Presentation Type:
Poster Presentation
Subject Category: MDR GNR
Mortality Risk Factors in Cases of Carbapenem-Resistant Pseudomonas aeruginosa Susceptible to Traditional Antipseudomonal β-lactams
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Background: Carbapenem-resistant Pseudomonas aeruginosa (CRPA) can cause healthcare-associated infections associated with poor outcomes. Unlike other carbapenem-resistant organisms, CRPA is often susceptible to at least one traditional anti-pseudomonal β-lactam antibiotic including cefepime, ceftazidime, and piperacillin-tazobactam ("S-CRPA"). This study aimed to determine if treatment of S-CRPA infections with a novel β-lactam/β-lactamase inhibitor (βL/ βLI) as opposed to a traditional anti-pseudomonal β-lactam which may increase the likelihood of resistance, was associated with improved clinical outcomes. **Methods:** We retrospectively analyzed all incident S-CRPA isolates in a four-hospital academic healthcare system in Atlanta, GA from 1/1/2013 to 9/30/2022. Patients receiving either a βL/ βLI or a traditional antipseudomonal β-lactam for definitive antibiotic therapy, defined as having received at least 3 days of the specified antibiotic between 4-14 days after the culture was obtained, were included. We excluded patients with cystic fibrosis. We compared patients who received definitive treatment with a βL/ βLI to those who received definitive therapy with a traditional anti-pseudomonal β-lactam. The primary outcome was mortality (in-hospital mortality and those discharged to hospice). We performed univariable and multivariable logistic regression analysis using SAS 9.4. A causal diagram was created to a priori to identify potential confounders for inclusion in a multivariate analysis including Elixhauser comorbidity score, specimen source, β-lactam resistance pattern, and whether the patient had a hospital-onset infection (culture obtained ≥3 days after admission) **Results:** There were 258 patients with S-CRPA who received definitive treatment with either βL/ βLI (n=22) or traditional anti-pseudomonal β-lactams (n= 236). Those who received definitive βL/ βLI therapy had higher Elixhauser comorbidity scores, longer lengths of stay, were more likely to have bacteremia, and more likely to have resistance to one or more traditional anti-pseudomonal β-lactams than those treated with traditional anti-pseudomonal β-lactams (Figure 1). In the univariable analysis, patients who received definitive BL/ BLI therapy had increased mortality and patients without bacteremia and hospital-onset infection had decreased mortality, but the associations were not statistically significant (Figure 2). In the multivariable analysis, treatment with traditional anti-pseudomonal β-lactams was not significantly associated with mortality (OR 1.9 95%CI 0.6 – 5.7). **Conclusions:** In patients with S-CRPA we did not observe a significant difference in mortality comparing definitive antibiotic treatments. A low number of S-CRPA isolates treated with a βL/ βLI limited our ability to assess the true effect of traditional anti-pseudomonal β-lactams versus βL/ βLI on mortality.

Figure 1: Case Characteristics by Type of Treatment Received

	Treatment with βL/βLI (n = 22)	Treatment with Traditional Antipseudomonal β-lactam (n= 236)	Total (n = 258)
Patient Characteristics			
Age (median, IQR)	57.5 (50.0 – 68.0)	62 (49.5 – 70.0)	62 (50.0 – 70.0)
Race			
African American/Black	7 (31.8)	125 (53.0)	132 (51.2)
Caucasian/White	11 (50.0)	90 (38.1)	101 (39.2)
Other	1 (4.5)	11 (4.7)	12 (4.7)
Unknown/Unreported	3 (13.6)	10 (4.2)	13 (5.0)
Length of stay in days (median, IQR)	32.5 (23 – 83)	28.5 (14 – 58.5)	29.5 (14 – 60)
Elixhauser Comorbidity Scores (median, IQR)	29 (19 – 38)	21 (5 – 32)	21.5 (5 -32)
Microbiologic Characteristics			
Specimen Source			
Blood	4 (18.2)	14 (5.9)	18 (7.0)
Respiratory	7 (31.8)	92 (39.0)	6 (35.9)
Urine	5 (22.7)	73 (30.9)	214 (33.9)
Other	6 (27.3)	57 (24.2)	63 (24.4)
Days from admission to culture (median, IQR)	12.5 (1.6 – 43.5)	7.5 (1.0 – 24.3)	8 (1.0 - 25.4)
Hospital onset S-CRPA	14 (63.6)	134 (56.8)	148 (57.4)
β -lactam resistance pattern			
S. to Ceftazidime, Cefepime, and Pip/Tazo	8 (36.4)	138 (58.5)	146 (55.7)
S. to 2 β-lactam	4 (18.2)	66 (28.0)	70 (27.1)
S. to 1 β-lactam	9 (40.9)	28 (11.9)	37 (14.3)
Missing (Pip/Tazo)	1 (4.6)	4 (1.7)	5 (2.0)
Outcome			
In-hospital mortality or discharge to hospice	6 (27.3)	43 (18.2)	49 (19.0)

IQR = Interquartile range. S. = Susceptible. βL/βLI = novel β-Lactam/β-Lactamase inhibitor. S-CRPA = Carbapenem-resistant *Pseudomonas aeruginosa* sensitive to traditional antipseudomonal β-lactams. Traditional anti-pseudomonal β-lactam = cefepime, ceftazidime, piperacillin/tazobactam. Pip/Tazo = Piperacillin/Tazobactam. Hospital Onset = culture obtained >3 days after admission.

Figure 2: Univariate and adjusted odds ratios for in-hospital mortality or discharge to hospice

	Odds Ratio for Outcome (95% CI)	P-value	[a]Adjusted Odds Ratio for Outcome (95%CI)	P-value
Treatment				
Traditional β-Lactam	Ref.		Ref.	
Novel β-lactam/β-lactamase inhibitor	1.68 (0.62 – 4.6)	0.31	1.90 (0.64 – 5.67)	0.25
Patient Characteristics				
Age	0.98 (0.97 – 1.00)	0.07	--	--
Elixhauser Comorbidity Score	1.00 (0.98 - 1.02)	0.91	1.00 (0.98 – 1.03)	0.78
Length Of Stay	1.00 (0.99 – 1.00)	0.22	--	--
Microbiologic Characteristics				
Specimen Type				
Blood	Ref.		Ref.	
Respiratory	0.46 (0.14 – 1.49)	0.20	0.50 (0.15 – 1.66)	0.26
Urine	0.62 (0.19 – 2.00)	0.42	0.61 (0.18 – 2.05)	0.42
Other	0.74 (0.23 – 2.44)	0.62	0.70 (0.21 – 2.39)	0.59
β -lactam resistance pattern				
S. to ceftazidime, cefepime and piperacillin/tazobactam	Ref.		Ref.	--
S. to 2 β-lactam	1.30 (0.65 – 2.62)	0.45	1.32 (0.65 – 2.69)	0.44
S. to 1 β-lactam	0.69 (0.25 – 1.93)	0.47	0.62 (0.18 – 2.10)	0.41
Missing (Piperacillin/Tazobactam)	1.10 (0.12 – 10.25)	0.9	0.71 (0.21 - 2.44)	0.95
Hospital Onset S-CRPA	0.54 (0.29 – 1.00)	0.05	0.56 (0.28 – 1.11)	0.10

Ref.= Reference. S.= Sensitive. S-CRPA = Carbapenem-resistant *Pseudomonas aeruginosa* sensitive to traditional antipseudomonal β-lactams. a) Model was adjusted for age, Elixhauser Comorbidity Score, Specimen type, β-lactam resistance pattern and Hospital Onset S-CRPA. Variables included were chosen a priori based on our causal model.

Antimicrobial Stewardship & Healthcare Epidemiology 2025;5(Suppl. S2):s116
doi:10.1017/ash.2025.358

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Poster Presentation
Subject Category: MDR GNR
High prevalence of multidrug resistant organisms in a pediatric post-acute care unit
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Background: The prevalence of multidrug-resistant organisms (MDROs) in the post-acute care setting is well-documented in adults. Few studies have investigated the prevalence in children. **Methods:** We performed a prospective, single-center study including children with tracheostomy tubes age 2 months to 17 years admitted to a 24-bed post-acute care unit within a quaternary care children's hospital. Index respiratory and stool specimens were obtained within two weeks of admission. Subsequent specimens were obtained weekly thereafter for up to eight weeks. MDROs were identified using methicillin-resistant Staphylococcus aureus (MRSA), extended-spectrum beta-lactamase Enterobacterales (ESBL-E), and carbapenem-resistant Enterobacterales (CRE) selective media (CHROMagar, Hardy Diagnostics). ESBL-E and CRE colonies were additionally plated onto MacConkey agar and only lactose fermenting organisms were considered positive. Index MDRO status was defined using week one samples; if not available, week two results were substituted. New MDRO acquisition was defined as a negative index MDRO culture with a subsequent positive culture. **Results:** A total of 47 children were enrolled. Median age was 9 months (interquartile range [IQR], 5-31 months) and median hospital length of stay prior to post-acute care admission was 89 days (IQR 27, 158). The most common pre-existing medical conditions were congenital heart disease (19, 40%), severe neurologic impairment (19, 40%), and prematurity **Conclusion:** MDROs are common in children hospitalized in the post-acute care unit. Nearly half of this cohort acquired CRE following