CHEST Recent Advances in Chest Medicine

Recent Advances in Community-Acquired Pneumonia*

Inpatient and Outpatient

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Community-acquired pneumonia (CAP) is a common illness, with the majority of patients treated out of the hospital, yet the greatest burden of the cost of care comes from inpatient management. In the past several years, the management of these patients has advanced, with new information about the natural history and prognosis of illness, the utility of serum markers to guide management, the use of appropriate clinical tools to guide the site-of-care decision, and the finding that guidelines can be developed in a way that improves patient outcome. The challenges to patient management include the emergence of new pathogens and the progression of antibiotic resistance in some of the common pathogens such as *Streptococcus pneumoniae*. Few new antimicrobial treatment options are available, and the utility of some new therapies has been limited by drug-related toxicity. Ancillary care for severe pneumonia with activated protein C and corticosteroids is being studied, but recently, inpatient care has been most affected by the development of evidence-based "core measures" for management that have been promoted by the Centers for Medicare and Medicaid Services, which form the basis for the public reporting of hospital performance in CAP care. ***(CHEST 2007; 131:1205–1215)***

Key words: community-acquired pneumonia; drug resistance; methicilllin-resistant pneumonia; severe pneumonia; severity index; *Staphylococcus aureus*; *Streptococcus pneumoniae*

Abbreviations: APACHE = acute physiology and chronic health evaluation; CAP = community-acquired pneumonia; CMS = Centers for Medicare and Medicaid Services; CRP = C-reactive protein; CURB-65 = confusion, elevated BUN level, elevated respiratory rate, low systolic or diastolic BP, and age > 65 years of age; DRSP = drug-resistant *Streptococcus pneumoniae*; HCAP = health-care-associated pneumonia; MRSA = methicillin-resistant *Staphylococcus aureus*; OR = odds ratio; PCT = procalcitonin; PSI = pneumonia severity index; SARS = severe acute respiratory syndrome

In the past several years, clinical advances in community-acquired pneumonia (CAP) have emerged in a number of areas that can aid in the care of both inpatients and outpatients. Major clinical issues for all CAP patients have been the changing spectrum of etiology, including drug-resistant *Streptococcus pneumoniae* (DRSP), methicillin-resistant *Staphylococcus aureus* (MRSA), and emerging viral pathogens (*eg*, severe acute respiratory syndrome [SARS] and avian influenza). In addition, there has been an interest in better understanding the natural history and prognosis of CAP by trying to define the role of prognostic scoring systems in guiding the decision about site of care (*ie*, inpatient, outpatient, or ICU) and by applying a number of serum markers (*ie*, C-reactive protein [CRP] and procalcitonin [PCT]) to prognosticate outcome. New antimicrobial agents have become available for both outpatients and inpatients, in several antibiotic classes, but the utility of some of these agents has been limited by new findings of toxicities that were not evident in registration trials of these medications (*ie*, gatifloxa-

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cin and telithromycin) prior to their approval for clinical use. In addition to new antimicrobial agents, paradigms for therapy have been advanced by a focus on better defining the optimal duration of therapy and on the role of adjunctive therapies for those with severe illness, including corticosteroids and activated protein C.

One of the major factors that has dominated the inpatient care of CAP in the United States has been the promulgation of "core measures," or standards of care, which have been supported by the Centers for Medicare and Medicaid Services (CMS) and the Joint Commission on the Accreditation of Healthcare Organizations. Success in achieving these measures has been publicly reported for the performance of individual hospitals, and it seems possible that these data could serve in the future as the basis for "pay for performance," thereby impacting the financial well- being of a specific health-care institution. Interest in these core measures has refocused attention on assuring that all patients receive evidence-based antibiotic choices, that they receive timely administration of antibiotics, that there is a proper use of blood cultures prior to antibiotic administration, and that each patient is current with pneumococcal and influenza vaccinations.

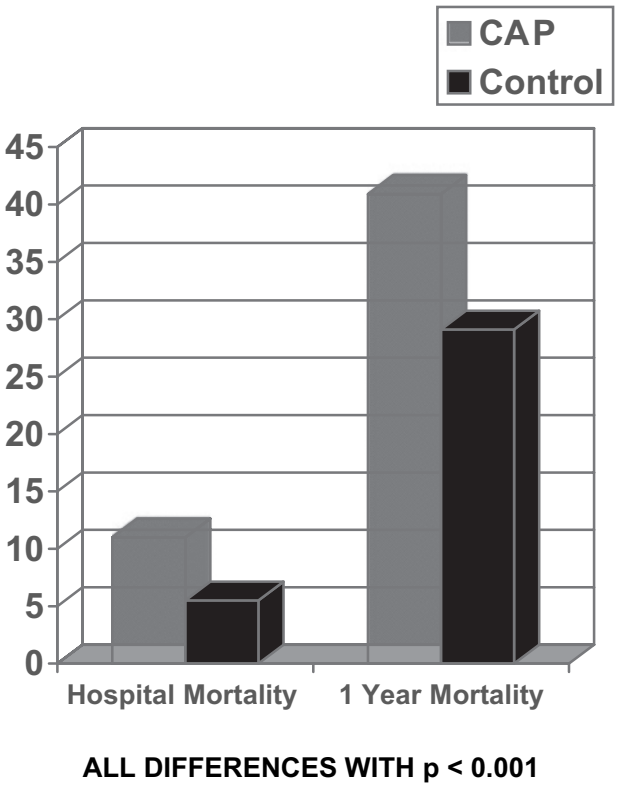

FIGURE 1. In this case-control study of Medicare patients with CAP, with five control subjects matched for age, sex, and race with each case, the in-hospital and 1-year mortality rates for patients with CAP were significantly higher than those for control subjects. From Kaplan et al.[1]

Understanding the Natural History and Prognosis of CAP

Most of the studies of CAP have examined the short-term outcomes of the illness, focusing on either 30-day or inpatient mortality. Kaplan and colleagues[1] used a Medicare database to perform a matched case-control study to evaluate the long-term impact (*ie*, 1-year mortality rate) of older patients with CAP. The authors compared 158,960 CAP patients to 794,333 hospitalized control subjects (5 for each patient) matching for age, sex, and race. While the in-hospital mortality rate for CAP patients exceeded that of control subjects (11% vs 5.5%, respectively), the differences in the 1-year mortality rate were even more dramatic (40.9% vs 29.1%, respectively) [Fig 1]. The high mortality rate was impressive, and the differences could not be explained by the types of underlying disease; the findings persisted, even if only the hospital survivors were examined. These findings make it clear that CAP is much more than a self-limited illness for those who survive, and that the 1-year mortality rate of elderly patients with CAP is four times higher than the in-hospital mortality rate, with one in three survivors of CAP dying in the subsequent year, following hospital discharge. The exact cause of death was not examined in the study, but the population was generally elderly, with 85% being >65 years of age; nursing home patients were included, and 70% had a comorbid medical illness. The findings expand on an older Scandinavian study[2] that reported a lower 10-year survival rate in CAP patients $>$ 60 years of age than in an age-matched population without CAP. In that study, the relative risk for death in CAP patients was 1.5 compared to those without CAP, and the 10-year survival rate was 39%, compared to 61% in the non-CAP population, with many of the deaths related to cardiovascular disease and subsequent pneumonia. All of these data make it very clear that CAP requiring hospital admission is a disease that should be prevented, whenever possible, in the elderly.

Prognostic Scoring Systems

The optimal management of CAP requires the prompt recognition of seriously ill patients to avoid such mistakes as the failure to use the hospital or ICU for patients who could benefit from care and observation in such settings. On the other hand, the major impact on the cost of CAP care is determined