

# Characteristics Associated with Mortality in Patients with Gram Negative Rod Bloodstream Infections Requiring ICU Level of Care

Alaina Shukdinas, PharmD<sup>1</sup>, Nikunj Vyas, PharmD, BCPS<sup>1</sup>, Shereef Ali, PharmD, BCPS, BCCCP<sup>1</sup>, Alissa Werzen, MD<sup>2</sup>, Sungwook Kim, PhD<sup>3</sup>

1. Department of Pharmacy, Jefferson Health - New Jersey, 2. Department of Infectious Diseases, Jefferson Health - New Jersey, 3. Department of Statistics, University of Sciences

## Purpose

The purpose of this study was to identify characteristics associated with mortality in ICU level of care patients who are diagnose with gram negative rod (GNR) bacteremia.

## Introduction

- Blood stream infections are associated with mortality rates up to 30% annually.
- Occurrence of bloodstream infections in North America is up to 677,000 cases per year.
- Mortality is higher with multidrug resistant blood stream infections but can be decreased by up to 14% when treated with appropriate antimicrobial regiments at initiation of therapy.
- Known risk factors associated with mortality in bacteremia cases within the ICU include older age, and reduced immune status. besides appropriate antimicrobial regiments, there is little other evidence to suggest what factors may affect mortality in patients with bloodstream infections.

## Methods and Analysis

### Study Design:

- This was an IRB approved retrospective investigational study performed at Jefferson Health New Jersey, a 607 bed 3-hospital health system in southern New Jersey, from November 1<sup>st</sup> 2020 to December 31<sup>st</sup> 2021.

### Primary Endpoint:

- The Primary objective of this study identify risk factors associated with mortality in patients with GNR bacteremia requiring ICU level of care

### Secondary Endpoint:

- The secondary objective was to evaluate if time to appropriate therapy and microbiologic cure had impact on in patient mortality in patients with GNR bacteremia requiring ICU level of care

### Inclusion Criteria:

- Patients aged  $\geq 18$  years of age, requiring ICU level of care, at least one blood culture demonstrating growth of one of the following:
  - A lactose-fermenting coliform, a non lactose-fermenting coliform, or a pseudomonas species.

### Exclusion Criteria:

- Patients with metastatic cancer, patients who left the hospitalization against medical advice, or a blood culture determined to be a contaminant.

### Statistical Analysis:

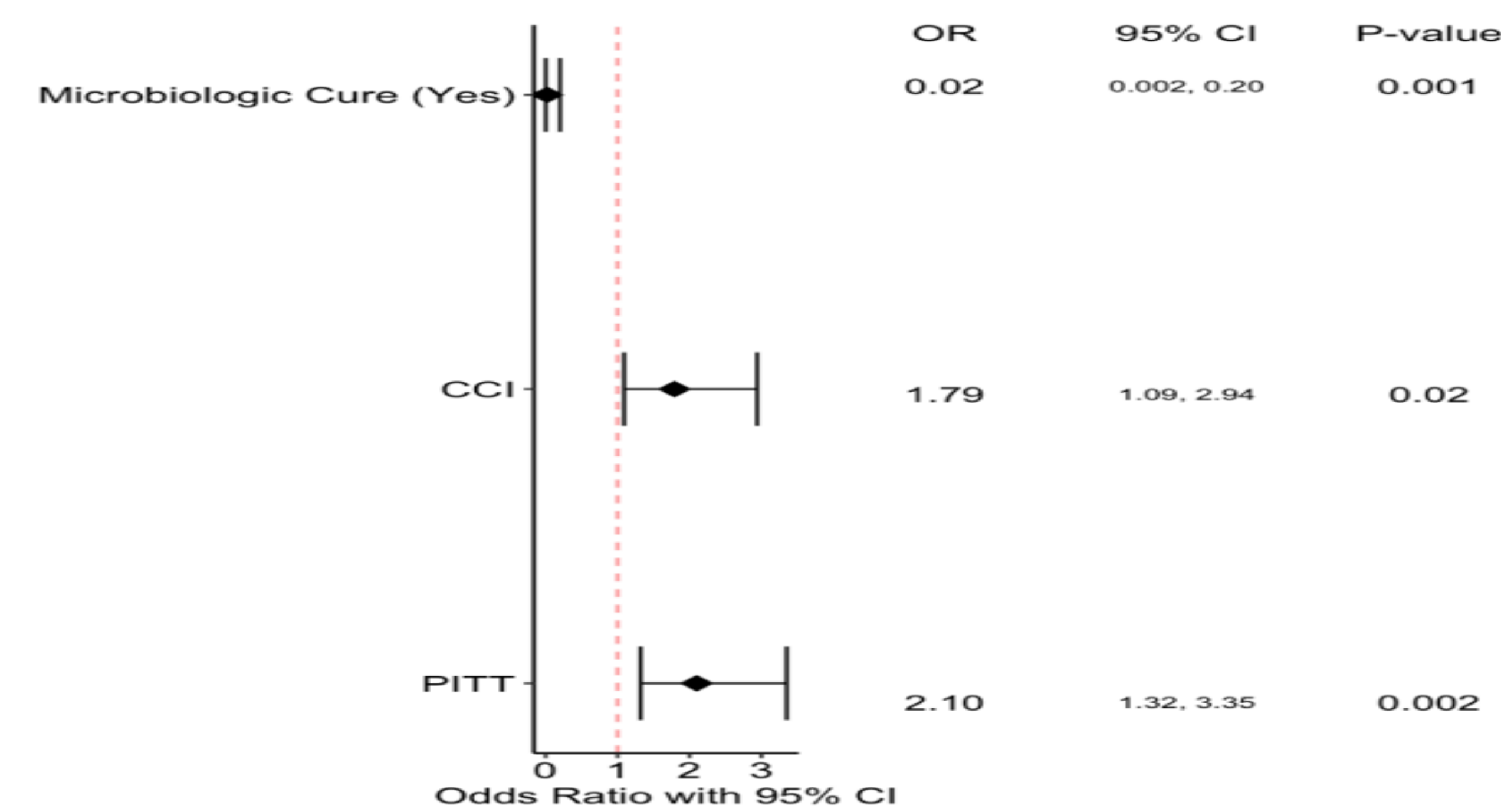
- Demographics were evaluated with descriptive statistics, the primary objective was evaluated with a multi-logistic regression analysis, secondary objectives with categorical data were evaluated by chi squared and continuous data was evaluated through Student's T test

## Results

**Table 1. Patient Demographics**

	Total Population N= 79
Sex, F (%)	44%
Age (years), median, range	69 (25-94)
Septic Shock on Presentation	81%
Immunocompromised	15%
Isolate source, %	
Urinary Tract	41%
Lower Respiratory Tract	27%
Intra-abdominal	8%
Other	25%
Organisms (%)	
<i>Escherichia coli</i>	38%
<i>Klebsiella pneumoniae</i>	20%
<i>Pseudomonas spp.</i>	13%
Other	29%
Charlson Comorbidity Index (median, range)	4 (0-10)
APACHE II Score (median, range)	22 (7-50)
Pitt Bacteremia Score (median, range)	4 (0-12)
qSOFA Score (median, range)	2 (0-3)

**Figure 1. Primary Outcome**



**Table 2. Primary Outcome**

	Alive	Expired	P-value
Septic Shock (%Y)	70%	88%	0.08
CCI Score, median (range)	4 (0-10)	5 (1-10)	0.05
APACHE II, median (range)	16 (7-14)	26 (7-50)	0.0004
PITT Bacteremia Score, median (range)	2 (0-7)	5 (0-12)	0.0001
qSOFA score, median (range)	1 (0-3)	2 (0-3)	0.0001

## Results (Continued)

**Table 3. Secondary Outcome**

	Alive	Expired	P-value
Time to appropriate therapy, hours (SD)	7.0 (+/- 14.5)	4.5 (+/- 12.8)	0.43
Microbiologic Cure (%Y)	100%	33%	0.0001
Time to microbiologic Clearance, hours (SD)	53.3 (+/- 35.9)	51.1 (+/- 42.2)	0.86

## Discussion

- Overall mortality in patients suffering from GNR bacteremia requiring ICU level of care suffer from high rates of inpatient mortality.
- Patients with higher comorbidity burden were more likely to suffer from all-cause inpatient mortality.
- Time to appropriate therapy did not correlate with improved clinical outcomes., however, patients who achieved microbiologic cure were more likely to survive.
- Time to appropriate therapy and time to microbiologic cure were similar between expired and alive patients.
- CCI, APACHE II, PITT Bacteremia an qSOFA scores all showed direct correlation and utility in assessing risks of increased mortality in this patient populations.

## Conclusion

- Patients with higher CCI, APACHE II, Pitt Bacteremia and qSOFA scores with GNR bacteremia requiring ICU level of care had higher association with all-cause mortality.
- When these high risk factors were present, time to appropriate therapy did not have an impact on inpatient mortality.
- These tools should be utilized as part of admission criteria to better assess mortality risks in patients GNR bacteremia requiring ICU level of care.

## Disclosure

The authors of this presentation have nothing to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation.

## References

- Hattori H, Maeda M, Nagatomo Y, et al. Epidemiology and risk factors for mortality in bloodstream infections: A single-center retrospective study in Japan. *Am. J. Infect. Control.* 2018 Dec;46(12):e75-e79. doi: 10.1016/j.ajic.2018.06.019. Epub 2018 Aug 29. PMID: 30172607.
- Goto M, Al-Hasan MN. Overall burden of bloodstream infection and nosocomial bloodstream infection in North America and Europe. *Clinical Microbiology and Infection.* 2013 June;19(6):501-509.
- Leibovici L, Shraga I, Drucker M, et al. The benefit of appropriate empirical antibiotic treatment in patients with bloodstream infection. *J Intern Med.* 1998;244:379-386.
- Lachhab Z, Frikh M, Maleb A, Kasouati J, Doghmi N, Ben Lahlou Y, Belefquih B, Lemnouer A, Elouennass M. Bacteraemia in Intensive Care Unit: Clinical, Bacteriological, and Prognostic Prospective Study. *Can J Infect Dis Med Microbiol.* 2017;2017:4082938. doi: 10.1155/2017/4082938. Epub 2017 Mar 19. PMID: 28408938; PMCID: PMC5376421.