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Guidelines adherence for patients with community acquired pneumonia in a Greek hospital

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Abstract. – *Background and Objectives:* **Community acquired pneumonia (CAP) remains an important cause of morbidity and mortality, with significant economical and social cost. Adherence to the international guidelines for the empiric treatment of CAP can improve patients' prognosis, reduces the need and shortens the length for hospitalization. However, adherence to guidelines varies among physicians.**

Material and Methods: **We performed a prospective observational study in 252 immunocompetent hospitalized patients so as to investigate whether the 2003 Infectious Diseases Society of America update of practice guidelines and the Greek national guidelines for CAP are followed by chest physicians working in "Sotiria" General Hospital in Athens, Greece.**

Results: **Total mortality rate was 12.3%. One hundred twenty (48%) patients were admitted to the Hospital, despite the fact that they were classified as risk class I or II according to the Fine criteria. Accordance to CAP guidelines, as far as the initial antibiotic regimen is concerned, was found to be poor (152 patients, 60%). A trend towards a shorter length of hospitalization was observed in patients treated with an initial antibiotic regimen in accordance to guidelines compared to those receiving an initial antibiotic regimen in discordance to guidelines.**

Discussion: **The implementation of CAP guidelines by chest physicians working in a Greek Hospital for Thoracic Diseases is poor. Improvement of adherence to guidelines may shorten the length of hospitalization and reduce the financial burden for the National Health System.**

Key Words:

Lower respiratory tract infections (LRTI), Community acquired pneumonia (CAP), Antibiotic treatment, Antimicrobial chemotherapy, Guidelines.

Introduction

Community acquired pneumonia (CAP) remains an important cause of morbidity and mortality, contributing to significant economical and social cost. Despite the use of new antimicrobial chemotherapeutic agents, both the incidence and morbidity of CAP remain almost unchanged during the last 30 years. Pneumonia is the sixth leading cause of death in the USA and the main cause of death among infectious diseases[1,2]. A total of 5.6 million cases of CAP occur annually and almost 1.1 million of these require hospitalization[1,2]. In the outpatient setting, the mortality rate of pneumonia remains low, ranging from 1-5%. On the contrary, for patients who require hospital treatment, mortality rate rises up to 12%[1].

The difficulty in selecting the appropriate antibiotic regimen arises from the fact that CAP can be caused by a wide range of pathogenic microorganisms, which cannot be identified after using clinical or radiographic criteria[3,4]. Conventional microbiological techniques have limited sensitivity and specificity in order to diagnose the causative pathogen. Some of them have also a large subjective component and are subject to interlaboratory variability[5]. Additively, in certain populations such as patients with COPD, more than one pathogens have been implicated as the cause of lower respiratory tract infections[6,7]. In this point of view many expert panels have emphasized the importance of developing guidelines for the management of CAP, in order to provide treatment in a more systematic way, reduce mortality and improve patients' prognosis.

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Since the development of the first guidelines for CAP, which was released by the American Thoracic Society (ATS) in 1993, new data have become available in many areas related to this disease[8]. These include a prognostic scoring to predict mortality, new knowledge about the microbiology of CAP and new approaches to provide care in a cost-effective and efficient manner. Furthermore, a number of new antibiotics have been developed and approved for the treatment of CAP, while *in vitro* antibiotic resistance has become increasingly prevalent and its clinical relevance is being greatly appreciated. The choice of the initial antibiotic regimen is one of the key factors for the prognosis of patients with CAP, with a higher mortality rate observed if the initial regimen is inappropriate[9]. Adherence to the international guidelines, for the empiric treatment of CAP, reduces patients' mortality and improves clinical outcome[9-12]. Some studies have also shown that apart from a higher mortality rate, adherence to guidelines results in a reduced need for hospitalization and a shorter hospital length of stay (LOS). Nevertheless, adherence to guidelines varies among physicians[13].

There are not enough data regarding the management of CAP from Greek physicians. According to the results of a small study, the adherence of Greek doctors to any guidelines for the treatment of CAP was approximately 65%, while the mortality rate in the group of patients without any concordance to the guidelines for proper antibiotic regimen, was higher[14]. The aim of the present study was to investigate whether the 2003 Infectious Diseases Society of America (IDSA) update of practice guidelines for CAP and the Greek national guidelines, released by the Hellenic Centre for Control and Prevention of Infectious Diseases, are followed by chest physicians working in "Sotiria" General Hospital for Thoracic Diseases, in Athens, Greece[15,16]. Moreover, epidemiological, clinical and microbiological data were collected and analysed concurrently.

Materials and Methods

Study Population

From October 2006 to April 2007 an observational prospective study was carried out in "Sotiria" General Hospital for Thoracic Diseases, an 850 acute and referral bed Hospital, in Athens, Greece. Currently, "Sotiria" General Hospital is the major Hospital for Thoracic Diseases not only in Athens but also in the whole country of Greece. Written informed consent to participate was obtained from all patients who were included. The Ethical Committee of "Sotiria"General Hospital, Athens, Greece, accepted the study protocol.

Inclusion criteria for the study population were: (1) Immunocompetent hospitalized patients at least 18 years old; (2) no history of hospitalization within the last 12 weeks before admission; (3) diagnosis of CAP. Patients diagnosed with CAP performed a new radiographic infiltrate in the chest X-ray (CXR) and experienced two or more of the following symptoms: [a] fever [b] dyspnoea (new onset of dyspnoea or increased dyspnoea over baseline) [c] pleuritic chest pain [d] cough [e] expectoration (new appearance of purulent sputum or increased sputum purulence) and [f] confusion; this was defined as disorientation with regard to person, place or time, that was not known to be chronic.

Exclusion criteria for the study population were: (1) residents of long-term care facilities diagnosed with pneumonia, since they belong to a separate entity (Health Care Associated Pneumonia); (2) patients with any kind of immunosuppression including patients receiving chemotherapy or immunomodulatory treatment; (3) history of hospitalization within the last 12 weeks before admission; (4) modification of the initial CAP diagnosis at any time during hospitalization; (5) transfer to another hospital or to another health care facility of any degree.

Study Protocol

Patients enrolled in the study were examined at the Emergency Department (ED), they were diagnosed with CAP and were hospitalized. The decision for hospitalization was at the discretion of the ED physicians, who were independent from the Authors. Two of the Authors assessed the inclusion criteria during the first day of hospitalization from the patients' medical records and by direct communication with the admitting physicians. The day of the first ED visit was defined as assessment 1. Assessment 2 and assessment 3 were performed 72 hours after admission and at the day of discharge, respectively. Demographic data of the enrolled patients were recorded at assessment 1 and included age, sex, smoking, alcohol habits, comorbid illnesses and antimicrobial treatment prior to hospital admission.

The following parameters were recorded on admission and on reassessments: [**a**] clinical

symptoms; [**b**] clinical signs (body temperature, respiratory rate, heart rate, arterial systolic and diastolic blood pressure, presence of rales); [**c**] arterial blood gases (ABGs) analysis (PaO_2, $PaCO_2$, PaO_2/FIO_2); [**d**] radiographic features (extension and evolution of infiltrates in chest radiograph, presence of pleural effusion); [**e**] laboratory parameters including: (1) White blood count (WBC); (2) Hct; (3) Hb; (4) Erythrocyte sedimentation rate (ESR); (5) C-reactive protein (CRP); (6) renal function indices such as blood urine nitrogen (BUN); (7) serum sodium and potassium; (8) liver function tests (SGOT, SGPT, ALP, serum albumin, total and direct bilirubin); [**f**] the presence of respiratory failure, the requirement for mechanical ventilation as well as the development of acute respiratory distress syndrome (ARDS), septic shock and/or multiple organ dysfunction syndrome (MODS). ARDS was defined as a syndrome of acute and persistent lung inflammation with increased vascular permeability, characterized by three clinical features: (1) Bilateral radiographic infiltrates; (2) a ratio of the partial pressure of arterial oxygen to the fraction of inspired oxygen (PaO_2/FiO_2) less than 200 mmHg, regardless of the level of positive end-expiratory pressure (PEEP) (the PaO_2 was measured in mmHg and the FiO_2 was expressed as a decimal between 0.21 and 1) and (3) No clinical evidence of an elevated left atrial pressure (if measured, the pulmonary capillary wedge pressure was 18 mmHg or less). Septic shock was defined as sepsis with hypotension, despite adequate fluid resuscitation, combined with perfusion abnormalities that may include, but are not limited to lactic acidosis, oliguria and or an acute alteration in mental status. Patients who required inotropic or vasopressor support despite adequate fluid resuscitation were in septic shock. MODSwas defined as the presence of an altered function of at least two organs in an acutely ill patient which necessitated medical intervention in order to maintain homeostasis. Unfavorable clinical course was defined as the need for intubation and/or death; [**g**] in-hospital mortality[17].

The Fine score was applied to determine the severity of CAP. Fine Score (Pneumonia Severity Index-PSI) includes 19 different variables and stratifies patients diagnosed with CAP into 5 mortality risk classes (I to V)[18,19]. Its ability to predict mortality has been confirmed in subsequent studies[20]. On the basis of associated mortality rates, it has been suggested that the majority of the patients classified on risk classes I or II could be treated as outpatients (with the exception of patients requiring admission for social reasons, for the management of unstable co morbidities and for hypoxemia or vomiting), whereas patients classified on risk classes IV and V should be admitted to the hospital. Regarding patients classified as risk class III, some of them should require hospitalization, even for short term, and some others could be treated as outpatients[18,19]. The characterization of the appropriateness of CAP treatment was based on the updated practice guidelines released by IDSA in 2003 and the Greek national guidelines for CAP, released by the Hellenic Centre for Control and Prevention of Infectious Diseases in 2006[15,16].

Microbiological Data

Gram-stain and cultures were assessed from: (1) blood; (2) sputum. Qualified sputum samples were considered those with the presence of ≥25 polymorphonuclear leucocytes/field and <10 squamous epithelial cells/field; (3) bronchial secretions; (4) bronchial washing fluid; (5) bronchoalveolar lavage (BAL) fluid and (6) pleural fluid[3,4,21]. Identification of microorganisms and susceptibility testing were performed according to standard methods. Results of quantitative cultures were expressed as colony forming units per milliliter (CFU/ml).

Urine was tested for the presence of *Legionella pn.* or *Streptococcus (S.) pneumoniae* antigen (Binax-Now test, BINAX-NOW, Scarborough, ME, USA) during assessment 1. A 5 ml blood sample was drawn for serological testing during patients' hospitalization. The blood sample was shortly centrifuged and stored at –80°C until it was tested. *Chlamydophila (C.) pneumoniae* specific IgG and IgA antibodies were measured by SERION ELISA (Friedrich-Bergius-Ring 19, D-97076 Würzburg, Germany). The prevalence of *C. pneumoniae* IgA and IgG antibodies were defined as >4 U/ml and >15 U/ml respectively. A positive IgA titer was used to define an acute *C. pneumoniae* infection. *Mycoplasma (M.) pneumoniae* specific IgM, IgG and IgA antibodies were measured by SERION ELISA (Friedrich-Bergius-Ring 19, D-97076 Würzburg, Germany). The prevalence of *M. pneumoniae*, IgA, IgG and IgM antibodies was defined as >14 U/ml, >30 U/ml and >17 U/ml respectively. Positive IgM and/or IgA titers were used to define a *M. pneumoniae* infection, according to the manufacturer's instructions. *Coxiella Burnetii* specific IgG,

IgA Phase 1 antibodies (both qualitative) and IgG, IgM Phase 2 (quantitative and qualitative respectively) were measured by Virion-SERION ELISA (Friedrich-Bergius-Ring 19, D-97076 Würzburg, Germany). Positive IgM and/or IgG Phase 2 titers were used to define an acute *Coxiella Burnetii* infection, according to the manufacturer's instructions. *Rickettsiae sp.* specific IgM antibodies were detected by using FOCUS Diagnostics IFA (Indirect Immunofluorescent Assay), (FOCUS Diagnostics Inc., Tests Kits and Products, 11331 Valley View street, Cypress, CA, 90630-4717, USA). IgM titers of 1:64 and greater were considered presumptive evidence of recent or current infection by organisms of the appropriate *Rickettsial* antigen group, while titers less than 1:64 suggested that the patient did not have an acute *Rickettsial* infection.

Statistical Analysis

An Access Database (Microsoft® Office Access 2003) has been created in order to record and save all the available data from the clinical records. The χ^2 test was used to test for differences in proportions for categorical data, and the Mann-Whitney rank-sum test was used to test for differences for continuous data. All p values were two-sided. Significance level was set at $p \leq 0.05$.

Table I. Demographic data, co-morbidities and outcome of the 252 patients with CAP.

Demographic data	
	Mean ± SD
Age (years)	56.3 ± 22.2 (range: 14-96)
Duration of hospitalization (days)	10.9 ± 11.8
	N, (%)
Males/Females	157/95 (62.3/37.7)
Active smokers	110 (43.7)
Alcoholism	30 (11.9)
Mortality	31 (12.3)
With co-morbidities	170 (67.5)
Comorbidities	**N, (%)**
Respiratory diseases in total COPD	85 (33.7) 42 (17.1)
Bronchial asthma	25 (9.9)
Bronchiectases	7 (2.8)
Cardiovascular diseases	106 (42.1)
Gastrointestinal diseases	40 (15.9)
Endocrine diseases in total	62 (24.6)
Diabetes mellitus	27 (10.7)
Neuropsychological diseases	43 (17.1)
Chronic renal failure	7 (2.8)

CAP: Community acquired pneumonia; COPD: Chronic obstructive pulmonary disease.

Results

Demographic data, co-morbidities and outcome of the 252 patients diagnosed with CAP are shown in Table I. The mean value (±SD) for the LOS was 10.9±11.8 days. A pathogenic microorganism was identified only in 47 (18.6%) patients. Sixteen (34%) of these patients had already been treated with at least one antibiotic before their referral to the hospital ED. The isolated pathogens are shown in Table II. As expected, *S. pneumoniae* was the predominant pathogen identified. Thirty seven (79%) out of the 47 patients with an identified microbial pathogen had a favourable outcome. The pathogens that have been identified in the 10 patients who died were: *S. pneumoniae* (five patients), *Legionella pneumophila* (three patients), *C. pneumoniae* (one patient) and coagulase negative *Staphylococcus spp.* (one patient). The coagulase negative *Staphylococcus spp.* was isolated in two blood cultures.

Only 25 (10%) of the 252 patients underwent all microbiological pathogen investigations as recommended by the CAP guidelines (two blood cultures, Gram stain and culture of sputum or bronchial secretions, urine antigens and serum antibodies detection). Only 10 out of the 31 patients who finally died, underwent all the basic diagnostic microbiological tests. However, the etiologic agent was identified in only four of them. The yields of isolation of the microbiological tests used are shown in Table III.

Regarding the severity of CAP, from the total of the 252 patients admitted to the hospital, only 132 (52%) had been designated as high risk patients (risk classes III, IV & V) according to the Fine criteria. Patients admitted to the hospital despite that they were classified in risk classes I or II, required shorter hospitalization in comparison to patients that had been classified in risk classes III, IV or V, with the difference

Table II. Bacterial pathogens identified in 252 patients with CAP.

Microorganisms	N, (%)
No Pathogen isolated	205 (81.35)
Streptococcus pneumoniae	12 (25.5)
Klebsiella pneumoniae	10 (21.3)
Legionella pneumophila	6 (12.8)
Coxiella Burnetii	3 (6.4)
Rickettsiae sp.	3 (6.4)
Staphylococcus aureus	3 (6.4)
Haemophilus Influenzae	2 (4.3)
Chlamydophila pneumoniae	2 (4.3)
Mycoplasma pneumoniae	1 (2.1)
Staphylococcus spp. (coagulase negative)*	1 (2.1)
Enterobacter Cloacae	1 (2.1)
Mycoplasma pn. + *Coxiella Burnetti*	1 (2.1)
Pseudomonas aeruginosa	1 (2.1)
Serratia marcescens	1 (2.1)

CAP: Community acquired pneumonia; *Two consecutive blood cultures were obtained to determine the isolation of coagulase negative *Staphylococcus species*.

being close to the borderline of statistical significance (8.8±9.8 days *versus* 12.5±13.2 days respectively, $p = 0.07$). The whole group classification in risk classes, according to the Fine criteria, and the corresponding mortality rate are demonstrated in Table IV. It is important to notify that the majority of the hospitalized low risk patients (risk classes I and II) could have been treated as outpatients, since only a few of them necessitated hospital admission due to social reasons, for the management of unstable co morbidities or because of persistent hypoxemia or vomiting.

Thirty one (12%) of the admitted patients with CAP finally died. Among the patients who died, 18 (58%) were male. Six (19%) of the deaths occurred during the first 72 hours of hospitalization. The mean (±SD) age of the patients who died was 73.9±18.2 years, (median: 80 years; range: 27-90 years). The LOS (mean±SD) of patients who died was longer (16.3±24.7 days; range: 1-119 days) compared to the LOS of patients who survived (10.2±8.5 days; range: 3-86 days, $p = 0.05$). Mortality rate was higher in the group of patients with coexisting chronic obstructive pulmonary disease (COPD) compared to the group of patients without COPD (23.2% *versus* 10.2% respectively, $p = 0.04$). One hundred and ten (44%) patients had already been treated with antibiotics before ED referral, while six patients had an undefined status. Mortality rate and LOS did not differ significantly between patients receiving antibiotics prior to their examination in the ED and patients not receiving antibiotics ($p = 0.97$ and $p = 0.8$ respectively).

According to CAP guidelines, the initial antimicrobial regimen was inappropriate in 100 (40%) patients. Fifty nine (59%) of them were overtreated (they received antimicrobial chemotherapeutic agents too broad in spectrum), while the rest 41 (41%) patients were undertreated (they received antimicrobial chemotherapeutic agents, which did not cover the appropriate spectrum).A higher mortality rate (17%) was observed in the group of patients whose initial antibiotic regimen was in discordance to the guidelines compared to the group of patients whose initial antibiotic regimen was in accordance to the guidelines (9.4%). Despite the 81% difference observed in the mortality rate, this differ-

Table III. Yield of different diagnostic techniques for the etiologic diagnosis of CAP.

Diagnostic test	Total number of samples (% of the total number of patients with CAP)	Positive samples (n)	Yield (%)
Culture of Sputum or Bronchial Secretions	170 (67.5)	17	10
Blood Culture	53 (21)	6	11.3
Washing fluid Culture	33 (13.1)	3	9.1
BAL Culture*	4 (1.6)	0	0
Urine Antigens[y]	114 (45.2)	16	14
Serum Antibodies[§]	67 (26.6)	9	13.4

CAP: Community acquired pneumonia; *BAL: Bonchoalveolar Lavage fluid; [y]Urine antigens for the presence of *Legionella pneumophila* or *Streptococcus pneumoniae;* [§]Serum antibodies evaluated during hospitalization for *Chlamydophila pneumoniae*, *Mycoplasma pneumoniae*, *Coxiella Burnetii* and *Rickettsiae species*.

Table IV. Mortality in relation to risk class, according to Fine score classification, of 252 patients with CAP.

Risk class	N (%)	Dead, N (%)*
I	71 (28)	0 (0)
II	50 (20)	1 (2)
III	47 (19)	4 (9)
IV	51 (20)	7 (14)
V	33 (13)	19 (58)
Total	**252 (100)**	**31 (12.3)**

CAP: Community acquired pneumonia; *% of each risk class.

ence was not statistically significant (p=0.1). The LOS was shorter in the group of patients who received initial antibiotic treatment in accordance to guidelines, in comparison to those in discordance, with the difference being close to the borderline of statistical significance (10.1±12.1 *versus* 12.2±11.3 days respectively, p = 0.07). Accordance of the initial antibiotic regimen to CAP guidelines and outcome of 252 treated patients with CAP are displayed in Figure 1. In 76 patients (30%) a modification of the initial antibiotic regimen was necessary due to clinical failure within the first 72 hours of antibiotic treatment. The initial antibiotic regimen administered in this group, was in accordance to CAP guidelines in 37 cases (49%). The mortality rate was 18.5% in this patient population.

Twenty seven (11%) patients were intubated during their hospitalization and 21 (57%) of them eventually died. From the 27 intubated patients, thirteen were classified on admission as risk class V, seven as risk class IV, three as risk class III, one as risk class II and three as risk class I. Unfavourable clinical course (intubation and/or death) was recorded in 42 (17%) patients, 36 (86%) of whom were classified on admission in risk classes III, IV or V. Interestingly, six (14%) patients with unfavourable clinical course were initially classified in risk classes I or II.

Regarding CAP complications, 96 patients (38%) developed multilobar pneumonia, 89 patients (35%) developed parapneumonic pleural effusion (drainage through a Bullau chest tube was performed in only three patients) and eight patients (3%) developed empyema (drainage through a Bullau chest tube was performed in all of them). Acute respiratory failure with or without ARDS complicated the clinical course of 93 patients (37%). Thirty of them (32%) died. Severe sepsis or septic shock occurred in 31 patients (12%) with a mortality rate of 77%, while 20 of them developed MODS with a mortality rate of 93%.

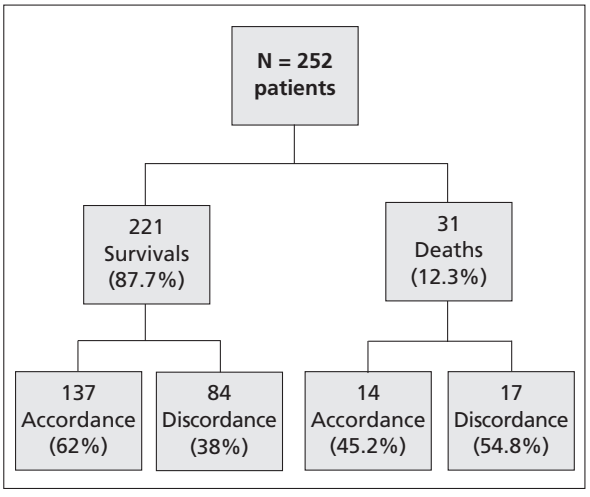

Figure 1. Accordance of the initial antibiotic regimen to CAP guidelines, and outcome of 252 treated patients with CAP. CAP: Community acquired pneumonia.

Discussion

To our knowledge this is the biggest study in Greece that investigated the adherence of chest physicians to any guidelines for CAP. The main finding of this study is the poor adherence to CAP guidelines, as far as the initial antibiotic regimen and the decision for hospital admission are concerned, in the biggest Hospital for Thoracic Diseases in Greece.

In the present prospective observational study, adherence to CAP guidelines regarding the decision of Hospital admission (52%), was poor since almost one out of two hospitalized patients could have been treated as outpatients. This finding is in contrast with the results of previous studies, where guideline adherence was higher (61%-97%)[22-24]. Acknowledging the fact that the cost of inpatient care for CAP is approximately 25 times greater compared to the outpatient setting, the high level of non-compliance to CAP guidelines by Greek physicians may have important financial consequences to the National Health system[2]. Apart from the cost, hospitalization also increases the risk of thromboembolic events and superinfection by more virulent or resistant hospital pathogens[25]. However, it should

be emphasized that in the present study 14% of the patients who had unfavourable clinical course (intubation and/or death) had been initially classified in risk classes I or II.This finding is in accordance with the results of a previous study where PSI score was found to have high specificity but low sensitivity (89.2% and 63.6% respectively), in adult patients under the age of 50, admitted with CAP[26]. Approximately 11% of the patients in the present study were intubated and transferred to the intensive care unit (ICU), a rate similar with that reported in the previously mentioned study[26].

Concerning the initial antibiotic treatment for CAP, the observed compliance (60%) based on the IDSA and Greek national guidelines was considerably lower than the compliance reported from other published studies (76.5%-83%)[9,23,27,28], but similar (65%) to the one reported in the previous smaller Greek study[14]. A conclusion from both Greek reports can be that the adherence of Greek physicians to treatment guidelines for CAP is poor, far from the average adherence rate referred in other countries, although this assumption has to be confirmed by future researches organized in several Greek areas.

The trend for shorter LOS observed in patients treated in accordance to CAP guidelines is in full agreement with the results of previous published investigations[9,14,28-31]. Low risk patients (those classified as risk class I or II) had also a trend for shorter hospitalization in comparison to high risk patients (those classified as risk class III, IV or V), a finding similar to those reported previously[32,33].

Despite the 81% increase in mortality rate for the group of patients whose initial antibiotic regimen was in discordance to the guidelines, this difference was not statistically significant ($p = 0.1$). A possible explanation for this finding could be the relatively small sample size of the population enrolled and the fact that 59% of the patients who received initial antimicrobial chemotherapy in discordance to CAP guidelines were actually overtreated (receiving antimicrobial agents of bigger broad spectrum. The observed mortality rate in our study (12.3%) is similar to the mortality rate mentioned by the IDSA guidelines (12% overall), while mortality rates in several other investigations ranged between 6%-20%[9,22,27,34-36]. From the lower to the higher risk classes (I to V), mortality was increasing to a rate similar to that reported previously (Table IV)[22,32,33,37,38]. COPD patients performed a significantly higher mortality rate compared to patients without COPD, a finding which is in full compliance with the existing literature data. COPD is accepted as an important predisposing factor for CAP, acknowledging that it leads to an impairment of hosts' pulmonary defence[6,15,16,39,40].

The low yield (18.6%) of pathogen identification found in our work, when compared to the yield of pathogen identification in other similar researches (37%-52%), could be explained by the fact that only 10% of our patients underwent the basic microbiological diagnostic tests recommended by the IDSA and Greek national guidelines for CAP[34,41-43]. Another explanation is that 44% of the enrolled patients had already been under antibiotic treatment by the time of the ED referral, a fact that reduces the possibility of pathogen isolation[43,44]. Moreover, serological tests where not repeated after a four-week interval, a fact that is considered as a limitation of the current study[6,7].

Conclusions

In conclusion, the implementation of CAP guidelines by chest physicians working in the biggest Greek Hospital for Thoracic Diseases, as far as the initial antibiotic regimen and the decision for hospital admission are concerned, was found to be poor. A trend towards shorter length of hospitalization was observed in patients treated with an initial antibiotic regimen in accordance to guidelines compared to those receiving initial antibiotic regimen in discordance to the guidelines. It is necessary to improve adherence to guidelines, in order to shorten the LOS and reduce the financial burden of the National Health System.

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