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Path to Resistance: Risk Factors Associated With Carbapenem-Resistant Pseudomonas aeruginosa

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Journal of Patient-Centered Research and Reviews (JPCRR) is a peer-reviewed scientific journal whose mission is to communicate clinical and bench research findings, with the goal of improving the quality of human health, the care of the individual patient, and the care of populations.
Background: An estimated 51,000 health care-associated Pseudomonas aeruginosa infections occur in the United States annually. More than 13% are secondary to non-carbapenem multidrug-resistant strains, which result in 400 yearly deaths. Traditional risk factors for resistance include ICU stay, mechanical ventilation, previous hospitalization and major comorbidities. As microbes evolve, risk factors also may evolve.

Purpose: To determine if traditional and/or new risk factors for P. aeruginosa resistance are valid and predictive of infection with carbapenem-resistant P. aeruginosa.

Methods: We retrospectively studied inpatients and outpatients ≥ 18 years old who presented to an Aurora Health Care facility with a positive P. aeruginosa culture during 2014. Cultures were obtained from the ACL Laboratories database, and patient medical records were reviewed in Epic. Chi-squared test with Yates correction and two-sample t-tests were performed on categorical and continuous variables, respectively. Binary regression was used for multivariable modeling. Significance was associated with P<0.05.

Results: Study population (N=1,763) characteristics were: mean age 68.0, body mass index 30.4 kg/m², 51.2% female sex, and 89.3% white race. Resistance to imipenem or meropenem (14.0%) on univariable analysis was associated with younger age (66.0 vs 68.3 years, P=0.027), hospitalized patients (19.7% vs 8.6%, P<0.0001), male sex (16.0% vs 12.0%, P=0.017), nonwhite race (23.5% vs 12.3%, P<0.0001), respiratory culture (30.9% vs 12.1%, P<0.0001), history of pulmonary disease (19.4% vs 12.9%, P=0.005), history of congestive heart failure (18.6% vs 13.0%, P=0.016), history of multidrug resistance (33.3% vs 13.6%, P=0.003) and recent surgery (17.8% vs 12.2%, P=0.002), as well as transfer from institution, Foley catheter, vasopressor treatment, central/PIC lines, mechanical ventilation, ICU admission, and bedridden status (all P<0.0001). In multivariable modeling, nonwhite race, respiratory culture, recent transfer, vasopressor use and central/PIC lines were significant. Only 0.57% of strains were resistant to the six traditional non-carbapenem drugs and both carbapenems.

Conclusion: Demographic and traditional risk factors, as well as respiratory cultures, were predictive of carbapenem resistance. Such information may guide initial antibiotic treatment of P. aeruginosa. Fortunately, less than 1% of strains were resistant to all drugs tested. Further studies looking at change in outcome while incorporating these risk factors in determination of empiric coverage for patients should be performed.