



# Epidemiology and Clinical Significance of Persistent Bacteremia in Severely Burned Patients

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## Abstract

**Background:** Recent literature questions the utility of follow-up blood cultures (FUBC), especially for gram-negative bloodstream infections (BSIs). This has yet to be evaluated in the burn intensive care unit (BICU), where many BSIs are gram-negative. We evaluated the FUBC frequency, positivity rate, and clinical significance of persistent BSI (p-BSI) in BICU patients.  
**Methods:** Patients  $\geq$  18 years old admitted to the US Army Institute of Surgical Research for combat-related thermal burns from 1/2003-6/2014 were included. P-BSI was defined as the same organism isolated from initial and FUBC (within 1-5 days). Non-p-BSI (np-BSI) included patients without subsequent isolation of the same organism between 1-5 days post-positive blood culture. Exclusion criteria were initial blood culture with usual skin flora, polymicrobial BSI, fungemia, and death within 24 hours of notification of initial positive blood culture. Those factors significantly associated with mortality on univariate analysis were evaluated with binomial logistic regression (BLR).  
**Results:** Of 126 patients meeting inclusion criteria with BSI, 53 (42.1%) had p-BSI and 73 (57.9%) had np-BSI (table 1). 50 (67.6%) np-BSI patients had FUBC. P-BSI and np-BSI patients did not differ in age, gender, or race, but p-BSI and np-BSI patients had median total body surface area (TBSA) burns of 47 (IQR 34-63) and 35.3 (IQR 23.3-56.6), respectively ( $p=0.021$ ). P-BSI patients had longer hospitalizations, ICU stays, and intubations ( $p < 0.01$ ; table 1). Microbiology did not differ between p-BSI and np-BSI ( $p=0.517$ ). Notably, 20 (37.7%) p-BSI patients died compared to 8 (10.8%) np-BSI patients ( $p < 0.001$ ; table 2). BLR revealed that p-BSI ( $p=0.031$ ), TBSA ( $p < 0.001$ ), ISS ( $p=0.008$ ), and length of ICU stay ( $p=0.002$ ) and intubation ( $p < 0.001$ ) were independently significantly associated with mortality.  
**Conclusion:** P-BSI was common in this burn population. Severe burns and longer duration of hospitalization, ICU stays, and intubation, but not microbiology were associated with p-BSI. However, p-BSI (in addition to more traditionally identified risk factors like TBSA and duration of hospitalization, ICU, and ventilator days), was independently associated with increased mortality. FUBC may serve as an additional prognostic factor in burn patients with BSI.

## Introduction

- Traditionally identified risk factors for mortality in burn patients include total body surface area (TBSA) and duration of hospitalization, ICU, and ventilator days
- The utility of follow-up blood cultures (FUBC) for gram-negative bacteria has been recently questioned, but utility in specific populations, such as those severely burned, has yet to be examined
- We evaluated the frequency of FUBC, and frequency and clinical significance of persistent bloodstream infections (p-BSI) in patients admitted to the burn intensive care unit (BICU)

## Methods

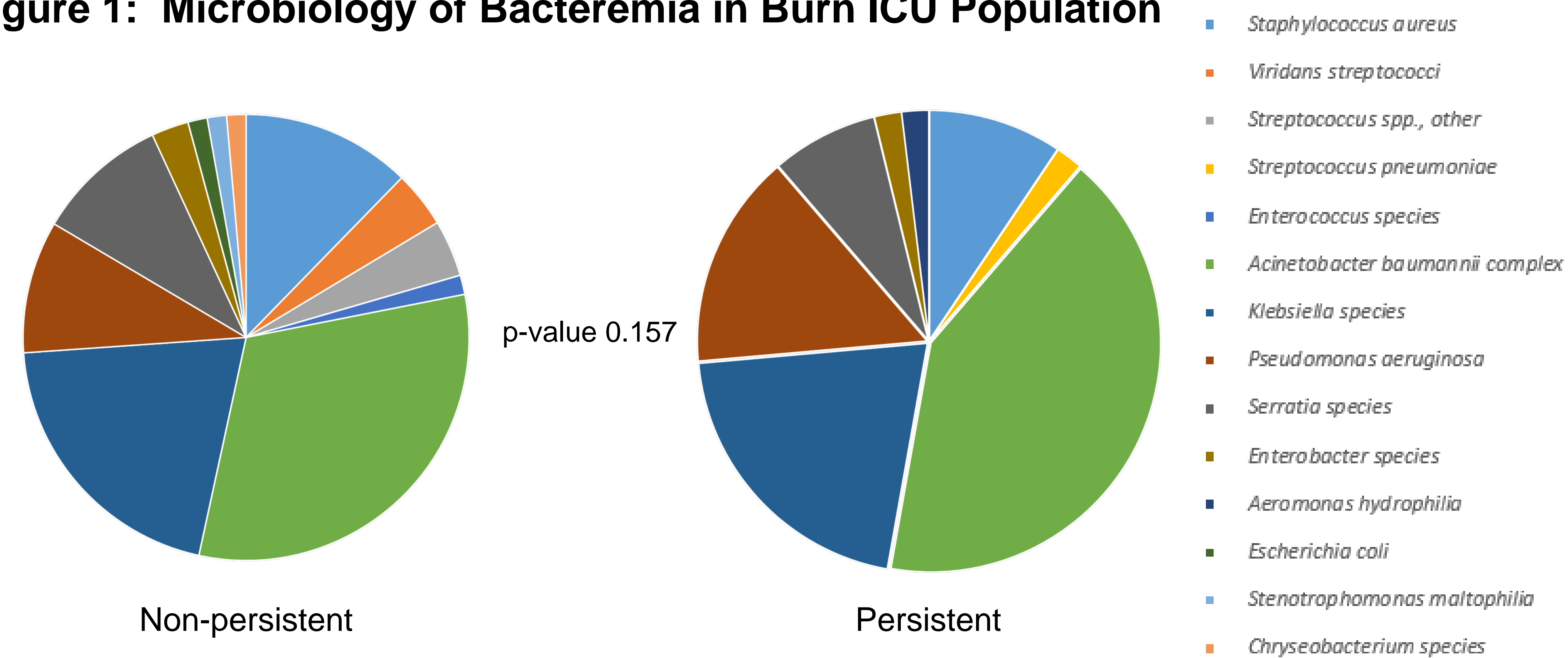
- Patients  $\geq$ 18 years old admitted to the US Army Institute of Surgical Research enrolled in the Combat Related Perineal Burns cohort from 1/2003-6/2014 were included
- P-BSI was defined as the same organism isolated from initial and FUBC within 1-5 days
- Non-p-BSI (np-BSI) included patients without isolation of the same organism between 1-5 days post-initial positive blood culture
- Exclusion criteria were initial blood culture with usual skin flora, polymicrobial BSI, fungemia, and death within 24 hours of notification of initial positive blood culture
- Those factors significantly associated with mortality on univariate analysis were evaluated with binomial logistic regression

## Results

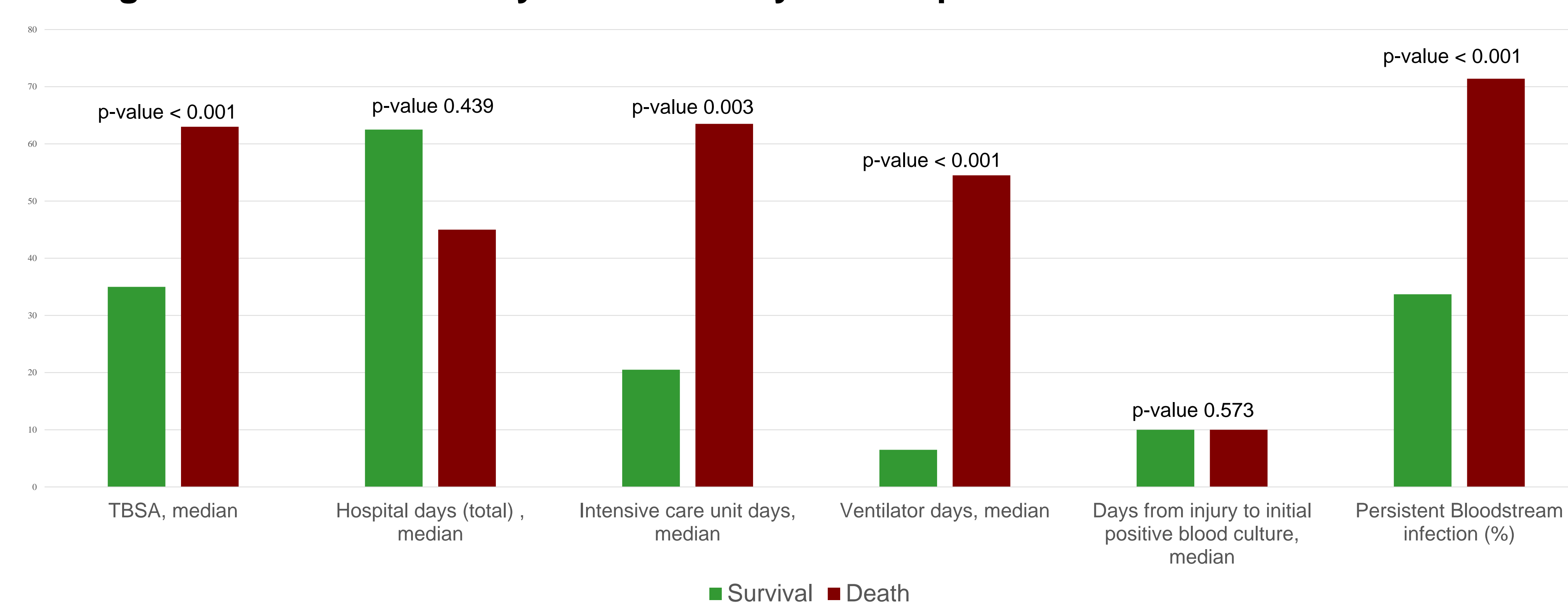
**Table 1: Demographics and clinical characteristics of patients without and with persistent bacteremia**

	np-BSI n=73 (%)	p-BSI n=53 (%)	p-value
Age, years, median (IQR)	24 (21-30)	23 (21-28)	0.620
Male gender	71 (97.3)	52 (98.1)	1.000
Race			
African American	11 (15.1)	4 (7.5)	0.640
Hispanic	7 (9.6)	6 (11.3)	
Other	15 (20.5)	12 (22.6)	
Caucasian	40 (54.8)	31 (58.5)	
TBSA, median (IQR)	35 (23-54)	47 (34-63)	0.016
Second degree burns, median (IQR)	7 (3-11.5)	6 (2-11.5)	0.389
Third degree burns, median (IQR)	27.5 (11-46.5)	41 (25-58.5)	0.007
Injury Severity Score, median (IQR)	25 (18-34)	29 (25-41)	0.046
Inhalational injury	31 (42.5)	24 (45.3)	0.753
Days from injury to arrival, median (IQR)	3 (2-4)	3 (2-4)	0.853
Hospital days (total) , median (IQR)	51 (31-88)	79 (43-138)	0.008
Intensive care unit days, median (IQR)	18 (11-41)	48 (17-90)	<0.001
Ventilator days, median (IQR)	6 (3-15)	17 (6-55)	<0.001

**Figure 1: Microbiology of Bacteremia in Burn ICU Population**



**Figure 2: Univariate analysis of mortality in burn patients with bloodstream infections**



## Results, continued

Binomial logistic regression revealed that the following were independently associated with mortality:

- TBSA ( $p < 0.001$ )
- Injury severity score ( $p=0.008$ )
- length of ICU stay ( $p=0.002$ )
- intubation ( $p < 0.001$ )
- p-BSI ( $p=0.031$ )

## Conclusions

- More severe burns and longer duration of hospitalization, ICU stays, and intubation were associated with persistent bloodstream infections
- Microbiology of persistent and non-persistent bloodstream infections did not differ significantly
- Persistent bloodstream infection was independently associated with increased mortality
- As persistent bloodstream infection is associated with increased mortality in burn patients, follow-up blood cultures may serve as an additional prognostic factor in this patient population

## References

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## Statements

This study was conducted under a protocol reviewed and approved by the US Army Medical Research and Materiel Command Institutional Review Board and in accordance with the approved protocol.

The views expressed are those of the authors and do not reflect the official views or policy of the Department of Defense or its Components