When and where should patients with community-acquired pneumonia be admitted?

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Community-acquired pneumonia (CAP) represents the leading cause of death due to infectious diseases in western countries and the origin of many cases of sepsis (S), severe sepsis (SS) and septic shock (SSh) attended in emergency departments (ED)[1]. In Spain the incidence is around 2-11 cases per 1,000 population per year with peaks of 15-35 cases per 1,000 population per year during times of viral epidemics in winter and in patients over 65 years, the chronically ill or with toxic habits[2]. With an overall mortality of 10-14%, there is great variability in admission rates ranging from 22 to 61% depending on centers, time of year and patient characteristics. Of these, 10-20% require admission to the intensive care unit (ICU) where mortality can reach 20-50%[3]. This, together with the knowledge that at least 75% of all diagnosed CAP are first treated in the ED reveals its transcendental role in the early management of these processes, which undoubtedly influences the evolution of the disease[1,4]. Adequate assessment of the need for admission (when) and the appropriate location (where) conditions the prognosis of patients with CAP. It also conditions the microbiological and laboratory tests solicited, the route and duration of antimicrobial administration, and the intensity of clinical observation and use of health resources[5]; i.e. the final costs. It is important to note that these costs increase 8 - 25 times compared to outpatient treatment[3].

So, making the right decision has implications for the safety of the patient and the cost-effectiveness for the system. In addition, non-severe CAP patients prefer to treat themselves at home, and present more rapid clinical recovery and return to work/daily lives than inpatients[6]. Most of the predictor scales of severity (PSS) stratify patients into risk groups in relation to observed mortality at 30 days. Consequently, an essential objective for the ED physician is to avoid unnecessary admissions and inappropriate discharges[4]. It is therefore essential to assess each case individually, using PSS as a complementary aid, taking into account additional criteria and events (pleural effusion, cavitation, multilobar involvement, hemodynamic instability, sepsis, hyperlactatemia) and also considering epidemiological and personal aspects (oral intolerance, hypoxemia, family support, comorbidities, toxic habits, psychiatric disorders, etc.)[1-3,6]. All this helps explain why 38-62% of low-risk CAP patients are admitted and 3-13% of high-risk CAP are treated as outpatients[7].

Clinical judgement (CJ) is often inaccurate and insufficient, but PSS also have major limitations and only represent helpful tools along with the Clinical Practice Guidelines (CPG). The variability of CJ and the recommendations from the various guidelines can be disconcerting. Fine or Pneumonia Severity Index (PSI)[8] and CURB65[9] are validated and recommended scales, demonstrating a similar ability to identify patients at risk of 30-day mortality. The PSI8 recommends outpatient treatment for class I-II, observation in short-stay units (SSU) for class III, and hospitalization for classes IV-V. The PSI correctly identifies low risk of early death in classes I, II and III and helps us decide on discharge, but may underestimate severity especially in young people with hypoxia: it does not assess additional criteria and circumstances that should be taken into account. Hence the concept of the "modified Fine index" which indicates admission in low-risk classes (I, II and III) in the presence of respiratory distress[1]. An objective fact is

that 16-27% of patients admitted to ICUs have PSI I, II or III[10]. For its part, CURB65[9] better detects high-risk patients who should be admitted, but it may overestimate the importance of age and indicate admission in many cases on the basis of age over 65 years, which should not be the only indicator for admission, and this scale does not evaluate oxygen saturation or PaO_2. Recently, some authors have questioned the usefulness of these scales for the elderly[11], and some CPG recommend combining the two scales and including additional criteria (AC), like when assessing any patient with infection in the ED, such as biomarkers (BM), the prediction of bacteremia, the existence of S, SS and SSH, personal circumstances and the CJ of expert ED physicians[1,2]. Furthermore, other authors consider the age group 75-80 years as an independent risk factor for early mortality[11,12]. In recent years there have been other CPG, some already validated such as that proposed by España et al called the Severity Community Acquired Pneumonia (SCAP)[12] or PSCURXO80 containing 2 major criteria (PH < 7.30 and SBP < 90 mmHg) and 6 minor criteria (confusion; BUN > 30 mg/dl; RR> 30/minute; multilobar/bilateral involvement, PaO_2 <54 mmHg or PaO_2/FiO_2 < 250 mmHg and age $\geq$ 80 years). This will probably be supported by future CPG since, in addition to predicting mortality like PSI and CURB65, it also predicts the need for mechanical ventilation (MV) and evolution from SS to SSh; SCAP defines severe CAP as that with at least one major or two minor criteria.

In addition to the factors listed in CPG (which confer a precise and static assessment) and those that reflect the patient's functional status, there are other independent AC that are more dynamic, including the infection itself and the systemic inflammatory response, which determine prognosis in the first few hours of stay in the ED. The estimated probability of bacteremia[13], the existence of S, SS or SSH as stages of a dynamic process and the inclusion of BM[14] to assist in decision-making on admission and the most suitable location are already included in clinical practice and will most probably appear in the new CPG on CAP currently being prepared by various scientific societies. BM values not only predict mortality, but also offer the possibility of predicting bacteremia, SS-SSH progression and even provide etiological orientation[14,15]. Among the BM studied, we would highlight proadrenomedullin[15], with results comparable to the PSS, and procalcitonin (PCT) which is highly sensitive and specific for predicting clinical evolution, the possibility of bacteremia, early mortality and even provides orientation regarding the pathogen responsible. Increasing availability of the PCT test in many EDs, together with the speed and ease of use makes it a likely criterion to be added to forthcoming prognostic scales of severity in the ED[14,15]. Early identification of severe and worsening patients is vital for transfer to the ICU. A delay in identification and therefore suboptimal non-ICU treatment is associated with increased mortality[16]. Both PSI and CURB65 are useful to assess the risk of death, but neither was designed to assess the need for ICU admission, for which most guidelines[1-3] base their criteria on those of the American Thoracic Society-Infectious Diseases Society of America (ATS/IDSA) 2007[3].

In this context, seeking to optimize resources and improve the management of patients with CAP, alternative hospitalization (AH) models have long been proposed instead of conventional hospitalization (CH). In this issue of EMERGENCIAS there are two very interesting articles confirming the efficacy and safety of SSU alone or integrated into a multidisciplinary model with early discharge and follow-up with day hospital care (DHC) or home care (HC) as alternatives to conventional hospitalization for patients with CAP who do not require ICU admission. In the first article, Juan et al.[17] show that SSU are effective and safe alternative locations for patients with CAP; they managed to reduce average stay (SSU 3.48 vs. CH 7.89 days) with no differences in readmission rates and mortality despite the fact that average age was higher in SSU patients (77.3 vs. 67.9 years). They even show that elderly patients especially benefit from SSU management because it tends to avoid the complications associated with CH (delirium, functional impairment, iatrogenic events, nosocomial infections, pressure ulcers, etc.).

The second article outlines the work of Llorens et al.[18] showing magnificent results of a multidisciplinary AH model (an ED-dependent SSU with post-discharge follow-up by the infectious diseases unit in DHC, or home care supervised by ED staff). Patients were also older (69 vs 62.7 years) and had greater functional impairment than those in the CH group, but showed shorter hospital stay (2.5 vs. 9.6 days) and lower mortality at 30 days (3.9% vs. 11.2%) regardless of prognostic PSI or CURB65 scores. All in all, the authors show that this model reduced hospital stay safely and effectively and reduced mortality in these patients with CAP.

The final decision on admission and the right location for this is a very complex process because of the diversity and number of criteria to be taken into account, and this is where ED physicians show their experience and know-how, selecting alternatives to CH that are safe for the patient and beneficial for the system. Therefore, the articles by Juan et al. and Llorens et al. represent an excellent step forward: ED observation units and short-stay units, day hospital care, home hospitalization and multi-disciplinary units are today replacing conventional hospitalization in many cases. The key now is to correctly identify candidates for these alternative forms of CAP patient management, and the works presented in this issue of EMERGENCIAS will undoubtedly be considered the Spanish experiences of reference for some years to come.

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