

How to manage community acquired pneumonia patient at the emergency department?

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Community-acquired pneumonia (CAP) is one of the most frequent infectious diseases in Western countries^{1,2} and its prognosis ranges from rapid resolution of symptoms and full recovery of functional status to the development of severe medical complications and death. As a result, pneumonia is a major cause of morbidity and mortality in most Western countries and the leading cause of hospitalizations among the elderly³. Approximately 10 to 20% of hospitalized patients with CAP must be admitted to the intensive care unit, where 20 to 50% of them will ultimately die^{4,5}. Therefore, understanding the prognosis of CAP is important from clinical and quality improvement perspectives. In the current issue of "Emergencias", Llorens et al. report the findings of an observational study of CAP patients presenting to an emergency departments with special interests for epidemiology, microbiology and process of care. Hereafter, we will briefly present the most relevant information for emergency physicians to collect for guiding initial hospitalisation decision.

Emergency physicians often have to deal with the admission decision of patients presenting with a suspicion of community acquired pneumonia to the hospital while treatment at home or in the hospital is considered to be one of the most important medical decision. Indeed, admission decision often impacts on the extensiveness of the microbiologic and laboratory evaluation, type, route, and duration of antibiotic therapy, intensity of clinical observation and medical resource use for this condition⁶. From a clinical perspective, accurate prognostication allows physicians to inform patients about the expected outcomes of an acute illness and the ability to predict the proba-

bility of serious adverse events can assist physicians in their initial management decisions, such as determining the most appropriate site of treatment, the intensity of hospital management, and the intensity diagnostic testing and antibiotic therapy⁷. However, clinicians tend to overestimate the risk of death in patients with community acquired pneumonia and this leads to unnecessary admissions to hospital⁸. This finding could partially explain that 65.1% low-risk patients included in Llorens et al survey were treated as inpatients.

Based on the underlying hypothesis that risk of mortality of patients with CAP can be stratified at presentation by use of readily available clinical information at presentation to the ED, several prediction rules has been developed. The pneumonia severity of illness score is based on 20 items that included demographic factors, comorbidity, physical examination findings, and laboratory and radiographic data readily available at ED visit⁹. The PSI scores ranged from 0 (no points are given for patients < 50 years of age without comorbidity and no physiologic abnormalities) to 250, with higher scores indicating more severe pneumonia. In the original study, patients were grouped into five risk classes for mortality; classes I to III (< 90 points) are at low risk for death, while the mortality rate in class IV was 9%, and 27% in class V. The CURB65 score was developed based on a study of over 1000 prospectively studied patients with community acquired pneumonia from 3 countries – UK, New Zealand and the Netherlands¹⁰. The 6-point CURB65 score, one point for each of Confusion, Urea > 7 mmol/l, Respiratory rate $\geq$ 30/min, low systolic (< 90 mmHg) or diastolic ($\leq$ 60 mmHg) Blood pressure, age $\geq$ 65 years (CURB-65 score) based on information available at initial

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hospital assessment, enabled patients to be stratified according to increasing risk of mortality (Score 0, 0.7%; Score 1, 2.1%; Score 2, 9.2%; Scores 3 to 5, 15% to 40%). A similar pattern of increasing disease severity was reported when only clinical parameters were considered (CRB-65) giving a 5-point score (risk of mortality for each score: Score 0, 1.2%; Score 1, 5.3%; Score 2, 12.2%; Score 3, 32.9%; Score 4, 18.2%).

Those objective scores can assist in identifying patients who may be appropriate for outpatient care. The overall discriminatory power for all these prediction rules was close. In a study conducted on a large North American cohort, Aujesky et al. showed that PSI performed slightly better compared to CURB and CURB-65, while Capelastegui et al. found, in a large single-center Spanish cohort an equivalence of the predictions made by the PSI, the CURB-65 and the CRB-65 score^{11,12}. Given that the CURB-65 and particularly the CRB-65 are simpler than the PSI, some authors advocate their use in non specialised hospital settings¹³. Over the past decade, the PSI has been extensively validated in Western countries, particularly in Europe and in Spain¹⁴. Since the publication of the PSI in 1997, 5 studies that enrolled a total of 3949 low-risk patients with CAP at 60 study sites in 4 countries (the United States, Canada, France, and Spain) have assessed the impact of the PSI on guiding the decision about the initial site of treatment for patients with CAP and uniformly demonstrate the positive impact of the PSI on patient care¹⁵⁻¹⁹. As result, because of its methodological rigor, superior prognostic accuracy, and proven effectiveness as a decision aid, the PSI has become the reference standard for severity adjustment and risk stratification of patients with CAP.

However, the pneumonia severity score does not consider other factors that might be important in mortality and for the hospitalisation decision altogether²⁰. Factors such as HIV co infection, alcohol or tobacco abuse or IV illicit drugs addiction have been found with a higher prevalence among low risk patient by Llorens and al, and may account for the somewhat high rate of hospitalization among low risk patients in their cohort. Indeed, it is evident that there are many factors that contribute to mortality among patients who require hospitalization for treatment of CAP²¹. These can be grouped as patient factors, processes of care factors, physician factors, and other factors. Therefore, the use of such scores must be tempered by the physician's determination of additional critical factors, including the ability to

safely and reliably take oral medication and the availability of outpatient support resources.

Among other factor that influence prognosis of CAP, Marrie et al. underline the contribution of functional status at the time of hospital admission as an independent predictor of mortality²¹. Similarly, Salive et al demonstrate limitations in activities of daily living and cognitive impairment are independently associated with a significantly increased risk of pneumonia mortality²². These findings are consistent with those of Llorens et al. that report a much higher rate of physical dependence among high risk patients.

In spite of these limitations the Emergency Department Community-Acquired Pneumonia trial demonstrated the effectiveness and safety of a real-time PSI-based decision aid to guide the initial site of treatment for low-risk patients with community-acquired pneumonia¹⁸. In this cluster-randomized trial, a decision aid recommending outpatient care for low-risk, non-hypoxemic patients without a medical or psychosocial indication for inpatient care was implemented using low, moderate, and high intensity implementation strategies for 1901 non-hypoxemic PSI risk class I-III patients enrolled from 32 hospital emergency departments. Patients managed at sites randomly allocated to moderate- and high intensity strategies were treated as outpatients significantly more frequently than patients managed at sites allocated to the low-intensity strategy (37.5% vs 61.0% and 61.9%, respectively), without compromising patient safety. This finding underlines the strength existing between intensity of the implementation strategy and the proportion of low risk patients safely treated as outpatients, and demonstrates the need to develop specific pneumonia guideline implementation interventions.

The pneumonia severity score only measures severity at the time of hospital admission. An illness is dynamic, and serial measurements of severity of illness are necessary to understand the subsequent course of illness. Clinicians are well aware that the evolution of patients with CAP within the first 2 to 3 days is crucial, and even in low risk ambulatory patients a clinical assessment at 48 hours is strongly recommended in the guidelines proposed by leading scientific societies^{2,23}. In fact, once clinical stability is achieved, substantial clinical deterioration owing to pneumonia is rare. Most recent studies report complications in 15% to 50% of hospitalized patients and overall mortality of 10% to 20%²⁴. As a result, in all PSI classes there is a large percentage of patients who required ICU admission¹⁴. Therefore, it

appears that the PSI does not completely adjust for all of the abnormalities that are present in ICU patients and are related to mortality. The in-hospital mortality rate for patients with CAP is considerable and varies with the population studied. For example, ICU patients in the low-risk PSI class (I-III) had 30-day mortality rates of 16%, which is much higher than those previously reported in other groups of non-ICU CAP patients. Thus, the decision to admit a patient to the ICU despite the low severity-of-illness score determines which type of therapy the patient will receive, which may change patient outcomes.

In the past few years, attention has been paid to processes of care and the impact of these on the outcome of pneumonia. Consistent with the "protocol de atención del paciente con NAC en el servicio de urgencias" presented by Llorens et al., the choice of appropriate empiric antibiotic regimens will depend on several factors that include the aetiology of CAP, clinical characteristics, severity of illness, and antimicrobial resistance. Therefore, local epidemiological surveys such as the one reported by Llorens et al, are required to inform policies makers and physicians, particularly emergency physicians, about local population characteristics and about the most frequent causative pathogens. Even if different causative pathogens may elicit differing host responses early in the pathogenesis of sepsis²⁵, it seems that at presentation patients with severe CAP experience similar coagulopathy and inflammation, regardless of causative microorganism or site of infection²⁶. There have been a large number of publications looking at the possibility of predicting the aetiological agent from the clinical features at presentation, however, while certain symptoms and signs are more common with specific pathogens, none allow accurate differentiation²⁷. However, biomarkers of coagulation and inflammation have been shown to be more abnormal in pneumococcal pneumonia^{28,29}. Progressive pneumonia and sepsis can occur owing to an unbalanced inflammatory response and the capacity of antibiotic therapy to further reduce morbidity and mortality rates, particularly during the first doses, may be limited^{30,31}. Indeed, disease progression while receiving appropriate therapy has often been reported in bacteremic pneumococcal pneumonia and in pneumonias caused by *Legionella* and gram negative bacilli^{24,32}. An additional cause of early failure is the presence of an uncovered pathogen and *Legionella* has been shown to be most frequently associated with discordant therapy, in such cases antibiotic treatment often does

not comply with current treatment CAP guidelines. Consistently, Shorr et al. demonstrated that failure to follow antibiotic recommendations for the treatment of severe CAP may increase the need for continuing MV. In this context, the lack of demonstrative sputum gram stain and urinary antigen testing seem to be particularly helpful³³. These 2 latter causes have been independently associated with early failure, a fact that may influence hospitalization decision and initial antibiotic strategy. Empyema is another cause of early failure and is mostly due to *S. pneumoniae* and has been associated with pleural effusion at baseline. Therefore, careful interpretation of chest radiographs at presentation is required and study of pleural fluid whenever possible²⁴. In this perspective, Llorens et al. epidemiological findings might be useful for emergency physicians of the Hospital General Universitario de Alicante area to guide first line antibiotic treatment, particularly for high risk patients.

In summary, CAP is a common and complex infectious disease and CAP patients often present to the ED, where most initial medical decisions, regarding site of care and antimicrobial therapy, are dramatically important as they impact on patient short term prognosis. During the last decade intensive medical research allowed to develop useful tools for predicting medical outcomes, improving quality of care and patients satisfaction, such as routine use of decision rules to guide site of care decision and compliance with antibiotic recommendations. Nonetheless the morbidity and mortality rates associated with CAP remain high, therefore every effort should be made to comply with recommended processes of care in the ED setting. In this perspective, the report by Llorens et al. published in the current issue of "Emergencias" participates usefully to this effort.

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