

Challenges in Assessing Blood Stream Infection Clearance in Patients Receiving Extracorporeal Membrane Oxygenation

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Introduction

- Traditionally, Gram-negative bacteremia, unlike fungal and Gram-positive infections, do not require follow-up blood cultures to document clearance.
- Persistent bacteremia due to GN organisms is reported at around 2-6% of cases.
- The presence of large retained cannulas in ECMO create concern for persistent bacteremia.
- This study investigates whether certain variables are predictive of blood stream infections with positive repeat cultures (BSIPRC) and if BSIPRCs are associated with increased mortality.

Methods

- A retrospective chart review was performed on all positive blood cultures from patients receiving ECMO at Brooke Army Medical Center between September 2012 and October 2021.
- Blood cultures were excluded if they were determined to be contaminants by the primary team.
- BSIPRC was defined as re-isolation of the same organism on repeat blood cultures.
- Appropriate antimicrobials defined as a treatment regimen that isolate was susceptible to.

Results

Table 1: Patient and Blood Stream Infection General Characteristics

Age in years, <i>median (IQR)</i>	42 (30-48)
Male, <i>n (%)</i>	46 (77%)
Hours on ECMO, <i>median (IQR)</i>	537 (337-1124)
ECMO Indication, <i>n (%)</i>	
COVID-19	32 (53%)
Non-COVID-19 Pneumonia	10 (17%)
Burn Injury	6 (10%)
Interstitial Lung Disease	2 (3%)
Cardiomyopathy	2 (3%)
Vasculitis	2 (3%)
Other	6 (10%)
Types of Blood Stream Infection, <i>n (%)</i>	
Gram-positive	52 (60%)
Gram-negative	22 (25%)
Fungal	13 (15%)
Organisms Isolated, <i>n (%)</i>	
<i>Enterococcus faecalis</i>	22 (25%)
<i>Staphylococcus aureus</i>	17 (20%)
<i>Staphylococcus epidermidis</i>	8 (9%)
<i>Pseudomonas aeruginosa</i>	7 (8%)
<i>Candida albicans</i>	5 (6%)

Figure 1: Days of Positive Blood Cultures In Patients with BSIPRC

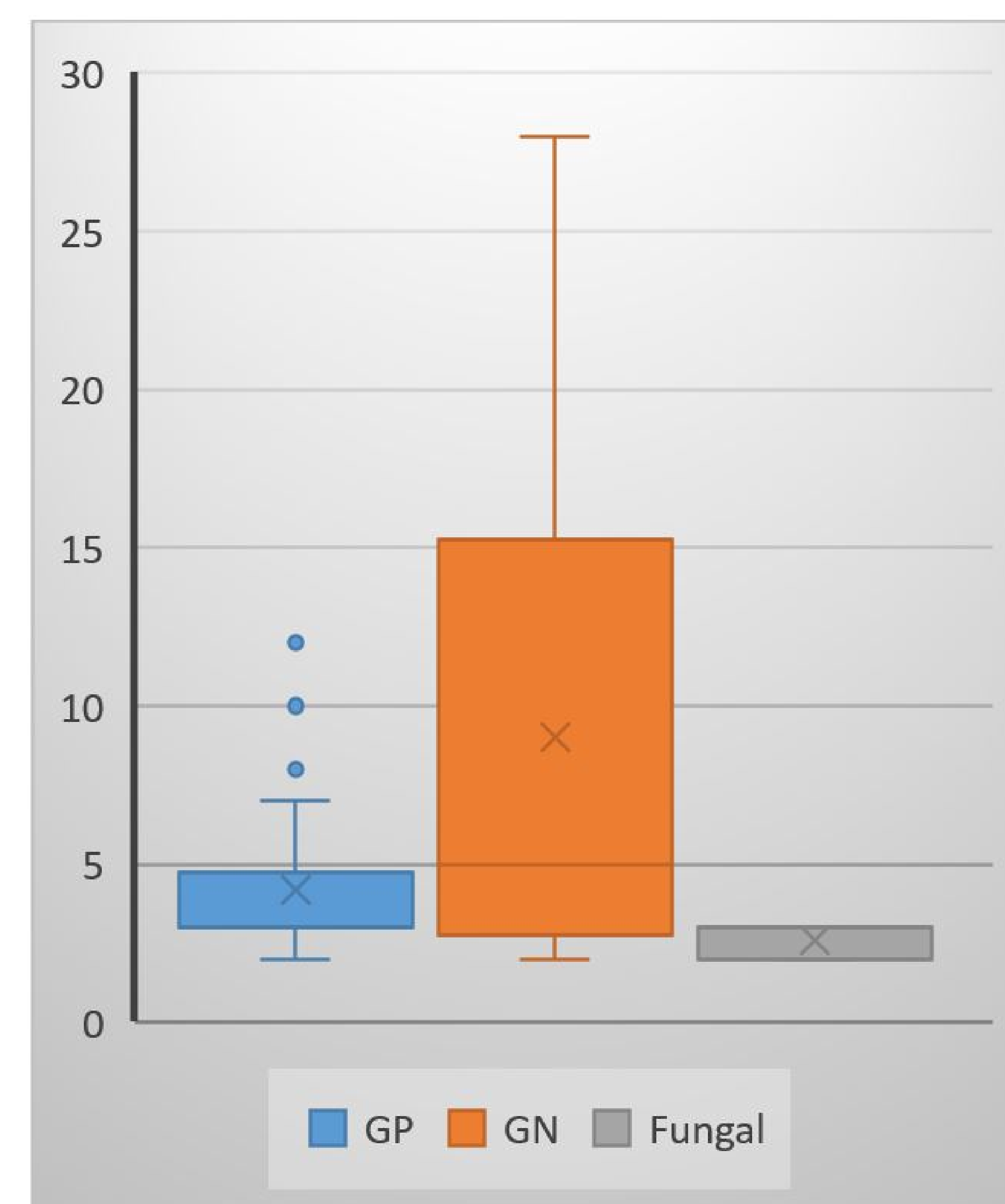


Table 2: Comparing Multiple Day vs Single Day Blood Stream Infections

	Multiple Days (n=35)	Single Day (n=45)	p-value
Age in years, <i>median (IQR)</i>	42 (31-48)	41 (29-47)	0.53
Male, <i>n (%)</i>	26 (74%)	38 (84%)	0.28
Types of Blood Stream Infection, <i>n (%)</i>			
Gram-positive	24 (48%)	26 (52%)	0.35
Gram-negative	6 (19%)	13 (81%)	0.007
Fungal	5 (45%)	6 (55%)	1.0
On appropriate antimicrobials day of repeat culture, <i>n (%)</i>	25 (71%)	39 (87%)	0.25
Max Temperature, <i>median (IQR)</i>	99.5 (98.8-100.3)	99.5 (99.0-100.6)	0.62
Leukocyte Count, <i>median (IQR)</i>	15.9 (11.6-21.2)	14.7 (10.2-19.7)	0.50
Vasopressor Requirement, <i>n (%)</i>	19 (54%)	22 (49%)	0.65
Receiving CRRT, <i>n (%)</i>	16 (46%)	20 (44%)	1
Intubated, <i>n (%)</i>	25 (71%)	28 (62%)	0.47
Days between BSI and ECMO cannulation, <i>median (IQR)</i>	12 (2-52)	12 (3-43)	0.97
Mortality, <i>n (%)</i>	10/24 (42%) *	11/30 (37%) *	0.78

Table 3: Gram-Negative vs Gram-Positive/Fungal Blood Stream Infections

	GN Infections (n=19)	GP + Fungal Infections (n=61)	p-value
Age in years, <i>median (IQR)</i>	39 (28 - 48)	40 (30 - 48)	0.65
Male, <i>n (%)</i>	18 (95%)	46 (75%)	0.10
On appropriate antimicrobials day of repeat culture, <i>n (%)</i>	15 (79%)	49 (80%)	1.0
Max Temperature, <i>median (IQR)</i>	99.6 (98.8 - 100.6)	99.7 (98.8 - 100.5)	0.58
Leukocyte Count, <i>median (IQR)</i>	16.9 (13.7 - 20.1)	15.9 (10.3 - 20.3)	0.54
Vasopressor Requirement, <i>n (%)</i>	14 (74%)	27 (44%)	0.03
Receiving CRRT, <i>n (%)</i>	12 (63%)	24 (39%)	0.11
Intubated, <i>n (%)</i>	14 (74%)	39 (64%)	0.58
Days between BSI and ECMO cannulation, <i>median (IQR)</i>	29.3 (6.0 - 53.5)	21.7 (3.0 - 45.4)	0.14
Mortality, <i>n (%)</i>	16/19 (84%) *	11/41 (27%) *	0.0001

*Last blood stream infection of patient only assessed

Conclusions

- There were no clinical findings that differentiated patients with single day vs multiple day BSIs
- BSI was associated with high mortality in patients with Gram-negative bacteremia.
- In the absence of clear predicative factors in demonstrating clearance of BSI and high incidence of positive repeat cultures being seen in Gram-negative BSIs (19%), repeat blood cultures may be necessary for all BSIs