Evaluating the Impact of Reported Beta-Lactam Allergies on Clinical Outcomes in Gram-Negative Bloodstream Infections

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Background

- Beta-lactam (BL) antibiotic allergies are commonly reported and account for ~ 15% of documented inpatient allergies
- More than 90% of these individuals do not demonstrate true allergy and can safely tolerate these agents
- Beta-lactams provide ideal therapeutic options for infections caused by Gram-negative organisms due to their spectrum of activity, increased efficacy, and safety profile
- Inaccurate allergy documentation can result in deleterious clinical consequences including receipt of suboptimal antibiotic therapy, healthcare-associated infections, and bacterial resistance
- Limited data exists examining the impact of this allergy label on clinical outcomes in Gram-negative bloodstream infections (BSIs)

Hypothesis

- Patients with documented BL allergy and BSIs due to Enterobacterales and *Pseudomonas* species (spp.) experience worse clinical outcomes

Outcomes

Primary Outcome:

- Time to effective therapy
  - First regimen with activity (*in vitro*) against causative organism, as determined by phenotypic susceptibilities

Secondary Outcomes:

- Proportion of patients receiving effective initial antibiotic therapy
- Intensive care unit (ICU) transfer within 72 hours following initial antibiotic administration
- Hospital length of stay (LOS) following initial antibiotic administration
- Thirty-day mortality
- Treatment-related adverse events

Methods

Study Design:

- Single center, retrospective, cohort
- Population: Patients with bloodstream infections caused by Enterobacterales or *Pseudomonas* spp.
- Timeframe: January 1st, 2017 to August 31st, 2021

Definitions:

- Beta-lactam allergy: allergy to any BL prior to index blood culture excluding monobactams
- Immunoglobulin E (IgE) mediated hypersensitivity reactions: rash, hives, bronchospasm, angioedema, anaphylaxis
- Time to therapy:
  - $Time_0$: Time of initial blood culture collection
  - $Time_1$: Time to administration of effective antibiotic dose

Inclusion Criteria	Exclusion Criteria
• Age ≥ 18 years • Hospitalized at the Hospital of the University of Pennsylvania • Index blood culture(s) with growth of Enterobacterales or *Pseudomonas* spp. ○ Index = 1st episode of bacteremia per patient per admission • Receipt of intravenous antibiotics with Gram-negative activity	• Receipt of empiric/systemic Gram-negative antibiotic therapy at an outside hospital prior to transfer • Receipt of systemic Gram-negative antibiotic therapy for a concomitant infection at time of index blood culture collection • Cystic fibrosis

Table 1. Key Baseline Characteristics	No Beta-Lactam Allergy % (N=90)	Beta-Lactam Allergy % (N=30)	*P* Value
IgE-mediated reaction	-	86.7 (26)	-
Intraabdominal source of infection	35.6 (31)	27.6 (8)	0.431
Median Quick Pitt Bacteremia Score (IQR)	1 (0-2)	1 (0-2)	0.831
Consultation Infectious Disease Allergy	28.9 (26) 0 (0)	36.7 (11) 0 (0)	0.404 -

Results

FIGURE 1. PATIENTS ON INITIAL EFFECTIVE THERAPY

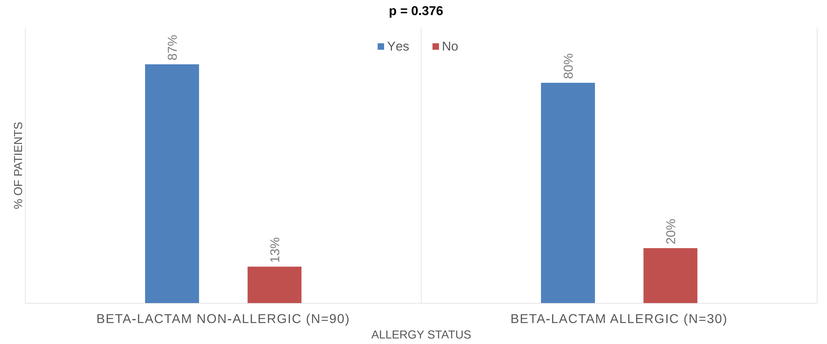

Table 2. Outcomes	No Beta-Lactam Allergy % (N=90)	Beta-Lactam Allergy % (N=30)	*P* value
Primary Outcome			
Time to effective therapy, minutes, median (IQR)	103 (27-775)	162 (20-824)	0.865
Secondary Outcomes			
Hospital length of stay, days, median (IQR)	9 (5-24)	8.5 (5-20)	0.981
ICU transfer within 72 hours of initial antibiotic therapy	30 (24)	25.9 (7)	0.687
30-day all-cause mortality	21.1 (19)	31 (9)	0.273
Clostridioides difficile infection	4.4 (4)	6.7 (2)	0.128

Discussion

- Increased time to effective therapy and mortality rates were observed among patients with reported BL allergies
- This study has potential limitations including the possibility of inaccurate allergy history documentation, inter-prescriber variability, along with the study being underpowered to detect statistical significance

References

1. Blumenthal K, Li Y, Hsu JT, et al. Outcomes from an inpatient beta-lactam allergy guideline across a large US health system. *Infect Control Hosp Epidemiol*. 2019 May;40(5):528-535
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Disclosures

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