

ORIGINAL INVESTIGATION

Comparison of Patients with Community-Acquired Pneumonia Who Did and Did not Receive Treatment in Accordance with the 2009 Pneumonia Guideline of Turkish Thoracic Society

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Abstract

OBJECTIVES: The purpose of our study was to compare community-acquired pneumonia (CAP) patients who were and were not administered treatment in accordance with the Turkish Thoracic Society (TTS) 2009 pneumonia guideline in terms of hospital stay length, treatment cost, and treatment efficacy.

MATERIAL AND METHODS: Patients who were admitted to our hospital and who were diagnosed with CAP were included in the study. Demographic characteristics of the patients, symptoms at the time of diagnosis, physical examination, laboratory and radiological findings, treatments, response to treatment at follow-up, length of hospital stay, and direct cost of treatment were recorded in the TTS pneumonia database (TURCAP: TURKEY Community Acquired Pneumonia). Taking into consideration the "Turkish Thoracic Society Consensus Report on the Diagnosis and Treatment of Community-acquired pneumonia in Adults (2009)," the patients recorded in the database were evaluated in terms of conformity to the guideline.

RESULTS: This present study included 156 patients diagnosed with CAP. Sixty-six patients (42.3%) were females, and 96 (57.7%) were males, and the mean age of the patients was 70.4 years. The most common symptoms on admission were cough (94.9%), expectoration of purulent sputum (77.6%), and fever (58%). Comorbid diseases were chronic obstructive pulmonary disease (COPD; 29.5%), asthma (3.2%), lung cancer (8.3%), cardiovascular diseases (32.7%), and diabetes mellitus (12.8%). It was observed that 67.3% of the patients received treatment in accordance with the guideline. No significant difference was found in terms of gender and symptoms between the groups that received and did not receive treatment in accordance with the guideline. The mean age of the patients who received treatment according to the guideline was higher than that of the patients who did not receive treatment according to the guideline; COPD was more frequent in the group of patients who received treatment according to the guideline. Pneumonia Severity Index and Confusion, Urea, Respiratory rate, Blood pressure-Age>65 scores of the patients who were treated according to the guideline was higher and treatment resulted in death in 8% of these patients.

CONCLUSION: Hospital stay length, treatment cost, and treatment efficacy were similar in patients who were and were not administered treatment in accordance with the guideline.

KEYWORDS: Community-acquired pneumonia, pneumonia treatment guideline, adherence with guideline

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INTRODUCTION

Community-acquired pneumonia (CAP) is responsible for a significant portion of hospital admissions, treatment cost, loss of school/work days, and deaths all around the world. The annual incidence in Europe has been reported to be 0.5–1.1%, and the incidence increases with age [1,2].

Currently, whereas deaths associated with infectious diseases are gradually decreasing because of the wide use of antibiotics and effective immunization policies, CAP is still a cause of high morbidity and mortality. In Turkey, lower respiratory tract infections rank fifth at 4.2% among causes of death [3].

Guidelines have been prepared for this disease with high incidence and mortality in order to create a common language among physicians, to increase the success of treatment, and to decrease length of hospital stay, treatment cost, and mortality. For this purpose, Pneumonia Diagnosis and Treatment Guidelines were first published in 1998 in Turkey; thereafter, it was revised in 2002 and 2009.

Studies performed on guideline adherence in literature demonstrate that adherence to the guideline decreases mortality and unnecessary hospitalizations while increasing the success of treatment [4–6]. A study from Turkey found no difference in the total cost of patients who received initial treatment in accordance and not in accordance with the guideline [7]. On the basis of studies in literature, this present study was planned to evaluate the characteristics of patients diagnosed with



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CAP and to compare hospital stay length, treatment cost, and treatment efficacy in patients who were and were not administered treatment in accordance with the guideline.

MATERIAL AND METHODS

All patients who were admitted to Dokuz Eylül University Faculty of Medicine between November 2010 and November 2011 and who were diagnosed with CAP because of having symptoms and physical examination findings consistent with pneumonia and presence of infiltrations in chest X-rays were included in the study. Patients with a probability of recurrent pneumonia, healthcare-associated pneumonia, migratory pneumonia, hospital-acquired pneumonia, and who were immunocompromised with pneumonia were excluded from the study.

The study was approved by the Non-interventional research Ethics Committee of Dokuz Eylül University Medical Faculty (10.13.2011/33-08).

Demographic characteristics of the patients; symptoms at the time of diagnosis; physical examination; laboratory and radiological findings; Confusion, Urea, Respiratory rate, Blood pressure-Age>65 (CURB-65); and Pneumonia Severity Index (PSI) scores; received treatments and treatment response at follow-up; length of hospital stay; and direct cost of treatment were recorded in the Turkish Thoracic Society (TTS) pneumonia database (TURCAP). The clinical, laboratory, and radiological data and treatments of patients recorded in the database were evaluated, and considering the Turkish Thoracic Society Consensus Report on the Diagnosis and Treatment of Community-acquired pneumonia in Adults (2009), they were assessed in terms of adherence to the guideline. The treatments administered to the patients were assessed in three groups as follows: second and third generation cephalosporins without anti-pseudomonal activity or aminopenicillins with beta-lactamase inhibitors plus macrolides (combination treatments), fluoroquinolone treatment, and treatments with anti-pseudomonal activity. Treatments in the groups determined according to the PSI and CURB-65 scores in the TTS guideline were taken as the basis, and treatments other than recommended treatments in these groups were considered as non-compliant with the guideline, and the patients who received the recommended treatments were considered as compliant with the guideline. In hospitalized patients who were initiated parenteral antibiotics, switching to oral treatment was considered as sequential treatment.

Statistical Analysis

Data of the patients recorded in TURCAP were analyzed using Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA) 15.0 statistics program. Chi-square test, student-t test, paired t-test, Fisher's exact test, Mann-Whitney U-test, and logistic regression test were used in the statistical analysis. The significance level was considered as $p<0.05$.

RESULTS

The present study included 156 patients who were diagnosed with CAP. Sixty-six (42.3%) patients were females, and 90 (57.7%) were males. The age of the patients ranged from 18 to 103 years, and the mean age was 70.4 years.

When the symptoms of the patients on admission were assessed, it was found that 148 (94.9%) patients had cough,

Table 1. Comorbid diseases in the patients

| Comorbid Diseases | Number of patients | % |
|--------------------|--------------------|------|
| COPD | 46 | 29.5 |
| Asthma | 5 | 3.2 |
| Lung cancer | 13 | 8.3 |
| CVD | 51 | 32.7 |
| DM | 20 | 12.8 |
| ceVD | 9 | 5.8 |
| CRF | 6 | 3.8 |
| Solid organ cancer | 10 | 6.4 |

COPD: chronic obstructive pulmonary disease; CVD: cardiovascular disease; DM: diabetes mellitus; ceVD: cerebrovascular disease; CRF: chronic renal failure

121 (77.6%) had purulent sputum, whereas 14 (9%) had no sputum production. Fever was present in 91 (58%) patients.

One hundred and ten (70.6%) patients had one or more comorbid diseases. The distribution of comorbid diseases is presented in Table 1, and it was observed that 42% of the comorbid diseases were respiratory system diseases [chronic obstructive pulmonary disease (COPD), asthma, lung cancer].

Whereas 105 (67.3%) of the patients were administered treatment according to the guideline, sequential treatment was administered in 57 (36.5%) of them.

When the groups that received and did not receive treatment in accordance with the guideline were compared, no statistically significant difference was determined in terms of gender and symptoms. The distribution of the symptoms is shown in Table 2. The mean age of the patients who received guideline adherent treatment was higher, and the difference between the groups was statistically significant ($p<0.001$). Considering the comorbid diseases, 40 (38.1%) patients who received treatment in accordance with the guideline had COPD, whereas 6 (11.8%) patients who received guideline-discordant treatment had COPD; there was a statistically significant difference between the groups ($p=0.001$). Asthma was present in 5 (9.8%) patients who received guideline-discordant treatment. Whereas none of the patients who received guideline-compliant treatment had asthma, there was a significant difference between the groups ($p=0.003$). The groups were similar in terms of other comorbid diseases.

C-reactive protein levels and leukocyte values showed a significant decrease in both groups after treatment, and the difference was found to be statistically significant ($p<0.001$).

It was determined that patients who received treatment in accordance with the guideline had significantly higher PSI and CURB-65 scores compared with those who received guideline-discordant treatment ($p<0.001$). Length of hospital stay was similar in the groups ($p=0.186$). The mean direct cost of treatment in patients who did and did not receive treatment in accordance with the guideline were 3025.4TL and 1739.8TL, respectively; however, there was no statistically significant difference between the groups ($p=0.06$) (Table 3).

Table 2. Symptoms of the patients who were and were not treated in accordance with the guideline

| Symptoms | Patients who received guideline based treatment | Patients who received guideline-discordant treatment | p |
|----------|---|--|-------|
| Fever | 58 (55.2%) | 33 (64.7%) | >0.05 |
| Cough | 98 (93.3%) | 50 (98%) | >0.05 |
| Sputum | 94 (89.5%) | 48 (94.1%) | >0.05 |

Table 3. Assessment of patients who were and were not treated in accordance with the guideline

| Parameters | Patients who received guideline-based treatment | Patients who received guideline-discordant treatment | p |
|-----------------------------|---|--|-------|
| PSI | 111 | 72 | 0.000 |
| CURB-65 | 2.51 | 1.54 | 0.000 |
| Hospital stay length (days) | 13.8 | 7.43 | 0.186 |
| Direct treatment cost (TL) | 3025.4 | 1739.8 | 0.06 |

PSI: Pneumonia Severity Index; CURB-65: Confusion, Urea, Respiratory rate, Blood pressure -Age>65

Whereas 84 (80%) patients who received guideline-compliant treatment showed a response to treatment, the treatment resulted in death in 9 (8.6%) patients. Treatment response was achieved in 42 (84%) patients who did not receive treatment in accordance with the guideline, whereas 4 (8%) patients died after treatment; there was no statistically significant difference between the groups ($p=0.9$) (Table 4).

The rates of hospitalization and the rates of patients who were hospitalized in the ward or intensive care unit are presented in Table 5. It was observed that the rate of hospitalization in the ward or intensive care unit was higher in patients who received treatment according to the guideline; the difference was statistically significant ($p<0.001$).

Whereas 48 (45.7%) patients who received guideline-compliant treatment received sequential treatment, only 9 (17.6%) patients who received guideline-discordant treatment received sequential treatment; there was a statistically significant difference between the groups ($p=0.001$).

Among the patients who were treated according to the guideline, 85 (86.7%) patients received combination treatment and 13 (13.3%) of them were treated with fluoroquinolones, whereas fluoroquinolone treatment was given to 18 (46.2%) patients who received guideline-discordant treatment. Fluoroquinolone use was more common in patients who received guideline-discordant treatment, and the difference between the groups was statistically significant ($p<0.001$).

DISCUSSION

In the studies evaluating treatment adherence to guidelines, adherence varies between 24% and 84.2% [6,8]. In a study

Table 4. Treatment response of patients who were and were not treated in accordance with the guideline

| Treatment response | Patients who received guideline-based treatment | Patients who received guideline-discordant treatment | p |
|---|---|--|-----|
| Patients who showed response to treatment | 84 (80%) | 42 (84%) | 0.9 |
| Patients who died | 9 (8.6%) | 4 (8%) | 0.9 |

Table 5. Hospitalization data of the patients who were and were not treated in accordance with the guideline

| Hospitalization data | Patients who received guideline-based treatment | Patients who received guideline-discordant treatment | p |
|--|---|--|------|
| Patients treated as outpatients | 6 (5.7%) | 24 (47.1%) | 0.00 |
| Patients who received treatment in the ward | 72 (68.6%) | 27 (52.9%) | 0.00 |
| Patients who received treatment in the intensive care unit | 27 (25.7%) | 0 (0%) | 0.00 |

performed by Sevinç et al. [8] in Turkey, the rate of adherence to guidelines was found to be 43.8%; the same study reported treatment success as 98.2% and mortality rate as 2% [8]. In the present study, compliance with the guideline was found to be 67.3%, whereas treatment success rate was 81.3%, and mortality rate was 8.4%.

It was found that the patients who received guideline-compliant treatment had significantly higher PSI and CURB-65 scores than the scores of patients who were not treated according to the guideline ($p<0.05$). It has been reported that the PSI and CURB-65 scoring systems are successful in the estimation of mortality and in the determination of patients with low mortality risk [9]. The result was interpreted as patients with high PSI and CURB-65 scores were started on treatment according to the guideline considering that that they had a severe disease.

Brown [10] reported that treating patients according to the guideline decreased hospital stay length, cost, and mortality; however, in our study, there was no statistically significant difference between the two groups in terms of hospital stay length, direct treatment cost, and mortality.

The mean direct cost of treatment in patients who received treatment in accordance with the guideline was 3025.4TL, and the mean direct treatment cost of those who received guideline-discordant treatment was 1739.8TL; however, the difference between the groups was not statistically significant ($p=0.06$). A study performed in our country on hospital costs found no difference between the radiological, laboratory, and total cost of patients who received and who did not receive their initial treatment in accordance with the guideline. The same study reported that gender and age had no

effect on the total cost, whereas the length of hospital stay and presence of comorbid diseases increase the cost [7]. In our study, the high cost of treatment in patients who received treatment according to the guideline was thought to be due to the high PSI scores and high rate of comorbid diseases in this group of patients.

The higher PSI and CURB-65 scores in the group that received treatment in accordance with the guideline was attributed to the facts that this group of patients had a higher comorbidity rate of COPD and that physicians showed higher adherence to the guideline while initiating empirical treatment in cases considered to be more severe and initiated broad spectrum antibiotics unnecessarily to less severe cases.

In the study by Gökirmak et al. [6], success rate in 36 CAP patients who were started on treatment according to the TTS guideline was found to be 92%. However, the same researchers found that success rate is lower (76%) in patients who received guideline-discordant treatment. In the present study, 84 (80%) patients who were administered treatment in accordance with the guideline responded to treatment, whereas 42 (84%) patients who received guideline-discordant treatment showed response to treatment; no significant difference was found between the groups ($p=0.9$). The high treatment success rate in the group that received guideline-discordant treatment was attributed to the administration of broad spectrum antibiotics.

There was a significant difference between patients who received and who did not receive treatment in accordance with the guideline in terms of rates of hospitalization and hospitalization in the intensive care unit ($p<0.001$). It was determined that all patients who were hospitalized in the intensive care unit were administered treatment in accordance with the guideline and that patients with less severe pneumonia who were treated as outpatients mostly received treatment not in accordance with the guideline.

In the guideline, sequential treatment is recommended in hospitalized patients in order to decrease the cost of treatment [2,11]. It was determined that the rate of patients who received sequential treatment was higher among those who received treatment according to the guideline and that the difference was statistically significant ($p<0.05$).

It was found that fluoroquinolone use was higher in the group that received guideline-discordant treatment and that the difference between the groups was statistically significant ($p<0.001$). It was determined that the patients with more severe pneumonia were mostly treated in accordance with the guideline, and combination treatments were especially preferred in that group of patients.

In conclusion, it was determined that the mean age of patients who received treatment in accordance with the guideline was higher, and that comorbid diseases, particularly COPD, were more common, and that the PSI and CURB-65 scores were higher. The hospital stay length, treatment cost, and treatment efficacy were similar in the groups that received and did not receive treatment in accordance with the guideline. It was thought that high treatment success

rate achieved in the group that received treatment not in accordance with the guideline was because of the administration of wide spectrum antibiotics. It was observed that all patients who were hospitalized in the intensive care unit were administered treatment in accordance with the guideline and that patients with less severe pneumonia who were treated as outpatients mostly received treatment not in conformity with the guideline. The use of fluoroquinolones was higher in the patients who received guideline-discordant treatment.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Dokuz Eylül University Faculty of Medicine (13.10.2011/33-08).

Informed Consent: Written informed consent is not provided because it is a retrospective study.

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