Impact of Follow Up Blood Cultures on Outcomes of Patients with Gram-Negative Bloodstream Infections

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Background

- Importance of follow up blood cultures (FUBC) for *Staphylococcus aureus* bloodstream infections (BSI) is well known, but the role of FUBC in gram-negative BSI (GN-BSI) remains controversial.

Aim

- Evaluate association between obtaining FUBC and mortality in patients with GN-BSI.

Methods

- Adults with first episodes of community-onset GN-BSI hospitalized at Prisma Health-Midlands hospitals in Columbia, South Carolina, USA from January 1, 2010 to June 30, 2015 were identified

- Patients who died or were discharged from hospital within 72 hours of collection of index blood culture were excluded to minimize impact of survival and selection biases on results, respectively.

- FUBC were defined as repeat blood cultures obtained between 24 and 96 hours from initial blood culture.

- Cox proportional hazards regression was used to examine association between obtaining FUBC and 28-day all-cause mortality.
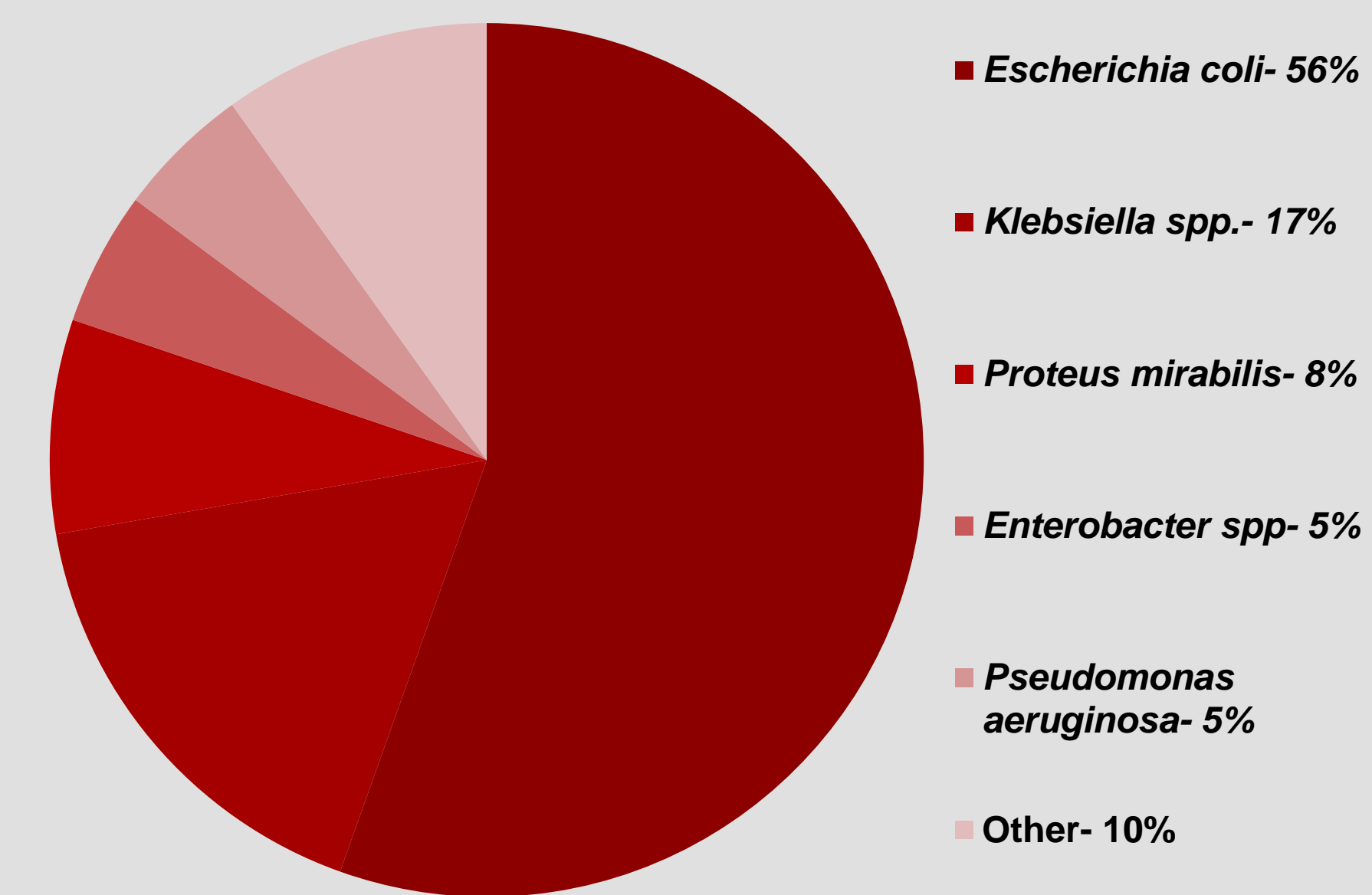
Results

- Among 766 patients with GN-BSI, 219 (28.6%) had FUBC obtained.

- 15 of 219 (6.8%) FUBC were persistently positive.

- Demographics and clinical characteristics of patients with GN-BSI are demonstrated in **Table 1.**

- *Escherichia coli* was the most common bloodstream isolate, followed by *Klebsiella* species **[Figure 1]**

- Mortality was significantly lower in patients who had FUBC obtained than in those who did not have FUBC (6.3% vs. 11.7%, log-rank p= 0.03) **[Figure 2]**

- After adjustments in multivariate Cox model, obtaining FUBC was independently associated with reduced mortality (HR 0.49, 95%CI: 0.25-0.90) **[Table 2]**

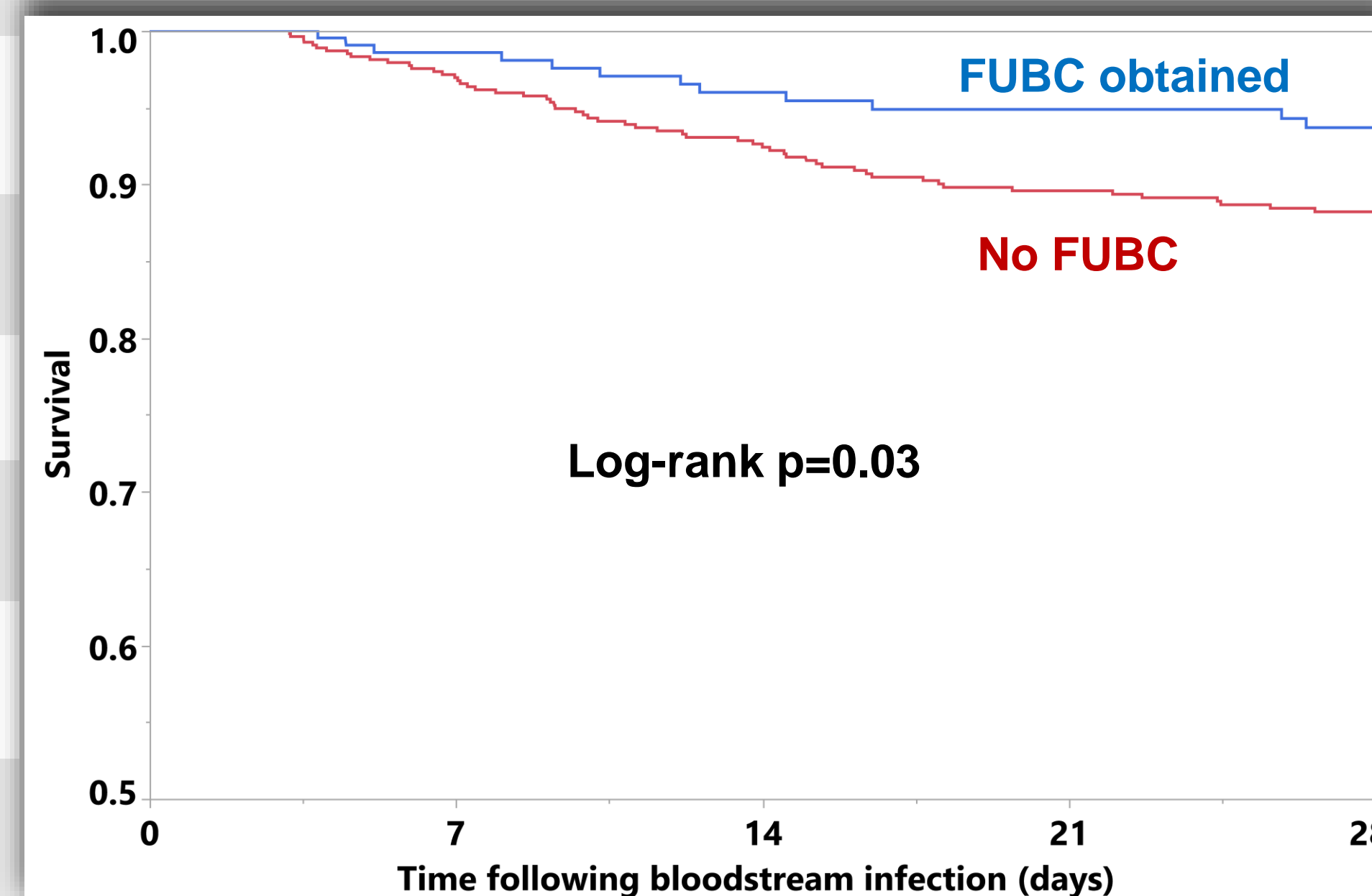## Results

Table 1: Demographics & Clinical Characteristics

Variable n (%)	FUBC (N=219)	No FUBC (N=547)	p-value
Age (y), median (IQR)	65 (52-75)	68 (56-79)	0.07
Female sex	68 (56)	315 (58)	0.72
Ethnicity			0.27
African American	110 (50)	263 (48)	
Caucasian	99 (45)	270 (49)	
Other	10 (5)	14 (3)	
Diabetes mellitus	91 (42)	232 (42)	0.83
End-stage renal disease	55 (25)	22 (4)	<0.01
Cancer	39 (18)	81 (15)	<0.30
Charlson comorbidity score, median (IQR)	2 (1-3)	2 (1-3)	0.46
Indwelling urinary catheter	11 (5)	54 (10)	0.03
Indwelling CVC	60 (27)	56 (10)	<0.01
Pitt bacteremia score, median (IQR)	1 (1-3)	2 (1-3)	0.36
Inappropriate empirical antimicrobial therapy	15 (7)	41 (7)	0.76
Urinary or CVC source	142 (65)	378 (69)	0.26

Figure 1: Microbiology of Bloodstream Infection

- *Escherichia coli* - 56%
- *Klebsiella spp.* - 17%
- *Proteus mirabilis* - 8%
- *Enterobacter spp* - 5%
- *Pseudomonas aeruginosa* - 5%
- Other - 10%

Figure 2: Kaplan-Meier Survival Curve

FUBC obtained

No FUBC

Log-rank p=0.03

Table 2: Independent Risk Factors for Mortality

Risk factor	Hazard ratio (95% CI)	p-value
Age (per decade)	1.35 (1.13-1.61)	0.02
Cancer	5.90 (3.53-9.84)	<0.001
Pitt bacteremia score (per point)	1.38 (1.26-1.50)	<0.001
Inappropriate empirical therapy	2.44 (1.21-4.46)	0.001
FUBC obtained by 96h	0.49 (0.25-0.90)	0.02

Conclusions

- Obtaining FUBC was independently associated with improved survival in hospitalized patients with GN-BSI.

- These observations are consistent with the results of recent publications from Italy and North Carolina supporting utilization of FUBC in the management of GN-BSI.

References

1. Giannella M, Pascale R, Pancaldi L, et al. Follow-up blood cultures are associated with improved outcome of patients with gram-negative bloodstream infections: retrospective observational cohort study. *Clin Microbiol Infect* 2020; 26: 897-903.

2. Maskarinec SA, Park LP, Ruffin F, et al. Positive follow-up blood cultures identify high mortality risk among patients with Gram-negative bacteraemia. *Clin Microbiol Infect* 2020; 26: 904-910.