional practice changes

Disclosures

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References

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