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Using DRIP to *Drop* Unnecessary Broad-Spectrum Treatments for Pneumonia

Community acquired pneumonia (CAP) is one of the most common reasons for admission to the hospital.[1] Despite the fact that Pseudomonas and MRSA are rare pathogens in CAP, broad-spectrum therapy (e.g., an anti-MRSA or an anti-pseudomonal agent) is commonly prescribed.[2,3] Clinical practice guidelines for treatment of CAP were updated in the Fall of 2019 and they finally shut the door on using the HCAP definition as a predictor of pneumonia from resistant pathogens. Instead, patient history of prior infection takes precedence, and any patient with history of MRSA or *P. aeruginosa* should receive empiric coverage targeting the previously isolated pathogen. For all others, the guidelines advocate using locally validated risk factors to determine which patients should receive empiric broad-spectrum agents to cover these organisms. Based on current evidence, recent hospitalization and receipt of parenteral antibiotics are the most likely risk factors.[4] Determining local risk factors can be challenging as many patients with CAP, particularly those with mild disease, never have a respiratory culture performed. This lack of data and reliance on previous HCAP definitions leads to many patients receiving broad-spectrum therapy despite this new guidance. This newsletter describes a novel bedside method to optimize the use of broad-spectrum antimicrobials in patients admitted for CAP.

In 2013, Webb et al. derived and validated a clinical prediction tool called the drug resistance in pneumonia (DRIP) score (see Table 1).[5] The authors found this score to be more sensitive and specific in their cohort than the HCAP definition at detecting drug resistant pathogens. They have since reported on the electronic implementation of the DRIP score in patients with CAP and found it to be more effective for guiding appropriate broad spectrum antibiotic use in CAP.[6]

Table 1. Drug Resistance in Pneumonia Score

Factors	Points
Major Risk Factors	
Antibiotic use, prior 60 days	2
Long-term care resident	2
Tube feeding	2
History of infection with a drug-resistant pathogen (prior 12 months)	2
Minor Risk Factors	
Hospitalization, prior 60 days	1
Chronic pulmonary disease	1
Poor functional status	1
Gastric acid suppression	1
Wound care	1
MRSA colonization (prior 12 months)	1
Total possible	**14**

The score was integrated into their electronic clinical decision support system in October of 2014 to provide guidance for empiric antimicrobial recommendations in CAP. For patients at low risk for drug-resistant bacteria (DRIP score of < 4), the clinical decision support system recommended ceftriaxone plus azithromycin, and for patients at high risk (DRIP score ≥ 4), the recommendation was for an anti-pseudomonal beta-lactam plus vancomycin and azithromycin. For patients with DRIP scores ≥ 4 or admitted to the ICU, the decision support added a recommendation to perform a nasal swab for MRSA PCR assay to aid in de-escalation of the empiric vancomycin when negative.[6]

Outcomes measured were broad spectrum antibiotic usage (DOT/1,000 patient days), 30-day all-cause mortality, length of stay, and total direct cost after the implementation of the DRIP score compared to the period when recommendations were based on the HCAP definition (2012). Bacteria were defined as drug-resistant if resistant to the CAP guideline recommended therapy (e.g., 3rd-generation cephalosporin or respiratory fluoroquinolones). There were 1,122 patients evaluated in the HCAP period (2012) and 1,047 in the DRIP score period (2015).

Drug-resistant pathogens were recovered from 3.2% of patients in 2012 and 2.8% in 2015, whereas broad-spectrum antimicrobials were administered in 40.1% of admissions in 2012 vs 33.0% in 2015 (absolute risk reduction [ARR] of 7.2%, 95% CI 3.1-11.2; p<.0001). The proportion of patients receiving anti-pseudomonal therapy decreased from 29.8% to 20.9% (ARR 8.9%, 95% CI, 5.2-12.5; p<.0001), and anti-MRSA therapy decreased from 34.8% to 29.4% (ARR 5.3%, 95% CI, 1.4%-9.2%; p=.01). Ultimately, a significant reduction in the primary outcome, broad-spectrum antimicrobial use, was observed (OR, 0.62; 95%CI, 0.39-0.98; p=0.039). The secondary outcomes, mortality, length of stay, and cost, were similar between groups. Inadequate initial empirical antibiotics were prescribed in 1.1% of patients in 2012 compared with 0.5% of patients in 2015 (p = 0.12). Test performance at a scoring cut off of ≥4 had a sensitivity of 70.6%, specificity of 82.2% and positive and negative predictive values of 8.4% and 99.2% respectively.

Incidence of *Pseudomonas* in CAP:

In studies describing the etiology of CAP, *P. aeruginosa* is responsible for **only ~1% of non-severe** and **5% of severe CAP**.[10–12]

CAP from *P. aeruginosa* occurs mainly in individuals with compromised immune system (e.g., HIV infection, transplant recipients, neutropenia, or immunomodulatory agents), those with recent antibiotic use, structural lung abnormalities such as cystic fibrosis or bronchiectasis, and those with repeated exacerbations of COPD and steroid use.[13,14]

As seen in many other studies in pneumonia, broad-spectrum antimicrobials were commonly prescribed to patients with CAP, and the use was 10-fold higher than the incidence of drug-resistant pathogens. Use of the DRIP score in combination with nasal swab for MRSA PCR was found to reduce the use of broad-spectrum antibiotics in pneumonia without any increase in percentage of inadequate therapy. This finding further highlights opportunities that may exist to use the DRIP score to complement targeted antimicrobial stewardship efforts to reduce antimicrobial prescribing for pathogens such as Pseudomonas and MRSA. There are other innovative methods to implement this clinical prediction tool rather than integrating into an electronic clinical decision support system as they did in this study. We encourage you to work with your DASON liaison to help decide whether applying these interventions would optimize usage of anti-pseudomonal beta-lactams and anti-MRSA agents at your facility.

Clinical Pearl:

The risk of infection with *P. aeruginosa* depends much more on patient specific risk factors and **not** on contact with various aspects of the healthcare system, such as residence in a nursing home or long-term care facility.

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