Patients Hospitalized With Pneumonia: Determining the Need for Broad-Spectrum Antibiotic Therapy

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(See the Major Article by Aliberti et al, on pages 470–8.)

Physicians are increasingly faced with the dilemma of deciding between broad-spectrum empiric antimicrobial therapy and narrow-spectrum treatment for patients hospitalized with serious infections. In the balance of this dilemma are the need to treat serious infections with an initial appropriate antibiotic regimen to optimize the likelihood of a good clinical outcome and the need to avoid unnecessary antimicrobial exposure to minimize the emergence of antimicrobial resistance [1]. A number of different strategies for antimicrobial stewardship can be used to achieve this balance [2]. In this issue of Clinical Infectious Diseases, Aliberti et al report a prospective observational study identifying risk factors for infection with multidrug resistant (MDR) bacteria in patients hospitalized with pneumonia [3]. These authors found that hospitalization in the preceding 90 days, together with residency in a nursing home or extended care facility (ECF), were the strongest independent predictors for infection with MDR pathogens. The authors concluded that physicians treating hospitalized patients with pneumonia should be familiar with these MDR risk factors in order to guide the appropriate use of empiric antimicrobial therapy.

The findings from Aliberti et al confirm our prior observation that specific risk factors can be used to determine the presence of infection with MDR bacteria in patients hospitalized with pneumonia [4]. We have subsequently refined the accuracy of our prediction model using the following weighted point assignments: 4 – recent hospitalization, 3 – admission from a nursing home or ECF, 2 – chronic hemodialysis, 1 – critically ill [5]. As a screening test for MDR bacteria, a score of zero had a high negative predictive value (84.5%) and could potentially be used to avoid the unnecessary use of broad-spectrum antibiotics.

The clinical relevance of studies such as that by Aliberti et al is their provision of a strategy for healthcare workers to balance the need to treat infections appropriately while avoiding the overuse of broad-spectrum antibiotics. Implicit in such a strategy is that physicians should be aware of the risk factor profile of the patients they are treating as well as the local patterns of MDR infection. Absence of risk factors for infection with MDR bacteria, especially in areas where the prevalence of such pathogens is low, should result in the primary use of more narrow-spectrum empiric antibiotic regimens for hospitalized patients with pneumonia. However, in critically ill patients where there is doubt or uncertainty regarding the presence of infection with MDR bacteria, a strategy of de-escalation after starting with a broad-spectrum regimen may be prudent [5, 6].

Since the publication of the 2005 update of the American Thoracic Society and Infectious Diseases Society of America nosocomial pneumonia guidelines, which incorporated for the first time the concept of healthcare-associated pneumonia (HCAP) [6], numerous studies and reviews have provided original data on the concept of HCAP as an infection occurring outside of the hospital setting that is often attributed to MDR pathogens [3–5, 7–20]. These pathogens are frequently not susceptible to the initial antimicrobial regimens recommended in guidelines for community-acquired pneumonia [21]. Many physicians are also unaware of the importance of the criteria for healthcare-associated infections and their clinical relevance for distinguishing patients at risk for MDR bacteria from those with community-acquired infections [22]. Because patients classified as having HCAP are often heterogeneous, and the studies published on HCAP sometimes differ in setting and methodology, some authors have criticized the overall concept of HCAP [23–25]. However, the number of investigations from diverse geographic locations supporting the clinical utility of the HCAP criteria for predicting infection with MDR pathogens adds credence to the
validity of HCAP as a distinct category of pneumonia [9, 14–16, 18, 26]. The most recent studies of HCAP have helped to further refine the relative importance of the individual HCAP criteria for identifying the presence of MDR infections, thus making them more useful for clinical decision making [3–5, 18, 26].

It is evident that hospital or healthcare exposure creates an opportunity for pathogens not commonly present in the community to colonize patients. This phenomenon seems to be primarily caused by the widespread use of antibiotics, often for prolonged periods of time, that select for MDR pathogens [27]. Admission to a room previously occupied by a methicillin-resistant Staphylococcus aureus (MRSA)–positive patient or a vancomycin-resistant Enterococcus (VRE)–positive patient significantly increases the odds of acquiring MRSA and/or VRE [28]. Additionally, prolonged MRSA carriage is relatively common, with 40% of patients who became colonized by MRSA during hospitalization remaining colonized for a median time of 7.4–8.5 months [29, 30]. New MRSA carriers also have a high risk of developing sterile-site MRSA infections in the year following acquisition [31, 32].

Hospitalized patients can also become colonized by MDR gram-negative bacilli. It has been estimated that 8% of patients newly admitted to general medical wards become carriers of extended-spectrum β-lactamase (ESBL)–producing Enterobacteriaceae during their hospitalization [33]. Risk factors for rectal carriage of ESBL-producing Enterobacteriaceae include nursing home residence, recent antibiotic treatment, and concomitant nasal carriage of MRSA and/or ESBL-producing Enterobacteriaceae [33]. Zahar et al found that the median duration of ESBL carriage was 132 days and that patients readmitted between 6 months and 1 year after their last positive culture were still positive 50% of the time [34].

Residents of nursing homes and ECFs also appear to be an important reservoir of MDR pathogens and therefore contribute to the influx of MDR bacteria into the hospital setting [35–38]. Studies performed >10 years ago at Veterans Affairs facilities in the United States showed a high prevalence of MRSA colonization among residents, with rates ranging from 13% to 35% [39, 40]. Major sites of colonization were nares, wounds, and decubitus ulcers [39, 40]. European studies have also evaluated the prevalence of MRSA colonization in ECFs and described ranges of 8.6%–22% of inhabitants [41–45]. Elderly residents living in ECFs are also at high risk of colonization and infection with MDR gram-negative bacteria [46]. Diagnoses of advanced dementia and nonambulatory status were significant risk factors for harboring these pathogens [46]. Subsequent studies have confirmed these observations [38, 47–49]. However, El-Solh et al found that patients with both antibiotic exposure in the previous 6 months and an activity of daily living (ADL) score ≥12.5 showed a 90% probability of having infection caused by MDR bacteria, while patients without these risk factors had a 0% probability of infection with MDR bacteria [50].

In summary, empiric antibiotic therapy for serious infections in hospitalized patients requires careful clinical consideration in order to provide appropriate initial coverage for the majority of patients infected with MDR pathogens. Equally important, the absence of risk factors for MDR pathogens, especially preceding hospitalization or admission from a nursing home or ECF, should at least question the need for initial broad-spectrum antibiotic therapy. A good understanding of the patient’s risk factor profile for infection with MDR bacteria and the prevailing local patterns of infection with these pathogens is required to balance the needs of the patient (administration of appropriate antibiotic therapy) with those of the hospital environment (preventing the emergence of antibiotic resistance). Last, physicians caring for patients with pneumonia need to be aware of the changing global patterns of pathogens accounting for these infections, which may require rethinking of current antibiotic practice patterns [51].

Notes

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