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THE RISK FACTORS OF EARLY READMISSIONS IN COPD EXACERBATIONS

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ABSTRACT

Background and Objective: It is known that hospital readmissions and frequent hospitalizations in hospitalized patients in Chronic Obstructive Pulmonary Disease (COPD) exacerbations shorten the survival. In this study, it was aimed to investigate the risk factors associated with "early readmission" in patients hospitalized for exacerbation of COPD within the first month after discharge from the hospital due to COPD exacerbation.

Materials and Methods: In this study, 54 patients hospitalized due to COPD exacerbation in Chest Diseases Department of Cukurova University Faculty of Medicine Balcali Hospital between September 2015 and February 2016 enrolled and the risk factors for readmission within the first month after discharge is evaluated.

Results: It was determined that 13 of 54 patients (24.1%) who participated in the study were readmissioned within the first month after discharge. The mean age of the patients in our study was 64.24 ± 9.95 and 84.6% of them were men. Although the mean age seemed to be more advanced in the early readmission group, this difference was not statistically significant ($p > 0.05$). The Charlson comorbidity index, lung cancer, moderate-severe kidney disease, presence of metastatic solid tumor, White Blood Cells (WBC) levels and low socioeconomic level were found to be significantly higher in the early readmission group ($P = 0.029$, $P = 0.012$, $P = 0.015$, $P = 0.024$, P, = 0.019 and $P = 0.057$ respectively). In addition, it was found that postbronchodilator Forced Expiratory Volume in first second / Forced Vital Capacity (FEV1 / FVC) was significantly lower in the group with early readmission. With multivariate regression analysis; the risk factors for readmission in the first 30 days after discharge were found as body mass index (BMI) and Charlson comorbidity index score, the other parameters could not reach the statistical significance.

Conclusion: In this study, we determined the risk factors that increase the risk of early re-hospitalization were comorbidities, serum WBC count and socioeconomic factors.

Key words; readmissions, COPD, COPD exacerbation, risk factors

INTRODUCTION

COPD is one of the leading causes of morbidity and mortality worldwide and causes a gradually increasing economic-social burden. (1) Exacerbations in patients with COPD cause frequent hospital admissions, relapses, and rehospitalizations. Especially, exacerbations that require hospitalization are associated with significant mortality and increased socio-economic burden. (1)

COPD exacerbation is an acute event characterized by a worsening of the patient's respiratory tract symptoms beyond the usual daily variability and leading to medication changes. (1) Readmission is defined as the re-hospitalization of a patient discharged from the hospital. Two different types of readmission are defined. Early readmission is defined as readmission within the first 30 days after discharge of patients who were hospitalized and discharged due to COPD exacerbation. Late readmission, on the other hand, in patients who were hospitalized and discharged due to COPD exacerbation within 30-90 days after discharge; According to some sources, it is defined as readmission within 1 year.

In this study, obtaining more comprehensive information about the risk factors that are thought to be the cause of early readmission in COPD patients was intended.

MATERIALS AND METHODS

Fifty-four adult patients over the age of 40 with a smoking history that admitted to Chest Diseases Department of Cukurova University Faculty of Medicine Balcali Hospital between September 2015 and February 2016, who were clinically diagnosed with COPD exacerbation and who were diagnosed with COPD according to the Global İnitiative for Chronic Obstructive Lung Disease (GOLD) guideline by pulmonary function tests (PFT), were included. Patients who were hospitalized for other reasons than COPD and were stable in terms of COPD and who had clinical findings that mimic a COPD exacerbation were excluded from the study. After obtaining the consent form of the patients participating in the study, a questionnaire form searching about the socio-demographic characteristics, symptoms and medical histories and physical examination findings were recorded. In order to determine the nature and severity of the disease and the presence of comorbidities; peripheral venous blood samples were taken for complete blood count and biochemical tests, arterial blood gas examination, sputum culture examination, postero-anterior (PA) chest radiography, thorax computed tomography (CT) (if nacessary in clinical circumstances), PFT, Carbone Monoxide Diffusion of Lung Test (DLCO) Total Lung Capacity (TLC) and Residuel Volüme (RV), Electrocardiography (ECG), Echocardiography (ECO), modified Medical Research Council (mMRC) dyspnea scoring, COPD Assessment Test (CAT), age, dyspnea, airflow obstruction (ADO) index, dyspnea, obstruction, smoking and exacerbation (DOSE) index, body mass index, obstruction, dyspnea and exercise capacity (BODE) index, blood pressure measurement, Turkish adaptation of the hospital anxiety-depression scale (HAD-S) was performed. The information regarding the treatment period in the hospital and the period discharge of the patients participating in the study were recorded, and patients who were hospitalized again due to COPD exacerbation within the first month after discharge were determined.

SPSS 19.0 package program was used for statistical analysis of the data. Categorical measurements were summarized as numbers and percentages, and numerical measurements as mean and standard deviation (median and minimum-maximum where necessary). Chi-square test was used to compare categorical measurements between groups. Whether numerical measurements showed normal distribution or not was determined by Kolmogorov Smirnov test. In the comparison of numerical measurements between two groups (groups with and without early readmission), if the assumptions were met, the T test was used for independent groups, and the Mann Whitney U test was used if the assumptions were not met. In the comparison of numerical measurements between more than two groups (such as education level, profession), one-way analysis of variance was used if the assumptions were met, and the Kruskal Wallis test was used if the assumptions were not provided. Paired subgroup comparisons were made using appropriate Post Hoc tests (such as Scheffeonferroni, Tamhane) or the Mann Whitney U test with Bonferroni correction for the cases found to be significant in these comparisons. Correlations between numerical measurements were analyzed with Pearson or Spearman correlation coefficients, depending on whether the assumptions were met or not. The statistical significance level was taken as 0.05 in all tests.

RESULTS

54 patients with COPD were included in the study and the number of patients who were readmission within the first 30 days after discharge was found to be 13 (24.1%). Considering the duration of hospitalization of the patients who were readmission within the first 30 days after discharge, it was observed that three patients (23.1%) 1-3 days, one patient (7.7%) 4-7 days, three patients (23.1%) 8 -15 days, three patients (23.1%) 16-21 days, and again three patients (23.1%) within 22-30 days. The mean age of 54 patients included in the study was 64.24 ± 9.95 years, and the mean age of the patients in the early readmission group was 66.54 ± 9.16 years. Although there was a higher mean age in patients who were readmitted for this condition, it was found that there was no significant statistical difference in terms of early readmission (P = 0.279).

While 68.3% of the patients who were not readmitted were under the guarantee of the Social Insurance Institution, this rate was only 38.5% in patients who were readmission. It was thought that the lack of govermental insurance could be a significant risk factor for early readmissions. (P = 0.057).

The clinical characteristics of the patients in our study are presented in Table 1. 15.4% of the patients who were readmitted and 31.7% of the patients who were not readmitted continued to smoke and the smoking intensity of the patients who were readmitted was found to be 47.23 ± 18.91 package/year. When compared with the group without readmission, both parameters were not statistically significant (P = 0.232 and P = 0.968, respectively). The average BMI of the relapsed

patients was 26.2 ± 4.63 kg / m2 (P = 0.613) and the vaccination rates of the patients who were readmitted were 30.8% (P = 0.918) for the influenza vaccine and 15.4% for the pneumococcal vaccine (P = 0,241).

The most common causes of COPD exacerbation are determined as, in order; inappropriate use of the inhaler treatment (83.3%), air pollution (79.6%) and infections (77.8%).

The respiratory symptoms of the patients in the study are also shown in Table 1. The most severe and common symptom of both groups was dyspnea. Cough was observed in 76.9% in group1 and 34.1% in group 2 and cough was observed to be significantly higher in group 1. (P = 0.010).

In the comparison of the drugs used in the stable COPD treatment, it was found that there was no statistically significant difference in terms of readmission risk.

Considering the hospitalization status of the patients in the study, there was only COPD exacerbation in 53.7%, respiratory failure in 35.2% and an association with Cor Pulmonale in 11.1% of study population.

Regarding respiratory functions, the mean postbronchodilator FEV1 / FVC of the patients with readmission were found to be significantly lower than those without readmission (P = 0.091). Other respiratory function parameters are shown in Table 1.

According to the GOLD 2006 classification, 18.5% of 54 patients were at mild-moderate stage, and 81.5% were severe-very severe stage COPD (P = 0.551). According to the GOLD 2011 classification, 85.2% of 54 patients were in the C and D groups (P = 0.734). (Table 1)

Mean mMRC dyspnea scale score was 3.61 ± 0.5 in patients with early readmission and 3.56 ± 0.59 in patients without readmission; mean CAT score was 21.15 ± 3.57 in patients with readmission and 21.37 ± 3.86 in patients without readmission. Neither mMRC nor CAT scores were statistically significant in terms of readmission risk (P = 0.878 and P = 0.911 respectively).

The ADO, DOSE indices which are among the COPD severity scores, were compared in both groups, and no statistically significant association was obtained in terms of readmission risk (P = 0.384, P = 894, respectively).

In our study, it was observed that having a professional recommendation about smoking cessation, pulmonary rehabilitation and physical activity in the last 12 months did not make a statistically significant difference in readmission risk. (P = 0.301, 0.456 and 0.660, respectively).

The comorbidities of the patients in our study are presented in detail in Table 2. Comparing the patients according to the Charlson comorbidity index, it was found that the rate of three or more comorbidities was higher in patients with readmission (77%) compared to patients without readmission (46.3%), and this difference was statistically significant (P = 0.029).

It was observed that the presence of lung cancer, moderate-severe renal disease and metastatic solid tumor was significantly higher in patients with readmission than in patients without readmission (respectively P = 0.012, P = 0.015, P = 0.024).

It was observed that the drug / dose increase in the last 12 months and the use of antibiotics or steroids in the last 12 months were not different between groups (P = 0.200 and P = 0.700, respectively). Likewise, it was observed that the admission to the emergency department in the last 12 months, hospitalization within the last 12 months or intensive care hospitalization within the last 12 months was similar (P = 0.596, P = 0.608 and P = 0.756, respectively). The length of stay in hospital was 15.15 ± 11.17 days in patients with readmission and 10.88 ± 5.81 days in patients without readmission, but this difference was statistically insignificant (P = 0.227) (Table 3).

The laboratory values of the patients during their hospitalization and the treatments they received during their hospitalization are shown in Table 4. In patients with readmission; WBC, c-reactive protein (CRP) and brain natriuretic peptid (BNP) values were observed to be higher and compared with the group without readmission; only the WBC count was reached statistical significance as a risk factor for readmissions (P = 0.019). No significant difference was observed in both groups in terms of re-hospitalization risk for all treatments administered during hospitalization. Again, no significant difference was found in both groups in terms of sputum culture growth and appropriate antibiotherapy use (P = 0.665 and P = 0.817, respectively).

The data of participants on discharge are shown in Table 5. 83.3% of the 54 patients were functionally good (able to walk more than 15 meters). Mean mMRC was 2 ± 0.49 and mean CAT score was 10 ± 2.9 in 54 patients participating in the study. It was observed that the mean ADO, DOSE, BODE scores at the time of discharge and the treatment regimen prescribed at discharge was not a significant risk factor for hospitalization.

Two separate multiple logistic regression analyzes were performed to determine the independent variables affecting re-admission. While the first regression equation (Table 19.A) includes the percentage variables of BODE and FEV1 in the first application, in the second equation (Table 19.B) the percentage variables of BODE and FEV1 at the time of discharge are included in the equation. In both equations, it was determined that the independent variables affecting re-admission are BMI and Comorbidity factors. The risk of re-hospitalization increases significantly in those with a body mass index over 25, with a comorbidity index of 3 and above, and a BODE score above 8 at the first application and over 6 at the time of discharge.

Discussion

Early Readmissions in COPD Exacerbations

COPD exacerbations cause frequent hospital admissions, relapses and readmissions, and contributes to deaths while in hospital or shortly after discharge. Any new severe exacerbation that requires hospitalization increases the risk of subsequent exacerbation and mortality. The number of exacerbations the patient had in the previous year is the strongest indicator of the number of exacerbations he will have in the following years. It has been observed that recurrent COPD exacerbations requiring hospitalization cause a decrease in lung function, adversely affect quality of life and increase mortality. In the studies conducted by Huong Q. Nguyen et al., using extensive integrated health system data, patients aged 40 and over who were hospitalized for COPD were prospectively followed and their physical activity levels were routinely evaluated at each visit. The mean age of 4596 patients evaluated for 30 days of readmission was calculated as 72.3 ± 11 years. While the 30-day readmission frequency was calculated as 18%, 59% of these hospitalizations occurred within the first 15 days. (2)

Ford E.S. conducted the study in USA in line with the data obtained from the National Inpatient Sample (NIS) and the National Emergency Service Sample (NEDS) which determined that approximately 20% of the patients hospitalized and discharged with the diagnosis of COPD exacerbation were readmitted within the first 30 days after discharge. (3)

As a result of the analysis of the invoice data of 190,000 patients hospitalized in 15 states in the United States, it was reported that the rate of rehospitalization in the first 30 days due to all reasons was 20.5%, although there were considerable differences between hospitals. Only one third of rehospitalizations after discharge are related to COPD. Other major causes of re-hospitalizations other than COPD within the first 30 days are cardiac, renal and gastrointestinal diseases and concurrent infections (especially pneumonia). (4)

In a study conducted by Christine SM Lau et al on 339,889 patients based in New York and California (with derivation cohort) and 258,113 patients based in Washington and Florida (with validation cohort) between 2006 and 2011, the rate of rehospitalization in the first 30 days due to COPD diversion cohort 7,54% with validation cohort and 6,70% with validation cohort. (5) In a retrospective cohort study of Christine L. Baker et al., Which evaluated 18,568 hospitalized patients between the ages of 40 and 65 in the USA between 2008 and 2010, the number of patients readmitted in the first 30 days associated with COPD was 340 (5%, 28) and the number of hospitalized patients in the first year was 1681 (27.58%). (6) Ryan McGhan et al. conducted a study that investigates the readmissions due to COPD and mortality due to all causes in 51,353 patients which discharged after COPD exacerbation in the healthcare system between 1999-2003. They found the risk of rehospitalization for COPD as 25% for 1 year and 44% for 5 years. (7)

In a prospective observational study conducted by Chun Chang et al.; 135 patients hospitalized due to COPd acute exacerbation and 71 of these patients (52.6%) were reinvested within 12 months. Median time to readmission was 78 days (42-178 days). (8)

In our study, in support of the above studies, the rate of early readmission due to COPD was determined to be 24.1%. The average time to first readmission was calculated as 14 ± 8.91 days. 30.7% of these re-hospitalizations occurred within the first week and 53.8% were within the first 15 days.

Risk factors for early rehospitalization in patients with COPD

The highest risk for the first 30-day readmission rates of COPD in a study conducted by Christine SM Lau et al between 2006 and 2011 on 339,889 patients based in New York and California (with derivation cohort) and 258,113 patients based in Washington and Florida (with validation cohort) were African-American, patients aged 65 and over, men, people from low-income families, and those with more than one comorbidity (5). In our study, it was thought that age and male gender, which are parallel to this study, may be associated with readmissions, but they were not found to be statistically significant (P = 0.279, P = 0.734, respectively). Likewise, in the low income group (monthly income <1000 TL), the early readmission rate was higher than the non low-income group (38.5% in those with re-hospitalization and 29.5% in the other group), but this was not statistically significant (P = 0.646). It was thought that the reason for this might be the small number of patients, the short duration of the study and the lack of homogeneous distribution of the groups. However, it has been determined that patients whose health insurance is provided by the Social Security Institution are less likely to be re-hospitalized. It was thought that among this patient group whose health insurance is not covered by Social Security Institution, there are patients with low income, such as those whose social security is covered by a green card and who do not have security, have problems such as accessing and using health services effectively, and this may be associated with socio-economic problems. Christine L. Baker et al. showed that the important determinants of 30 and 90 days of readmissions were comorbid diseases, frequency of health care use, and index inpatient intensive care follow-up with multivariate regression analysis. (6) The study of Ryan McGhan et al., stated that accompanying diseases including advanced age, male gender, previous hospitalization status, asthma and pulmonary hypertension increased the risk factors for readmissions. (7) In our study, it was found that there was male gender predominance with a higher average age for the patients who were readmitted, but it was not statistically significant in both cases.

This situation, which is in parallel with the results of many studies but not statistically significant in our study, is thought to be related to the small number of patients in our study and the short duration of the study. In our study using the Charlson comorbidity index to observe the negative effects of

diseases accompanying COPD on readmissions; we found that the rate of readmission was higher in patients with multiple comorbidities. In the Charlson Comorbidity Index, where multiple comorbidities were evaluated in a simple statistical evaluation, it was shown that the presence of moderate-severe renal failure, lung cancer and metastatic solid tumor was associated with readmissions. High sensitivity CRP and GOLD category D were found to be independent risk factors for readmission in multiple regression analysis in a prospective observational study of Chun Chang et al. In addition, it has been found that these independent factors are more sensitive in calculating the risk of readmissions. (8) When we evaluated the risk factors in this study, we concluded that the percentage of FEV1 / FVC is a risk factor for readmission due to COPD exacerbation. In addition, unlike many other studies, no significant difference was found between the two patient groups in terms of early readmission between the disease severities according to the GOLD 2006 and 2011 classifications. The reasons for this situation are thought to be the insufficient number of patients in the groups due to the low number of patients, the inhomogeneity of the distribution among the groups in the classifications, and the fact that the study was conducted in a tertiary hospital where more serious and symptomatic patients were hospitalized. Among the laboratory findings, it was observed that the WBC value was significantly higher in the group with readmission compared to the group without readmission, and it was thought that this situation might pose a risk for readmission. In addition, serum CRP levels were observed to be higher in the group with readmission compared to the group without readmission, but a significant result could not be achieved. Again, in our study, it was thought that we may have encountered such a result due to the small number of our patients and the inability to use high sensitive CRP in the current laboratory conditions. Huong Q. Nguyen et al. The independent risk factors identified for readmission were low physical activity, anemia, previous hospitalizations, number of days of hospitalization, more comorbidity, the first time oxygen was prescribed at discharge, and an emergency application before hospitalization. (9)

In our study, it was observed that previous hospitalizations, intensive care admissions, average number of days of hospitalization, and anemia were not significant for readmissions, but it was thought that this situation may be related to the small number of patients and the short duration of work. In the multiple regression analyzes of the same study, 30-day readmission risk of COPD patients with regular physical activity was found to be significantly lower compared to inactive patients. Of the 54 patients in our study, the patients who could do regular physical activity during discharge were recommended to walk for at least 3 days a week and at least 1 hour a day, so the patients were evaluated in this respect, and it was observed that there was no significant difference between those who practiced regular physical activity and those who did not practice regular physical activity in the patient group who were readmitted. However, it is thought that this may be

due to the lack of an objective method by which we can evaluate regular physical activity and a result related to the patient statement.

Huong Q. Nguyen et al. 2910 patients aged 40 and over who were hospitalized for COPD were examined in another study designed as a retrospective cohort. Within the scope of routine nursing care, the functional status of the patients in the last 24 hours before hospitalization was recorded as "Level 1: bed-bound, 2nd Level: sitting, 3rd Level: standing near the bed, 4th Level: walking 50 steps and 5th Level: able to walk more than 50 steps ". In the multiple regression analysis of these patients with a 30-day readmission rate of 19%, it was found that the risk of readmission of those with a functional level of 1-3 was 2 times higher than those with a level of 4 and 5. No significant difference was found between the functional level in terms of readmission risk. (2) In our study, the functional status of all patients in the groups with and without early readmission after discharge was at the 4th and 5th levels. Therefore, a clear assessment could not be made regarding the functional status posing a risk of readmission.

Although COPD exacerbations are often neutrophilic, approximately 10-25% are eosinophilic. In a retrospective observational cohort study conducted by Dildar Duman et al.with 1704 patients hospitalized in a tertiary hospital due to COPD exacerbation, the patients were divided them into 2 groups according to their peripheral blood eosinophilia levels Group 1 (eosinophilic):> 2% and Group 2 (non-eosinophilic): <0.2% . Approximately 20% of patients are classified as eosinophilic. They found that the six-month mortality was similar in the eosinophilic and non-eosinophilic groups (14.2% and 15.2%, respectively), but the length of hospital stay and readmission rates were longer and higher in the non-eosinophilic group. (10) In our study, the number of patients with peripheral blood eosinophil rate> 2% in the early readmission group was 3 (23.1%) and the number of patients with peripheral blood eosinophil rate> 2% in the non-readmitted group was 10 (24.4%). and there was no significant difference between early readmission and peripheral blood eosinophil rate.

Peter A Coventry et al. conducted a prospective cohort study by 79 patients hospitalized due to COPD acute exacerbation, patients were followed for 12 months and their lung functions, medical comorbidities, previous hospitalizations, medications they used and sociodemographic data were recorded. St George's Respiratory Questionnaire (SGRQ), Hospital Anxiety and Depression Scale (HADS) and social support levels were evaluated and recorded at the beginning, 3rd month and 12th month. The relationship between psychosocial factors and readmission has been tried to be examined in the analyzes performed with multiple regression models. 26 patients had at least one readmission within 90 days and 60 patients before 1-year follow-up. Presence of depression at admission; In the multiple regression analysis adjusted for sociodemographic and FEV1, it was

found to be a reason increasing the risk of readmission. Social support was not found to be associated with the risk of readmission. It was determined that patients with readmission had lower SGRQ and HADS scores at 12 months when compared with patients without readmission. As a result, they suggested that depressive symptoms and socioeconomic level are associated with the risk and number of readmissions, and that psychosocial support practices should be performed at home in order to reduce hospitalizations and financial and moral burden spent in the evaluation and follow-up of patients with COPD. (11). In our study, we used the Hospital Anxiety and Depression Score (HADS) to detect the presence of anxiety and depression. It was observed that the presence of anxiety and depression in the patients did not make a significant difference between the two groups in terms of early readmission. It was thought that the primary reason for this was the small number of patients, but it was thought that depression anxiety diagnoses would be evaluated by the relevant branch physician instead of a single scoring.

In 2 separate multiple logistic regression analyzes performed to determine the independent variables affecting readmission, the risk of readmission was found to be significantly higher in patients with a body mass index above 25 and with a comorbidity index of 3 and above.

CONCLUSION

As a result, in this study we conducted to determine the risk factors causing early readmission in COPD exacerbations, it was found that 13 (24.1%) of 54 patients hospitalized and discharged due to COPD exacerbation were readmitted within the first 30 days. It was concluded that comorbidities, WBC count and socioeconomic factors pose risks for early readmission.

Table 1. Basal clinical characteristics of study population

Clinical characteristics	Total number of study population n=54	Readmission (-) (group 2) (n=41)	Readmission (+) (group 1) (n=13)	(P)
Syptoms				
Dyspne	54 (100)	41 (100)	13 (100)	0,734
Increase in sputum	20 (37)	17 (41,5)	3 (23,1)	0,274
Increase in sputum purulance	21 (38,8)	17 (41,5)	4 (30,8)	0,430
Cough	24 (44,4)	14 (34,1)	10 (76,9)	0,010
Wheezing	46 (85,2)	35 (85,3)	11 (84,6)	0,264
Tightness in chest	6 (11,1)	4 (9,8)	2 (15,4)	0,586
Reason of hospitalization				
COPD exacerbation	29 (53,7)	24 (58,5)	5 (38,5)	
With Respiratory insufficiency	19 (35,2)	13 (31,7)	6 (46,2)	0,447
With Cor pulmonale	6 (11,1)	4 (9,8)	2 (15,4)	
Post BD FEV1/FVC (%) (X±SD)	48,44±10,4	49,77±10,73	44,23 ± 8,55	0,091
Post BD FEV1(%) (X±SD)	38,96±18,66	39,8±19,04	36,28 ± 17,85	0,442
DLCO (X±SD)	50,31±21,83	51,8±23,65	45,6 ± 14,46	0,412
RV/TLC (X±SD)	160,9±28,3	159,7±28,5	168,3 ± 27,3	0,413
Mean mMRC score (X ± SD)	2±0,49	3,56±0,59	3,61±0,5	0,878
Mean CAT score (X ± SD)	21,31±3,76	21,37±3,86	21,15±3,57	0,911

Table 2. Comorbidities of study population

Comorbidities	Total number of study population	Readmission		P
	n=54	(-) (group 2) (n=41)	(+) (group 1) (n=13)	
Charlson Comorbidity Index				
0 (mild)	5 (9,3)	5 (12,2)	0 (0)	
1-2 (moderate)	20 (37)	17 (41,5)	3 (23,1)	
3-4 (severe)	20 (37)	14 (34,1)	6 (46,2)	0,029
≥5 (very severe)	9 (16,7)	5 (12,2)	4 (30,8)	
Comorbidities				
Anxiety	11 (20,4)	6 (14,6)	5 (38,5)	0,077
Depression	31 (57,4)	24 (58,5)	7 (53,8)	0,766
Cachexia	7 (13)	6 (14,6)	1 (7,7)	0,495
Hypertension	26 (48,1)	20 (48,8)	6 (46,2)	0,869
Pneumonia	20 (37)	15 (36,6)	5 (38,5)	0,903
Pulmonary-vascular diesase	19 (35,2)	13 (31,7)	6 (46,2)	0,348
Osteoporosis	0	0	0 (0)	0
Anemia	22 (40,7)	16 (39)	6 (46,2)	0,650
Heart failure	15 (27,8)	10 (24,4)	5 (38,5)	0,334
Lung cancer	11 (20,4)	5 (12,2)	6 (46,2)	0,012
Diabetes mellitus	12 (22,2)	9 (22)	3 (23,1)	0,932
Coronary artery disease	18 (33,3)	12 (29,3)	6 (46,2)	0,268
Periferic vascular disease	1 (1,9)	1 (2,4)	0 (0)	0,456
Gastroesophagial reflux	20 (37)	17 (41,5)	3 (23,1)	0,220
Sleep apnea syndrome	0	0	0 (0)	0
Arthrosis	0	0	0 (0)	0
Leukemia,Lymphoma_Myeloma	2 (3,7)	2 (4,9)	0 (0)	0,289
Cerebrovascular disease (except hemiplejia)	0	0 (0)	0 (0)	0
Connective tissue disorders	1 (1,9)	0 (0)	1 (7,7)	0,088
Hemiplejia	1 (1,9)	1 (2,4)	0 (0)	0,456
Moderate-severe kidney failure	2 (3,7)	0 (0)	2 (15,4)	0,015
Moderate-severe liver disease	2 (3,7)	2 (4,9)	0 (0)	0,289

Nonmetastatic solid tumor	2 (3,7)	2 (4,9)	0 (0)	0,289
Metastatic solid tumor	4 (7,4)	1 (2,4)	3 (23,1)	0,024
Others	0 (0)	0 (0)	0 (0)	0

Table 3. Characteristics of COPD exacerbations

ALEVLENME ÖYKÜSÜ ÖZELLİKLERİ	Total number of study population	Readmission		P
	n=54	(-) (group 2) (n=41)	(+) (group 1) (n=13)	
Emergency department admission in last year				
0	6 (11,1)	5 (12,2)	1 (7,7)	
1	16 (29,6)	12 (29,3)	4 (30,8)	0,596
≥2	32 (59,3)	24 (58,6)	8 (61,5)	
Hospitalization in last year				
0	23 (42,6)	17 (41,5)	6 (46,2)	
1	17 (31,5)	12 (29,3)	5 (38,5)	0,608
≥2	14 (25,9)	12 (29,3)	2 (15,4)	
İntensive care unit admission in last year				
0	47 (87)	35 (85,4)	12 (92,3)	0,756
1	5 (9,3)	5 (12,2)	0 (0)	
≥2	2 (3,7)	1 (2,4)	1 (7,7)	
Mean duration of hospitalisation/days(X±SD)	10,5±7,56	10,88±5,81	15,15±11,17	0,227
Duration of hospitalisation/days				
<7	14 (25,9)	11 (26,8)	3 (23,1)	
7-14	29 (53,7)	23 (56,1)	6 (46,2)	0,997
15-30	10 (18,5)	7 (17,1)	3 (23,1)	
>30	1 (1,9)	0 (0)	1 (7,7)	

Table 4. Characteristics of study population at the time of hospitalisation

	Total number of study population	Readmission		P
	n=54	(-) (group 2)(n=41)	(+) (group 1)(n=13)	
Laboratory Results				
WBC (X ± SD)	9,91 ± 5,87	10,99±4,762	15,56±7,71	0,019
Hemoglobin (X ± SD)	13,85 ± 2,02	13,57±2,10	13,25±1,82	0,599
Hematocrit (X ± SD)	45 ± 5,71	43,53±5,86	42,42±5,37	0,524
CRP (X ± SD)	1,68 ± 7,59	3,48±4,66	8,18±12,82	0,252
BNP (X ± SD)	294,5 ± 1674,61	731,3±1405,6	1781,8±2211,8	0,077
Eosinofil (%) (X ± SD)	0,1 ±1,82	1,31 ±1,82	1,23 ±1,91	0,753
Treatments taken during hospitalisation				
Oral/im-iv steroid	52 (96,3)	39 (95,1)	13 (100)	0,289
Oral/im-iv antibiotics	47 (87)	35 (85,4)	12 (92,3)	0,495
Oxygen	45 (83,3)	34 (82,9)	11 (84,6)	0,886
Bronchodilatators (Nebülization/inhalation	54 (100)	41 (100)	13 (100)	0
Noninvasive mechanical ventilation	9 (16,7)	5 (12,2)	4 (30,8)	0,137
İnvasive mechanical ventilation	1 (1,9)	1 (2,4)	0 (0)	0,456

Table 5. Characteristics of study population at hospital discharge

	Total number of study population	Readmission		p
	n=54	(-) (group 2) (n=41)	n=54	
Functional status at discharge				
Can walk less than 15 meters	9 (16,7)	5 (12,2)	4 (30,8)	0,137
Can walk ore than 15 meters	45 (83,3)	36 (87,8)	9 (69,2)	
Mean mMRC score (X ± SD)	2 ± 0,49	1,53 ± 0,5	2,77 ± 0,43	0,141
Mean CAT score (X±SD)	10 ± 2,9	9,98 ± 2,84	10,85 ± 3,16	0,368
Mean ADO (X±SD)	8 ± 1,91	7,8 ± 1,91	8,2 ± 1,96	
Mean DOSE (X±SD)	3 ± 1,69	3,2 ± 1,77	3,3 ± 1,49	0,907
Mean BODE (X±SD)	6 ± 1,67	5,37 ± 1,67	6,1 ± 1,66	0,088
Mean e-BODE (X±SD)	7 ± 1,97	6,78 ± 2	7,4 ± 1,85	0,309
Discharge with				
Medical treatment	54 (100)	41 (100)	13 (100)	0
Non invasive mechanical ventilation	1 (1,9)	0 (0)	1 (7,7)	0,088
Oxygen	5 (9,3)	3 (7,3)	2 (15,4)	0,406
Vaccination recommendation	47 (87)	36 (87,8)	11 (84,6)	0,769
Written treatment plan	54 (100)	41 (100)	13 (100)	0
Recommendation of Pulmomary rehabilitation	14 (25,9)	10 (24,4)	4 (30,8)	0,651
Recommendation of smoking cessation	18 (33,3)	13 (31,7)	5 (38,5)	0,655
Recommendation of regular physical exercise	49 (90,7)	37 (90,2)	12 (92,3)	0,820
education of inhaler treatment	52 (96,3)	40 (97,6)	12 (92,3)	0,418
Education of right inhaler use	53 (98,1)	40 (97,6)	13 (100)	0,456
Recommendation of Nutrition and diet	39 (72,2)	30 (73,2)	9 (69,2)	0,784
Recommendation about social determinants	8 (14,8)	6 (14,6)	2 (15,4)	0,947

Table 6. Results of multiple logistic regression analysis performed to determine independent variables affecting re-admission

A		Readmission							
		(+)		(-)				%95 CI	
		N	%	N	%	p	OR	Min	Max
Age group	<60	3	(15,0)	17	(85,0)				
	≥60	10	(29,4)	24	(70,6)	,081	5,665	,807	39,769
BMI	<25	4	(17,4)	19	(82,6)				
	≥25	9	(29,0)	22	(71,0)	,026	10,041	1,322	76,287
BODE	<8	6	(15,8)	32	(84,2)				
	≥8	7	(43,8)	9	(56,3)	,019	10,454	1,475	74,078
Comorbidities	<2	3	(12,0)	22	(88,0)				
	≥3	10	(34,5)	19	(65,5)	,043	6,507	1,061	39,912
Treatment compliance	(+)	5	(17,2)	24	(82,8)				
	(-)	8	(32,0)	17	(68,0)	,243	2,604	,522	12,975
PreFEV1%		35,9±14,4		38,3±18,6		,882	1,004	,953	1,058

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Abbreviations;

ADO: Age, Dyspnea, Airflow Obstruction index

BMI: Body Mass İndex

BNP: Brain Natriuretic Peptid

BODE: Body Mass İndex, Obstruction, Dyspnea and Exercise capacity index,

CAT: COPD Assessment Test

COPD: Chronic Obstructive Pulmonary Disease

CRP: C-Reactive Protein

CT: Computed Tomography

DLCO: Carbone Monoxide Diffusion of Lung Test

DOSE: dyspnea, obstruction, smoking and exacerbation index

ECO: Echocardiography

ECG: Electrocardiography

FEV1 / FVC: Forced Expiratory Volume in first second / Forced Vital Capacity

GOLD: The Global İnitiative for Chronic Obstructive Lung Disease

HAD-S: Turkish adaptation of the hospital anxiety-depression scale

mMRC: modified Medical Research Council dyspnea scoring

NEDS: The National Emergency Service Sample

NIS: The National Inpatient Sample

PFT: Pulmonary Function Tests

PA: Postero-Anterior

RV: Residuel Volüme

SGRQ: St George's Respiratory Questionnaire

TLC: Total Lung Capacity

WBC: White Blood Cells