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Adherence to Therapeutic Guidelines for Patients with Community-Acquired Pneumonia in Australian Hospitals

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ABSTRACT: Community-acquired pneumonia (CAP) is a significant cause of morbidity and mortality, particularly in elderly patients, and is associated with a considerable economic burden on the healthcare system. The combination of high incidence and substantial financial costs necessitate accurate diagnosis and appropriate management of patients admitted with CAP. This article will discuss the rates of adherence to clinical guidelines, the use of severity scoring tools and the appropriateness of antimicrobial prescribing for patients diagnosed with CAP. The authors maintain that awareness of national and hospital guidelines is imperative to complement the physicians' clinical judgment with evidence-based recommendations. Increased use of pneumonia severity assessment tools and greater adherence to therapeutic guidelines will enhance concordant antimicrobial prescribing for patients with CAP. A robust and multifaceted educational intervention, in combination with antimicrobial stewardship programs, may enhance compliance of CAP guidelines in clinical practice in Australia.

KEYWORDS: community-acquired pneumonia, pneumonia severity tools, clinical guidelines, antimicrobial prescribing

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Introduction

Community-acquired pneumonia (CAP) is an infection of the lung parenchyma, acquired in the community, as distinguished from hospital-acquired pneumonia, and is classically associated with a novel radiological infiltrate and typical clinical symptoms.[1] Current Australian epidemiological data are scarce[2]; however, in other Western countries, CAP occurs in approximately 5.6–6.11 per 1000 of the adult population per year.[3] The etiologic agents responsible for CAP are most commonly *Streptococcus pneumoniae, Mycoplasma pneumoniae, Chlamydophilia pneumoniae*, or respiratory viruses.[2,4] *S. pneumoniae* is the most common etiologic agent responsible for CAP in both hospitalized patients and patients in the community.[5] Although *Staphylococcus aureus* is now an uncommon cause of CAP, it is associated with a more severe clinical presentation.[4] Although pneumonia involves a nonsterile body site and is therefore not usually thought of as an invasive infection, up to 25% of cases are associated with bacteremia and can therefore be described as invasive.[6]

CAP is a significant cause of morbidity and mortality, particularly in elderly patients,[7] and is associated with a considerable economic burden on the healthcare system.[8] The combination of high incidence and substantial financial costs necessitates accurate diagnosis and appropriate management of patients admitted with CAP.[7] This article discusses the rates of adherence to clinical guidelines, the use of severity scoring tools, and antimicrobial prescribing for patients diagnosed with CAP.

Pneumonia severity scores have been demonstrated to improve clinical care for patients with CAP by providing independent predictors of disease severity.[9] Documented use of severity assessment tools may enhance concordant

antimicrobial prescribing. The CORB (Confusion, Oxygen Saturation, Respiratory Rate, Blood Pressure) score is an Australian-derived and validated tool that is used to predict the requirement for intensive respiratory or vasopressor support and inpatient mortality in patients with CAP.[10] CORB score parameters include confusion, oxygen saturation ≤90%, respiratory rate ≥30/min, and systolic blood pressure <90 mmHg or diastolic blood pressure ≤60 mmHg.[10] A CORB score of 0 indicates mild CAP, 1 indicates moderate CAP, and ≥2 indicates severity CAP. Although it may not be as sensitive as other pneumonia severity scores, such as CURB-65 or SMART-COP, its advantages are that it is simple, uses predictive variables, does not require invasive testing, removes bias regarding patient age, and can be performed early in the course of the clinical assessment.[10]

The CORB score can be used to guide appropriate antibiotic prescribing for patients with CAP. However, a study by Maxwell et al reveals that documented use of a pneumonia severity score in Australian hospitals is extraordinarily low (5%).[11] Numerous studies have revealed that there is poor recording of CAP severity scores in clinical documentation.[12–14] At our institution, the CORB score was not documented in any of the medical records of over 250 patients admitted with CAP in 2012. This may reflect a lack of awareness or perceived usefulness of pneumonia severity assessment tools.[11]

The Australian Government has produced guidelines that recommend (empiric) treatment for CAP based on pneumonia severity. For mild CAP, which can usually be treated in the outpatient setting, amoxicillin orally is recommended, while doxycycline or clarithromycin are recommended for atypical organisms such as *M. pneumoniae*.[15] For moderate CAP, the Australian guidelines recommend the use of benzylpenicillin IV plus either doxycycline or clarithromycin orally.[15] In patients with severe CAP, the Australian guidelines recommend the use of intravenous benzylpenicillin with gentamicin and azithromycin IV/oral.[15] If there is a documented penicillin allergy, IV ceftriaxone plus azithromycin is recommended.[15]

Adherence to empiric antibiotic guidelines for the management of patients with CAP has been demonstrated to reduce mortality and morbidity,[16–18] shorten the length of hospital admission,[19] and decrease healthcare costs.[20] However, there is substantial evidence to suggest that national guidelines on the management of patients with CAP are often poorly adhered to in clinical practice.[13,21–24]

In fact, many of the antimicrobial regimens used in Australian hospitals are not consistent with national antibiotic guidelines and are excessively broad in spectrum. In our institution, we found that greater than 50% of patients with CAP received broad-spectrum antibiotics, such as a third-generation cephalosporin (ceftriaxone) as either monotherapy or in combination with another antibiotic. Similarly, a recent Australian study demonstrated that the use of broad spectrum cephalosporins in patients with mild–moderate CAP contributed to a number of discordant prescribing episodes.[9] Other Australian studies have produced similarly concerning results, whereby the use of third-generation cephalosporins is discordantly high and not in keeping with national and hospital guidelines.[11,25] The widespread use of third-generation cephalosporins results in significant ecological adverse effects; specifically, the selection of drug-resistant organisms and the development of colonization or infection with multidrug-resistant organisms.[26]

Penicillin-resistant strains are defined according to the minimal inhibitory concentration as defined by the United States of America National Committee for Clinical and Laboratory Standards. In non-meningeal infections, penicillin resistance is defined as an MIC of ≥8 μg/mL.[27] Resistant pneumococcus is a global problem, especially in parts of Europe, such as France and Spain, and is linked to widespread broad spectrum antibiotic use.[28] Mera et al noted that non-vaccine serotypes have acquired multidrug resistance at a rate that is proportional to the serotype placement process.[29]

Despite the global increase in pneumococcal resistance and high rates of penicillin resistance measured internationally, rates of penicillin resistance remain low in Australia. In 2001, 12% of all invasive pneumococcal isolates were penicillin resistant,[30] while in 2006, 10.6% of invasive pneumococcal isolates were resistant or of intermediate susceptibility to penicillin, a figure which is lower than the resistance rates in 2005.[31] Although susceptibility to penicillin does vary geographically within Australia, benzylpenicillin remains a sensible component of first-line treatment for patients with CAP.

The national guidelines state that patients with mild CAP can be managed as outpatients using oral antibiotics and reviewed within 24–48 hours.[15] Numerous studies demonstrate that the national CAP guidelines regarding the decision for hospital admission has been poorly adhered to.[19,32] The cost of inpatient care for a patient with CAP is more than 20 times greater than that of a patient managed in the outpatient setting.[33] Apart from the financial costs, hospitalization increases the risk of thromboembolic complications and superinfection by more virulent or resistant nosocomial pathogens.[34]

Notwithstanding severity scoring systems and hospital guidelines, the use of physicians' clinical judgment, including consideration of patient age, co-morbidities, and social circumstances, should be used when evaluating the need for hospital admission and appropriate antibiotic prescribing. Scoring tools are designed to predict mortality; however, the risk of death does not necessarily equate with the need for inpatient hospitalization.[35] Social circumstances, co-morbid conditions, and failure of outpatient antibiotic therapy are not accounted for in most of the severity scoring systems; however, these factors are critical when making site of care decisions regarding inpatient hospitalization.[35,36] Therefore, pneumonia severity scoring systems should be used in conjunction with clinical judgment to inform treatment decisions.

Barlow et al.[37] evaluated the barriers to therapeutic guideline adherence for the management of patients with CAP.

These factors included, but were not limited to, inadequate education on antimicrobial therapy, insufficient knowledge regarding pneumonia severity assessment tools, and self-reported unfamiliarity with therapeutic guidelines.[37] Other studies have demonstrated that, in order to enhance compliance with therapeutic guidelines, undergraduate education on the topic of antimicrobials needs to be more applicable to clinical practice and hospital guidelines need to be presented in a user-friendly and easily accessible format.[38,39]

Awareness of national and hospital guidelines is imperative to complement the physicians' clinical judgment with evidence-based recommendations. Increased use of pneumonia severity assessment tools and greater adherence to therapeutic guidelines will enhance concordant antimicrobial prescribing for patients with CAP. A robust and multifaceted educational intervention, in combination with antimicrobial stewardship programs, may enhance compliance of CAP guidelines in clinical practice in Australia. The antimicrobial stewardship programs should utilize various strategies, such as formulary management, prior approval, and post-prescribing evaluation.[40] A multidisciplinary approach to antimicrobial stewardship may enhance appropriate antimicrobial prescribing, improve patient outcomes, and ensure cost-effective therapy.[40]

Author Contributions

Conceived the concepts: NF, NA, AH. Analyzed the data: NF, NA, HW, IG. Wrote the first draft: NA. Contributed to the writing of the manuscript: NA, NF. Agree with manuscript results and conclusions: All authors. Jointly developed the structure and arguments for the paper: NF, NA. Made critical revisions and approved final version: NF, NA. All authors reviewed and approved of the final manuscript.

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