



Post Discharge Short Term Mortality in Hospitalized Patients with Community-Acquired Pneumonia

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Abstract

Introduction: Community-acquired pneumonia (CAP) is one of the most important causes of morbidity and mortality in developed countries, especially in the elderly and adults. Thus, the relationship between CAP and short and long-term mortality in patients is critical. A better understanding of CAP related mortality factors can enable us to make inferences for patient care. In this study, we aimed to determine the short-term (1 month) mortality rate for CAP after hospitalization and to find the risk factors associated with mortality.

Methods: Hospitalized patients with CAP were classified into two groups as follows: patients who died within 1-month after hospital discharge and patients who survived in the same period. All patients' data recorded in a computer-assisted protocol. Data were collected on demographic characteristics, comorbidities, causative organisms, laboratory findings, and survival situations.

Results: The findings showed that 489 non-immunosuppressed adults with CAP were hospitalized. 11.4% patients died 1-month after the hospitalization. The frequency of male sex and current smokers were similar between the groups. However, patients who died in 1-month after hospital discharge were older. Regarding comorbidities, patients who died within 1-month after hospital discharge more often had chronic renal disease; other comorbidities were more seen in alive patients. Patients who died within 1-month after hospital discharge more often had higher WBC, Neutrophil, Procalcitonin, BUN, AST, PaCO₂ value, and lower lymphocyte, Hct, Hb, protein, albumin value than who survived. Length of hospital stay was longer in survived patients than died patients.

Discussion and Conclusion: The findings obtained in this study suggest that mortality of in-patients with CAP is remarkably high. Although we could not show any significant independent risk factor for mortality, we can say that some laboratory parameters and some comorbid conditions may affect the mortality rate. Our findings may help to understand the relationship between CAP and mortality, and designing optimal management of comorbidities in this population after discharge.

Keywords: Hospital-acquired pneumonia; post discharge mortality; markers.

Community-acquired pneumonia (CAP) is one of the major causes of morbidity and mortality in adults in developed countries, especially in the elderly^[1]. Also, it is a common reason for hospitalization approximately 20-25% of CAP patients require inpatient treatment. Severe

CAP, defined as admission to the intensive care unit (ICU), develops in approximately 10-20% of inpatients^[2]. Mortality rates reported as <1% to >40% according to treatment setting, disease severity, age and comorbidities^[3]. Hospital mortality rate for CAP patients is approximately 13%^[4].

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Moreover, it has been shown that hospitalization for CAP is associated with high long-term mortality compared with other major medical conditions. The frequency of long-term mortality reported in these studies ranged from 11% to 53%^[5,6]. Therefore, it has been stated that CAP should be recognized as a medical emergency due to its acute life-threatening condition^[7]. In our country, lower respiratory tract infections are ranked as the 5th cause of death with a rate of 4.2%^[8]. In addition, mortality rate in CAP patients hospitalized in our country has been reported as 9.7%, mortality-related factors have been reported as advanced age and presence of comorbidity^[9]. There is an important interest in determining the relationship between CAP and short- and long-term mortality in surviving patients. A better understanding of the factors associated with this complication can enable us to make inferences for patient care. Therefore, this is a crucial issue that requires comprehensive evaluation. We aimed to determine the short term (1 month) mortality rate after hospitalization for CAP, and to find out the risk factors related with mortality in this study.

Materials and Methods

This retrospective study was carried out in a Training and Research Hospital for adults. All adult patients >17 years of age with CAP who were admitted to the hospital from 1 January 2009 to 31 December 2017 were recruited. CAP was identified using ICD-10 codes (International Classification of Diseases, 10th Revision). The case definition for hospitalized CAP was hospitalization and either one of the main discharge diagnoses of pneumonia. Mortality of CAP was defined as death for any reason occurring within 30 days of the CAP case definition.

Patients with neutropenia, immunoglobulin deficiencies, HIV infection, transplantation or splenectomy, those who were receiving immunosuppressant and/or corticosteroid therapy were not included in this study. Hospitalized patients with CAP were classified into two groups: patients who died within 1-month after hospital discharge and patients who survived in the same period.

All patients' data recorded in a computer-assisted protocol. Data were collected on demographic characteristics, comorbidities, causative organisms, laboratory findings, and survival situation.

Mortality data mostly depends on regular examinations recorded in hospital software data. Additionally, searches were conducted from the national death reporting system (<https://obs.saglik.gov.tr/Account/Login>). This study was approved by applying to the Istanbul Training and Re-

search Hospital Ethics Committee (Ethics committee number: 2142, date:10.01.2020).

The statistical analysis was performed with version 22.0 of the SPSS software package. P-values less than 0.05 were considered statistically significant. All reported p-values were 2-tailed. Significant differences between groups were detected using the chi-square test for categorical variables. For continuous variables, we used the Student's t-test or Mann Whitney U test, depending on the results of the Kolmogorov Smirnov normality test. The logistic regression model of factors potentially associated with 1-month mortality included all the significant variables in the multivariate analysis (p<.05) with clinical importance.

Results

During the study period, 489 non-immunosuppressed adults with CAP were hospitalized. Fifty-six (11.4%) patients died 1-month after hospitalization. The demographic features at hospital admission of patients who survived and died in 1-month after hospital discharge are compared in Table 1. The frequency of male sex and current/former smokers were similar between the groups. However, patients who died in 1-month after hospital discharge were older (p>0.05). Regarding comorbidities, patients who died within 1-month after hospital discharge more often had chronic renal disease. Other comorbidities were more seen in alive patients.

The laboratory findings at hospital admission of patients who survived and died within 1-month of leaving hospital are compared in Table 2. Patients who died within 1-month after hospital discharge more often had higher WBC, Neutrophil, Procalcitonin, BUN, AST, PaCO₂ value, and lower lymphocyte, Hct, Hb, protein, albumin value than who survived. Other laboratory parameters showed no significant difference between groups. Length of hospital stay was longer in survived patients than patients who died

Table 1. Demographic characteristics at hospital admission of patients with all CAP patients (survived and died)

Characteristic	Alive (n=433)	Died (n=56)
Age (years, mean)	62.60±16.20	65.39±14.02
Male sex (n,%)	319 (73.67)	41 (73.21)
Current/former smoker (n,%)	236 (54.50)	26 (46.42)
Comorbidities		
Diabetes mellitus	75 (17.32)	5 (8.92)
Chronic respiratory disease	191 (44.11)	21 (37.5)
Cardiac disease	182 (42.03)	20 (35.71)
Chronic renal disease	18 (4.15)	5 (8.92)

(9.95±6.46 day vs. 8.17±6.31 day, $p=0.019$). We were not able to determine risk factors independently associated with 1-month mortality. The results of the regression analysis for factors that are potentially associated with 1-month mortality after hospital discharge in patients with CAP are summarized in Table 3.

Table 2. Laboratory findings at hospital admission of patients with all CAP patients (survived and died)

Characteristic	Alive (n=433)	Died (n=56)	p
Whole blood count			
WBC ($10^3/\mu\text{L}$)	12.20±7.21	15.79±11.85	0.000
Neutrophil ($10^3/\mu\text{L}$)	9.83±6.70	12.02±6.11	0.001
Lymphocyte ($10^3/\mu\text{L}$)	1.38±2.50	0.91±0.98	0.000
Platelet ($10^3/\mu\text{L}$)	293.26±127.58	272.25±137.15	>0.05
Hct (%)	37.47±6.67	35.44±6.48	0.047
Hb (g/dL)	12.09±2.17	11.37±2.18	0.02
CRP (mg/L)	145±10.90	170.23±10.14	0.053
ESR (mm/h)	70.10±34.15	66.73±36.59	>0.05
Procalcitonin (mg/L)	0.21±0.23	0.29±0.23	0.013
Biochemistry			
Glucose (mg/dL)	151.92±88.24	143.37±65.30	>0.05
Na (mEq/L)	137.60±21.01	135.87±5.09	>0.05
BUN (mg/dL)	45.51±24.41	67.17±39.13	0.000
Protein (g/dL)	6.60±0.80	6.17±0.92	0.001
Albumin (g/dL)	3.27±0.54	2.88±0.53	0.000
ALT (U/L)	30.91±43.47	46.01±69.38	>0.05
AST (U/L)	34.08±63.41	74.65±178.69	0.031
Arterial Blood Gas			
pH	7.432.35±0.070	7.418.32±0.125	>0.05
PaO ₂ (mmHg)	71.25±29.97	84.02±54.80	>0.05
PaCO ₂ (mmHg)	42.32±13.57	48.54±19.82	0.035

Table 3. Factors associated with 1-month mortality after discharge for CAP patients

Characteristic	Odds ratio	95% Confidence interval	p
CRP	3.07	0.00-0.00	0.99
Glucose	2.13	0.062-73.07	0.67
Neutrophil	0.00	0.00-0.00	1.00
Lymphocyte	0.69	0.19-2.50	0.57
WBC	1.05	0.20-5.55	0.95
Hct	1.85	0.23-15.04	0.56
Hb	1.43	0.18-11.09	0.73
PaCO ₂	3.15	0.90-10.99	0.07
BUN	2.62	0.74-9.25	0.13
Procalcitonin	1.71	0.43-6.77	0.44
Protein	1.18	0.28-4.98	0.82
Albumin	0.00	0.00-0.00	1.00
AST	2.69	0.68-10.53	0.15

Discussion

In this retrospective study of a large cohort of hospitalized patients with CAP, we found that 11.45% of patients died within the first month after hospital discharge. Although we observed that some laboratory parameters showed a significant difference in survived patients, we were not able to determine risk factors independently associated with 1-month mortality after hospital discharge.

There are some reports documenting the mortality rate in CAP patients. In Adamuz et al.'s study, they prospectively analysed CAP patients who were hospitalized and they documented that 241 (15.2%) patients died during a 1-year follow-up after hospital admission. Of these, 93 (7.2%) died within 1-year of leaving the hospital. Another finding of this study was, after the first months of hospital discharge, the cases of mortality from infectious diseases decreased progressively, while deaths from acute cardiovascular causes showed stability throughout the follow-up^[10]. Other previous reports found a frequency of long-term mortality from 11% to 53% in CAP patients^[5,6,11]. However, these studies evaluated longer-term mortality during 1-7 years of follow-up, and some of them included in-hospital mortality. Another study reported in-hospital mortality rate of CAP patients as 17.2%. They explained the cause of this mortality rate by including patients with haematological malignancies and immunosuppression in their population, who are known to have a high incidence of CAP and carry a worse prognosis^[12]. One of the important risk factors for mortality in hospitalized CAP patients is the presence of comorbidities. We found that non-survived patients had more often chronic renal disease than survived patients. Another study documented that COPD, diabetes mellitus, cancer, dementia, rehospitalization within 30 days of hospital discharge and nursing home residence were independent predictors of 1-year mortality after hospital discharge^[10]. Mortensen et al. reported that rehospitalization for another episode of pneumonia, cardiovascular and cerebrovascular disease and exacerbation of COPD was frequent after initial hospitalization for pneumonia^[5]. Moreover, cancer, high glucose level, dementia and nursing home residence were also have been identified as independent predictors of long-term mortality by others^[11,13,14]. Comorbidities are not only important for mortality.

Kolditz et al.^[12] evaluated that chronic comorbidities (with the highest ORs associated with respiratory, neurologic and immunosuppressive disease) are independently associated with a higher incidence of CAP. Therefore, it can be said that these patients should be supported by the

current recommendations for targeting preventive measures. Moreover, this underscores the importance of careful evaluation of chronic comorbidities in every patient with CAP. Because the risk of organ dysfunction due to comorbidity decompensation and prognostic impact of severe, advanced comorbidities may result in possible treatment restrictions. On the other hand, it is showed that chronic respiratory disease can have a protective role. Dusemund et al.^[15] found fewer disease-related complications of CAP in COPD and asthma patients compared with their controls. In-hospital mortality was lower in the COPD and much more pronounced asthma cohorts. A possible mechanism of this finding can be earlier symptom onset of milder CAP in patients with lung disease with subsequent earlier treatment. We also determined that survived patients had more often respiratory disease than non-survived patients. In contrast, a recent meta-analysis found inconsistent effects of COPD on CAP prognosis^[16]. Previous studies documented that age could be another risk factor for mortality in this patient population^[6,13,17]. However, in Adamuz et al.'s^[10] study, age was not independently associated with 1-year mortality in the adjusted model. In our study, although non-survived patients were older than alive patients, it could not reach statistical significance. Similarly, some researchers have documented that, in an elderly population, age per se is not an independent predictor of hospital mortality in CAP patients^[14]. Sex, which is a part of the PSI score, is also accepted as a strong independent risk factor for worse CAP prognosis^[19,20]. However, Arnold et al.^[20] reported that females have worse outcomes for CAP than males. In our study, we were not able to show that sex is an independent risk factor, but we saw that sex is not different in survived and non-survived patients.

The limitations of this study are its retrospective design, conducted in a single-center, and obtaining information about 1-month mortality from the hospital database. We had no data on causes of death. We were not able to provide data on pneumonia severity. Comorbidities were retrieved from ICD-10 coding and not validated by clinical data. Additionally, there are no data on the use of immunosuppressive medications.

Conclusion

This study indicates that the mortality of in-patients with CAP is remarkably high. Although we could not show any significant independent risk factor for mortality, we can say that some laboratory parameters and some comorbid conditions can affect the mortality rate. Our findings may help to understand the relationship between CAP and mortal-

ity, and designing optimal management of comorbidities in this population after discharge.

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