Monaldi Arch Chest Dis
2006; 65: 2, 82-88

ORIGINAL ARTICLE

A survey on hospitalised community-acquired pneumonia in Italy

P.L. Migliorati[1], E. Boccoli[2], L.S. Bracci[3], P. Sestini[4], A.S. Melani[3]

ABSTRACT: A survey on hospitalised community-acquired pneumonia in Italy. P.L. Migliorati, E. Boccoli, L.S. Bracci, P. Sestini, A.S. Melani.

***Background and aim*. Community Acquired Pneumonia (CAP) remains a major cause of disease and death. We evaluated the levels of care, the outcome and the characteristics of hospitalised patients with CAP in a primary hospital in Italy. We also investigated the value of both the Pneumonia Severity Index (PSI) and the modified Appropriateness Evaluation Protocol (AEP) for recognising both the outcome and the unnecessary admissions and stay of hospitalised patients with CAP.**

***Methods.* A retrospective review of all the charts of adult patients with CAP at Manerbio, Brescia, Italy between January 2001 and December 2002 was performed.**

***Results.* We evaluated 148 patients; their mean age (±SD) was 70 (±17) years; 34% were female. Most patients (87%) had at least a concomitant co-morbid disease. The overall survival rate at 30 days was 88%. All but one death occurred in the high-risk group of patients according to the PSI. On the contrary, the death rate of patients with inappropriate hospital admission according to the AEP was high. Patients with high PSI score had a significantly longer hospital length of stay than the low-risk group. However, a substantial part of the hospital stay did not show any justification into the charts.**

***Conclusions.* The PSI, but not the AEP, upon hospital admission, was useful for evaluating the outcome of patients with CAP. The PSI score and the modified AEP can be useful for assessing the appropriateness of hospitalisation for patients with CAP. There is the need for a practical and validated tool to support physicians in their decision making regarding the early and safe discharge of hospitalised patients with CAP.**

Monaldi Arch Chest Dis 2006; 65: 2, 82-88.

Keywords: Community-acquired pneumonia; hospitalisation; length of stay; prognostic analysis; retrospective analysis.

[1] Medicina Interna, Ospedale Civile di Manerbio (Bs),
[2] Direzione Sanitaria, Azienda Ospedaliera Univeritaria Careggi, Firenze;
[3] Fisiopatologia e Riabilitazione Respiratoria, Azienda Ospedaliera Universitaria Senese;
[4] Clinica Malattie Apparato Respiratorio, Università di Siena, Italy.

Correspondence: Andrea S. Melani, U.O. Fisiopatologia e Riabilitazione Respiratoria, Policlinico Le Scotte, Azienda Ospedaliera Universitaria Senese, Viale Bracci, I-53100-Siena, Italy; e-mail: a.melani@ao-siena.toscana.it

Introduction

Community-acquired Pneumonia (CAP) is a common disease and remains a major cause of death. Most patients with CAP have a good outcome and can be treated at home, but a subset shows a severe evolution, requiring hospitalisation. The Pneumonia Severity Index (PSI), firstly devised in the United States [1], is commonly used to evaluate the short-term outcome of patients with CAP [2-3]. The PSI is calculated at the time of the diagnosis according to 20 clinical and laboratory variables. It stratifies patients with CAP into 5 risk classes, which can be distinguished into two groups, respectively, with low- (classes I-III) and high-risk of death (classes IV-V). The proper decision at the time of the diagnosis between patients with CAP who either can be safely treated at home or require hospitalisation has clinical and economic consequences [4-5]. In fact, the management of CAP in hospital is much more expensive than at home and amounts to the major part of the total direct cost for this disease [6]. It is also important to recognise early when hospitalised patients with CAP can be safely discharged at home. It has been shown that the length of hospital stay for patients with CAP may be reduced without adversely affecting the patient's outcome [7]. The key point for early and safe discharge is to assess when hospitalised patients with CAP achieve the clinical stability [8-9].

The Appropriateness Evaluation Protocol (AEP) is a generic and not a diagnosis-specific tool used to assess the appropriateness of both the admission and the stay in acute-care hospitals. The AEP, firstly developed in the United States [10], has been used in a number of studies [11-16]. It includes objective criteria related to both the level of care and monitoring and the clinical condition. The admission or the hospital stay on that day is considered as appropriate when at least an established criterion is met.

The aims of this retrospective study were to evaluate: a) the characteristics of adult patients consecutively hospitalised for CAP in a single hospital in Italy; b) whether the analysis of their clinical records permits the assessment of the PSI and the modified AEP; c) the value of the PSI for recognising the outcome of hospitalised patients with CAP; d) whether the PSI and the modified AEP are useful to identify the unnecessary hospital admissions and stay.

Material and methods

This study was conducted at Manerbio, Brescia, Italy. This community has a primary public hospital that provides care to approximately 75,000 residents. The hospital includes a medical ward and an Intensive Care Unit (ICU).

From January 2001 to December 2002, one of us (PLM) screened the charts of all patients discharged with the diagnosis of pneumonia or a pneumonia-related disease (International Classification of Diseases, Ninth Revision, codes 480-487 in any position). We excluded patients: A) who failed to show an infiltrate consistent with pneumonia when a chest x-Ray was performed within 24 hours of hospital admission, B) aged less than 15 years, C) who were transferred from another hospital ward or had been discharged from another hospital within 10 days before the admission, D) with concomitant known active tuberculosis, lung cancer, non-infectious causes of pneumonia, or with immunodeficiency (consecutive treatment with at least 10 mg prednisone or the equivalent drug per day for >30 days, solid organ transplantation, HIV infection, hypogammaglobulinaemia).

Then, we analysed the records of enrolled patients using a standardised structured form, which included both demographic and clinical findings and the levels of care and monitoring for every day of the hospital stay. This checklist had been previously tested for comprehensibility and reliability on a group of patients with CAP not included in the present survey. According to the literature [8-9, 17], we defined the course of CAP as complicate and unstable when at least a criterion described in table 1 was recorded into the chart on that day of hospitalisation. The data instrument also included information useful to evaluate both the PSI at the time of admission [1], and the modified AEP [14-16]. The modified AEP includes minimal modifications with respect to the traditional method according to the evolution of medical science and the European health situation [14]. Recently, the modified version of the AEP has been translated into the Italian language and validated [16].

The data was collected retrospectively by two reviewers outside the hospital personnel (ASM and EB). During this analysis all patients or relatives were re-contacted to ascertain their post-discharge outcome so that the survival rate at 30 days after hospital discharge could be established. A review board exemption was obtained for this study, and permission for personal data analysis was obtained by phone for all the patients. The study was organised and developed on December 2003 so that we can exclude that it has influenced the chart recording. Thirty records were randomly sampled and abstracted in duplicate by both reviewers. Reliability testing indicated good accordance with a K-statistic ranging from 0.85 for clinical variables to K=0.71 for the modified AEP score.

Table 1. - Pre-established criteria of unstable (1-13) or complicated (14-22) CAP

1.	New onset of resting heart rate greater than 100 beats per minute
2.	New onset of resting systolic blood pressure <90 mm Hg
3.	New onset of resting respiratory rate greater than 24 breaths per minute
4.	New onset of resting diastolic blood pressure less than 60 or greater than 120 mm Hg
5.	Body temperature greater than 37.8°C
6.	New onset of resting hypoxhaemia whilst breathing air <60 mmHg (or hoxyhaemoglobin saturation <90%)
7.	Acute worsening change of consciousness, such as come, or acute confusion
8.	New onset of inability to maintain oral uptake of food
9.	New onset of arrhythmias, such as atrial flutter or fibrillation; Acute heart ischaemia at EKG
10.	Acute onset or decompensation of underlying co-morbid diseases, such as diabetes mellitus, renal failure (volume of urine <80 ml/4 hours), or congestive heart failure
11.	Acute venous thromboembolism
12.	New onset of serum electrolyte impairment, such as hyponatriemia (<135 mmol/l)
13.	New onset of acute bleeding
14.	At least 50% increase in the size of baseline opacity at chest x-ray
15.	Metastatic spread of infections
16.	Pneumothorax
17.	Empyema
18.	Lung abscess
19.	ARDS
20.	Multiorgan dysfunction syndrome
21.	Defined etiologic identification° of difficult germs such as *Staphylococcus aureus, Legionella* species, *Pseudomonas aeruginosa* or *Enterobacteriaceae*
22.	Suspicion of aspiration pneumonia*

°In accordance to the Fang's criteria[19]; *We defined the suspicion of aspiration pneumonia if there was an underlying illness with altered consciousness, or diminished gag reflex, or abnormal swallowing mechanism.

Unless reported otherwise, data was reported as means +/- Standard Deviation (SD). Categorical variables were analysed using the *chi* square test or the Fisher exact test and continuous variables using the *t*-test. We evaluated the association between the length of hospitalisation in days and the appropriateness of stay using the analysis of variance (ANOVA). A *p*-value of <0.05 for a two-tailed test was considered as significant. All analyses were performed using the statistical package Stata on a PC-compatible personal computer (Stata Corporation, College Station, TX, USA).

Results

We identified 148 patients who fulfilled the enrolment criteria. The mean age of the group was 70.3 (±17.3) years. Most patients were over 65 years old (72%) and had a concomitant co-morbid illness (87%). Other demographic and clinical characteristics of enrolled patients are reported in table 2. The main clinical and laboratory characteristics of the studied patients at the time of hospital admission are respectively described in tables 3 and 4. According to Fang and coll. [18], we identified a definite etiologic agent in 15% of cases. 80 (54%) patients had started home antibiotic therapy prior to the hospital admission. Such treatment did not obtain any difference of outcome in terms of death, transfer to the ICU, or length of hospital stay.

All patients received an antimicrobial treatment, more often (93%) a regimen of intravenous antibiotic therapy within 24 hours of hospital admission in accordance to the published guidelines [2-3]. The mean duration of intravenous therapy was 5.4 (±2.9) days.

The overall survival rate at 30 days was 87.8%. The outcome of patients according to their PSI score is reported in table 5. There are several differences between patients with low- and high-risk class (see table 6). As shown in table 7, we found at least a possible cause of hospital admission in 23 patients with a low-risk score according to the PSI. Interestingly, 16 of these 23 patients showed an appropriate admission according to the AEP. Another seven charts of patients with low-risk class according to the PSI, recorded the requirement of general practitioners for explaining the hospital admission. These patients did not have the appropriate admission according to the modified AEP. Overall, in accordance to the modified AEP, 52 (35%) hospital admissions were not appropriate; of these, 21 (54%) occurred in patients with low-risk class according to the PSI. The sur-

Table 2. - Some demographic and clinical characteristics of 148 patients with CAP at the time of hospital admission

Characteristic	No patients (% of total)
Living in nursing home or chronic care facility residency	30 (20)
At least another episode of pneumonia prior to the study	21 (14)
Gender,	
• Females	51 (34)
• Males	97 (66)
Smoking status	
• Current smokers	39 (26)
• Ex-smokers	63 (43)
• Never smokers	46 (31)
At least a concomitant co-morbid condition	129 (87)
COPD	51 (34)
Asthma	5 (3)
Other lower respiratory diseases	8 (5)
Liver diseases	22 (15)
Congestive heart failure	35 (24)
Cardiac arrhythmias	4 (3)
Cancer	15 (10)
Obesity	19 (13)
Renal failure	14 (9)
Neuromuscular disease	8 (5)
Alcohol abuse	21 (14)
Dementia or other cerebrovascular diseases	38 (26)
Arterial hypertension	58 (39)
Diabetes	40 (27)
Malnutrition*	14 (9)

*Based on the clinical decision and report of the hospital physician.

Table 3. - Main clinical characteristics of 148 patients with CAP recorded at the time of hospital admission

Characteristic	No of patients (% of total)
Acute onset of altered mental status	46 (31)
Cough	66 (45)
Sputum	30 (20)
Malaise	15 (10)
Headache	4 (3)
Hemoptysis	4 (3)
Arthromyalgia	12 (8)
Chills	30 (20)
Dyspnea	66 (45)
Cyanosis	12 (8)
Tachypnea (>29 breath per minute)	8 (5)
Diastolic blood pressure <60 mmHg	4 (3)
Systolic blood pressure <100	6 (4)
Pulse >124/min	24 (16)
Hypothermia (<35°C)	2 (1)
Hypertermia (>37°C)	74 (50)
Hypertermia (>38.3°)	37 (25)
Hypertermia (39.9°C)	2 (1)
Pleural pain	25 (17)
Vomiting	15 (10)
Focal diminished breath sounds	22 (15)
Focal sounds such as rales, rhonchi	42 (28)
Suspicion of aspiration pneumonia	28 (19)

Table 4. - Main laboratory characteristics of 148 patients with CAP at the time of clinical admission

Characteristic	No of patients (% of total)
Right lung infiltrates at chest x-ray	89 (60)
Basal infiltrates at chest x-ray	101 (68)
Interstitial pattern of infiltrates at chest x-ray	4 (3)
Multilobar infiltrates at chest x-ray	31 (21)
Hypoxaemia (<60 mmHg)	55 (35)
Severe hypercapnia (>55 mmHg)	8 (5)
Pleural effusion	38 (26)
Blood urea nitrogen>30 mg/dl (11 mmol/L)	83 (56)
Creatinine >1,2	38 (26)
Creatinine >2,5	12 (8)
Glucose >250 mg/dl (14 mmol/L)	12 (8)
Sodium <130 mmol/l	4 (3)
Arterial pH <7.35	15 (10)
Hematocrit <30%	3 (2)
WBC count <4000	2 (1)
WBC >30000	2 (1)
Hypoalbuminhaemia	37 (25)

vival rate was, respectively, 86% and 92% in the groups of patients with appropriate and inappropriate admission according to the modified AEP (χ^2 =1.45; NS).

The mean length of stay is reported in table 8. Only seven (4.7%) patients were discharged when they were not clinically stable according to our criteria. Early discharge was due to transfer to a skilled nursing facility (N=1), home palliative care of terminal illness (N=4), patients discharge against medical advice (N=2). According to the modified AEP, the appropriateness of the hospital stay occurred in 45% and 63% of days, respectively, for the groups of patients with low- and high-risk PSI score (χ^2=27.4; p<0.001). According to our clinical criteria of unstable or complicate course of CAP, the length of hospital stay was justified in 31.2% and 51.9% of days, respectively, for the groups of patients with low- and high-risk PSI score (t=4.28; p<0.001).

Discussion

Our patients had demographic and clinical characteristics, including high levels of underlying co-morbid diseases, similar to those reported by Fine et al. [1]. In our survey the death rate was 12.2%. The literature states that the percentage of deaths of hospitalised patients with CAP range from 2 to 40%, with a mean of approximately 14% [20]. A more recent study reported an overall in-hospital mortality in a database of 159,000 cases from Medicare of 11% [21]. Thus, our death rates were not substantially different from these figures. The total of ICU admissions was 5.4% in our study and 7 of these 8 patients belonged to the PSI high-risk classes. Out of 1,339 hospitalised patients with CAP in the PORT study, 170 (12.7%) patients were transferred to the ICU and slightly more than a quarter were included in the low-risk classes according to the PSI [21]. However, the frequency and the characteristics of patients with CAP ad-

Table 5. - Short-term outcome for 148 patients with CAP according to their PSI score at the time of hospital admission

Risk class	No (%)	Death, No (%)	Transfer to the ICU, No (%)
I	3 (2.0)	0	0
II	20 (13.5)	0	0
III	16 (10.8)	1 (6.2)	1 (6.2)
IV	56 (37.9)	1 (1.8)	0
V	53 (35.8)	16 (30.2)	7 (13.2)

Table 6. - Some differences between patients with low- and high-risk class according to the PSI score

Characteristic	Patients with high-risk class*	Patients with low-risk class*	Level of significance
Mean age (SD), yrs.	76 (12)	47 (17)	P<0.05
Males/females (% of total)	50/50	32/68	P<0.05
COPD	37	17	P<0.05
Diabetes	29	13	P<0.05
Suspicion of aspiration	21	7	P<0.05
Alcohol abuse	15	5	P<0.05
Malnutrition	11	0	NS
Asthma	6	3	NS
Obesity	10	14	NS
Previous episodes of pneumonia	13	15	NS

* Except for mean age, all values are expressed as percentage of total.

Table 7. - Some possible causes of hospital admission recorded into the chart of patients with low-risk score according to the PSI

Cause	No patients
Pleural effusion	10
COPD	9
Fibrothorax	1
Interstitial lung disease	1*
Unstable diabetes	5
New onset of atrial fibrillation	1
Myocardial infarction	2
Thrombophlebitis and suspicion or certain pulmonary embolus	2
Respiratory or gastrointestinal bleeding	2
Neuromuscular diseases being unable to oral ingestion	1
Alcoholism	6
Homelessness	2
Use of illicit drugs	2
Cognitive impairment	4

*Death.

mitted to the ICU are rather variable, being largely influenced by local practice and availability rather than by absolute severity. As the percentage of deaths occurring in patients of low-risk classes according to the PSI has been proposed as a practical index of quality of care [22], our survey with only one death in this category suggests a good performance of treatment in our study setting.

The PSI arose as a tool for evaluating the short-term mortality of patients with CAP [1]. Its value is largely accepted [2-3]. However, the profile of CAP and its severity is changing due to the progressive ageing of the population as well as the availability of newer effective antibiotics and the diffusion of drug-resistant bacteria strains. Thus, the clinical value of the PSI requires confirmation in each setting and along the course of years [23]. Likewise, to our knowledge, no previous study has evaluated the PSI score in a series of patients with CAP in Italy. We have shown that the retrospective analysis of the charts can permit the evaluation of the PSI score. This survey, although performed in a single centre, meaning that it has limited external validity, has confirmed the value of PSI as an effective index of short-term mortality in a typical provincial non-teaching hospital in Italy.

Table 8. - Length of hospital stay* and its appropriateness according to the PSI risk class

Severity of PSI	Mean ± SD (median) length of hospital stay, days	Mean ± SD length of hospital stay justified according to the clinical course of disease, days	Mean ± SD length of hospital stay appropriate according to the modified AEP, days
Low-risk group	6.25 ± 3.52 (6.0)	1.95 ± 3.00	2.83 ± 3.47
• I risk-class	3.33 ± 2.52 (3.0)	0.25 ± 0.5	1.24 ± 2.14
• II risk class	4.95 ± 2.95 (7.5)	1.50 ± 2.87	1.84 ± 2.36
• III risk class	8.71 ± 3.07 (8.5)	2.14 ± 3.25	3.37 ± 3.22
High-risk group	9.47 ± 5.20 (9.0)	4.97 ± 5.92	5.85 ± 5.49
• IV risk class	8.09 ± 4.01 (8.0)	3.24 ± 3.74	3.72 ± 4.12
• V risk class	11.76 ± 6.14 (10)	7.94 ± 7.65	8.52 ± 7.45

*After exclusion of patients admitted to the ICU or death: The length of hospital stay was calculated by subtracting the admission day from the discharge date.

It has been suggested that the high PSI score (i.e., classes IV-V) could be used to identify patients with CAP requiring hospitalisation [4]. Although we found that most hospital admissions occurred in the group of patients with high-risk score, a significant proportion of patients was hospitalised despite the low PSI score. However, our study clearly shows that the severity of CAP according to the PSI cannot be the only criterion for deciding hospitalisation. The suspicion or the presence of concomitant co-morbid diseases is the main cause of hospitalisation despite a low PSI score. Other causes of hospital admission, also accepted by the ERS guidelines [24], were due to unreliable patients for psychiatric and social problems, or to the failure of first-line home antimicrobial treatment. Likewise, other studies had shown that some patients with a low risk of mortality according to the PSI were likely to benefit from hospitalisation [25-28]. Similarly, our findings support the broader indications expressed by the most widely used guidelines [2-3, 24] that the PSI score alone cannot supersede clinical judgment in the decision of hospitalisation for patients with CAP. Interestingly, our study shows that the association of the modified AEP at the time of admission could be useful to identify patients who would benefit from hospitalisation despite a low PSI score. This is not surprising, because the AEP recognised all the severe clinical conditions, not only those related to the CAP. Conversely, the AEP score at the hospital admission resulted a much poorer predictor of clinical outcome than the PSI. This is also not surprising, because, while the PSI score is completely focused on the short-term prognosis of the patient, the AEP is mostly built on health care interventions administered to the patient.

In this survey we have tried to develop a clinical method for identifying the unnecessary days of hospitalisation after the admission. Unfortunately, there is no full agreement about this topic due to the more or less rigorous definitions of complicate or unstable course of the CAP. Our study has shown that the discharge criteria that we chose for our patients with CAP were quite conservative. On the contrary, a substantial part of the hospital stay did not show any justification into the charts. Due to the retrospective study design of this survey, it may be that the lack of careful recording into the charts has caused an overestimation of unnecessary days of hospitalisation. However, our finding is unique: In a prospective survey where the physicians responsible for discharge were aware of the study, Menendez et al. [30] reported that the overall percentage of patients with inappropriate length of hospital stay was 68%. In another prospective study, Halm et al. [9] showed that 65-86% of 686 patients with CAP stayed in hospital for at least a 1 day after having reached stability. Porath et al. [29] also found high levels of unnecessary days of hospitalisation using the modified AEP.

We conclude that the retrospective analysis of the charts easily permits the evaluation of the PSI score. The PSI, but not the AEP, at the time of hospital admission, is useful for evaluating the outcome of patients with CAP. The PSI score and the modified AEP can be useful for individuating the appropriateness of hospitalisation for patients with CAP. There is the need for a validated tool to support physicians in their decision making regarding the early and safe discharge of hospitalised patients with CAP.

References

1. Fine MJ, Auble TE, Yealy DM, *et al*. A prediction rule to identify low-risk patients with community-acquired pneumonia. *N Engl J Med* 1997; 336: 243-250.
2. American Thoracic Society. Guidelines for the management of adults with community-acquired pneumonia. Diagnosis, assessment of severity, antimicrobial therapy, and prevention. *Am J Respir Crit Care Med* 2001; 163: 1730-1754.
3. Bartlett JG, Dowell SF, Mandell LA, File TM, Musher DM, Fine MJ. Practice guideline for the management of community-acquired pneumonia in adults. *Clin Infect Dis* 2000; 31: 347-382.
4. Fine MJ, Hough LJ, Medsger AR, *et al*. The hospital admission decision for patients with community-acquired pneumonia. Results from the pneumonia Patient Outcomes Research Team Cohort study. *Arch Intern Med* 1997; 157: 36-44.
5. Atlas SJ, Benzer TI, Borowski LH, *et al*. Safely increasing the proportion of patients with community-acquired pneumonia treated as outpatients. *Arch Intern Med* 1998; 158: 1350-1356.
6. Guest JF, Morris A. Community acquired pneumonia: the annual cost to the National Health Service in the UK. *Eur Respir J* 1998; 10: 1530-1534.
7. Mc Cormick D, Fine MJ, Coley CM, *et al*. Variation in length of hospital stay in patients with community-acquired pneumonia: are shorter stays associated with worse medical outcome? *Am J Med* 1999; 107: 5-12.
8. Fine MJ, Medsger AR, Stone RA, *et al*. The hospital discharge decision for patients with community-acquired pneumonia. Results from the pneumonia Patient Outcomes Research Team Cohort study. *Arch Intern Med* 1997; 157: 47-56.
9. Halm EA, Fine MJ, Marrie TJ, *et al*. Time to clinical stability in patients hospitalized with community-acquired pneumonia: implications for practice guidelines. *JAMA* 1998; 279: 1452-1457.
10. Gertman PM, Restuccia JD. The appropriateness evaluation protocol: a technique for assessing unnecessary days of hospital care. *Med Care* 1981; 19: 855-71.
11. Siu AL, Sonnenberg FA, Manning WG, *et al*. Inappropriate use of hospitals in a randomized trial of health insurance plans. *N Engl J Med* 1986; 315: 1259-1263.
12. Chassin MR, Kosecoff J, Park RE, *et al*. Does inappropriate use explain geographic variations in the use of health care services? A study of three procedures. *JAMA* 1987; 258: 2533-2535.
13. Fellin G, Apolone G, Tampieri A, *et al*. Appropriateness of hospital use: an overview of Italian studies. *Int J Qual Health Care* 1995; 7: 219-225.
14. Lang T, Liberati A, Tampieri A, *et al*. A European version of the Appropriateness Evaluation Protocol. Goals and presentation. The BIOMED I Group on Appropriateness of Hospital Use. *Int J Technol Assess Health Care* 1999; 15: 185-97.
15. Angelillo IF, Ricciardi G, Nante N, *et al*. Appropriateness of hospital utilisation in Italy. *Public Health* 2000; 14: 9-14.

16. Trianni G, Lavazza L, Palazzi GP, *et al*. [Organizational appropriateness: outcomes of the assessment with the AEP/PRUO of the hospital stays in Careggi Hospital - Florence in 1995 and 1998]. *Epidemiol Prev* 2001; 25: 164-173.
17. Siegel RE. Strategies for early discharge of the hospitalized patient with community-acquired pneumonia. *Clin Chest Med* 1999; 20: 599-605.
18. Fang G-D, Fine M, Orloff J, *et al*. New and emerging etiologies for community-acquired pneumonia with implications for therapy. A prospective multicenter study of 359 cases. *Medicine* 1990; 69: 307-316.
19. Fine MJ, Smith MA, Carson CA, *et al*. Prognosis and outcomes of patients with community-acquired pneumonia. *JAMA* 1995; 274: 134-141.
20. Kaplan V, Clermont G, Griffin MF, Kasal J, Watson RS, *et al*. Pneumonia: still the old man's friend? *Arch Intern Med* 2003; 163: 317-23.
21. Angus DC, Marrie TJ, Obroscky DS, Dremslzov TT, Coley C, *et al*. Severe community-acquired pneumonia. Use of intensive care services and evaluation of American and British Thoracic Society diagnostic criteria. *Am J Respir Crit Care Med* 2002; 166: 717-723.
22. Marrie TJ. Deaths in risk classes I-III: a measure of quality of care in patients hospitalised with CAP? *Eur Respir J* 2004; 23: 103-105.
23. Flanders WD, Tucker G, Krishnadasan A. Validation of the pneumonia severity index: importance of study-specific recalibration. *J Gen Intern Med* 1999; 14: 333-340.
24. European Study on Community-acquired pneumonia (ESOCAP) Committee. Guidelines for the management of adult community-acquired lower respiratory tract infections. *Eur Respir J* 1998; 11: 986-991.
25. Marras TK, Gutierrez C, Chan CK. Applying a prediction rule to identify low-risk patients with community-acquired pneumonia. *Chest* 2000; 118: 1339-1343.
26. Roson B, Carratalà J, Dorca J, Casanova A, Manresa F, Gudiol F. Etiology, reasons for hospitalization, risk classes, and outcomes of community-acquired pneumonia in patients hospitalized on the basis of conventional admission criteria. *Clin Infect Dis* 2001; 33: 158-165.
27. Stauble SP, Reichlin S, Dieterle T, Leimenstoll B, Schoenenberger R, Martina B. Community-acquired pneumonia- which patients are hospitalised. *Swiss Med Wkly* 2001; 131: 188-192.
28. Arnold FW, Ramirez JA, McDonald LC, Xia EL. Hospitalization for community-acquired pneumonia. The Pneumonia Severity Index vs. clinical judgement. *Chest* 2003; 124: 121-124.
29. Porath A, Schlaeffer F, Lieberman D. Appropriateness of hospitalization of patients with community-acquired pneumonia. *Ann Emerg Med* 1996; 27: 176-183.
30. Menéndez R, Ferrando D, Vallés JM, Martìnez E, Perpinà M. Initial risk class and length of hospital stay in community-acquired pneumonia. *Eur Respir J* 2001; 18: 151-156.