Comparison of two scores for short-term outcomes in patients with COPD exacerbation in the emergency department: the Ottawa COPD Risk Scale and the DECAF score

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Among the two clinical scales compared in this study, the DECAF score was found to be more specific, despite the high sensitivity of OCRS, in predicting short-term serious outcomes of AECOPD in the ED https://bit.ly/3UR1QTR

Cite this article as: Unal A, Bayram B, Ergan B, *et al*. Comparison of two scores for short-term outcomes in patients with COPD exacerbation in the emergency department: the Ottawa COPD Risk Scale and the DECAF score. *ERJ Open Res* 2023; 9: 00436-2022 [DOI: 10.1183/23120541.00436-2022].

Received: 21 June 2022
Accepted: 4 Nov 2022

Abstract

Background While clinical decision rules have been developed to evaluate exacerbations and decisions on hospitalisation and discharge in emergency departments (EDs) in patients with chronic obstructive pulmonary disease (COPD), these rules are not widely used in EDs. In this study, we compare the predictive efficacy of the Ottawa Chronic Obstructive Pulmonary Disease Risk Scale (OCRS) and the Dyspnea, Eosinopenia, Consolidation, Acidemia, and Atrial Fibrillation (DECAF) score in estimating the short-term poor outcome of patients in our ED with exacerbations of COPD.

Methods This single-centre prospective observational study was conducted over 6 months. Patients with acute exacerbations of COPD admitted to the ED during the study period were included in the study. A poor outcome was defined as any of the following: readmission and requiring hospitalisation within 14 days of discharge, requiring mechanical ventilation on the first admission, hospitalisation for longer than 14 days on the first admission, or death within 30 days. The sensitivity and specificity of the OCRS and the DECAF score for a poor outcome and for mortality were calculated.

Results Of the 385 patients who participated in the study, 85 were excluded based on the exclusion criteria. 66% of the patients were male, and the mean age was 70.15±10.36 years. A total of 20.7% of all patients (n=62) experienced poor outcomes. The sensitivity of an OCRS score <1 for predicting a poor outcome in patients was 96.8% (95% CI 88.8–99.6%) and the specificity was 18.5% (95% CI 13.8–24.0%). The sensitivity and specificity of an OCRS score <2 were 83.3% (95% CI 35.9–99.6%) and 65.5% (95% CI 59.6–70.7%), respectively. The sensitivity and specificity of a DECAF score <1 were 88.7% (95% CI 78.1–95.3%) and 34.5% (95% CI 28.4–40.9%), respectively. When the DECAF score was <2, sensitivity and specificity were 69.3% (95% CI 56.4–80.4%) and 74.8% (95% CI 68.8–80.2%), respectively.

Conclusion Our physicians achieved high specificity but low sensitivity in predicting a poor outcome. The OCRS is the more sensitive of the two tools, while the DECAF score is more specific in predicting a poor outcome when all threshold values are evaluated. While both tools may results in unnecessary hospitalisation, they can reduce the incidence of hospital discharge of patients with exacerbations of COPD who will develop poor outcomes in the ED.

Background

Chronic obstructive pulmonary disease (COPD) occurs with alveolar damage, airway collapse and air trapping due to damage to small airways and increased respiratory effort after protracted inflammation and constriction of the airways [1]. COPD is a major cause of morbidity and mortality, affecting >5% of the

entire population [2]. While its incidence around the world varies between 5% and 20% according to various sources, the prevalence of COPD in Turkey has been calculated as 19.2%. In 2019, the World Health Organization considered COPD the third most common cause of death in the world. In Turkey, it is ranked as the fourth most common cause of death. The high prevalence of COPD substantially increases the costs of hospital admissions, drugs and long-term follow-up [3].

Exacerbations of COPD (ECOPD) are acute episodes requiring treatment regulation and characterised by shortness of breath, cough and change in sputum purulence [3]. ECOPD are one of the common causes of shortness of breath admissions to the emergency department (ED). Although there are studies evaluating the long-term prognosis in hospitalised patients [4, 5], studies evaluating safe discharge and decisions on hospitalisation in the evaluation of patients in the ED are limited [6], and these rules are not widely used in EDs. The Global Initiative for Chronic Obstructive Lung Disease guidelines recommend using the patient's history, the response to first treatments, physical examination findings and home care support in determining the need for hospitalisation [3]. The Ottawa COPD Risk Scale (OCRS) successfully predicts the short-term outcomes of patients admitted to an ED and diagnosed with ECOPD. Validation of the OCRS has recently been completed [7]. OCRS has a three-stage review system and consists of initial assessment, investigations and re-assessment after ED treatment steps. In the initial assessment step, history of coronary artery bypass grafting, history of intervention of peripheral vascular disease, history of intubation for respiratory distress, and heart rate (on ED arrival) >110 min^{-1} are evaluated. The investigations step comprises evaluations for acute ischaemic changes on ECG, pulmonary congestion on chest radiography, haemoglobin <10 $g{\cdot}L^{-1}$, urea >12 $mmol{\cdot}L^{-1}$ and serum CO_2 >35 $mmol{\cdot}L^{-1}$. The last step, after treatment received in the ED, evaluates whether arterial oxygen saturation (S_{aO_2}) is <90% on room air/usual O_2 or if heart rate is >120 min^{-1}. Each criterion has a score between 1 and 3, with the patient receiving an overall result between 0 and 16. In the validation study, 0 points was defined as low risk, 1–2 points as medium risk, 3–4 points as high risk and 5 and above as very high risk [7]. A recent study reported that the Dyspnea, Eosinopenia, Consolidation, Acidemia, and Atrial Fibrillation (DECAF) score successfully predicts in-hospital mortality for patients hospitalised with a diagnosis of ECOPD [5].

Both the OCRS and the DECAF score have previously been used to determine the short-term outcomes of patients with COPD. Nevertheless, there is insufficient evidence for their use in decision-making geared towards the safe discharge of ECOPD patients from an ED. In this study, we compared the predictive efficacy of the OCRS and the DECAF score in estimating the short-term poor outcome of patients with ECOPD in an ED.

Methods

Study design and setting

This single-centre prospective observational study was conducted between 20 October 2019 and 20 April 2020 at the Dokuz Eylul University Hospital ED, with the approval of the ethics committee of the Dokuz Eylul University School of Medicine (decision number: 2019/28-41). Written informed consent was obtained from all patients who participated in the study or from their relatives.

Study population

The study included 385 COPD patients who were admitted to the ED during the specified period with one or more complaints like dyspnoea, coughing and sputum. Individuals among these 385 patients who met the exclusion criteria were excluded from the study (figure 1). In our study, the exclusion criteria were revised from [7] and comprised the following: 1) having a cognitive impairment, such as confusion, disorientation or dementia, because this affects the individual's ability to make an informed decision to participate in the study; 2) patients with lung cancer or lung metastasis; 3) a diagnosis of pneumonia, pneumothorax, heart failure and pulmonary embolism provoking shortness of breath, excluding ECOPD; 4) the presence of newly developed rhythm disturbance requiring intervention or ischaemic changes in the follow-up, excluding sinus tachycardia and multifocal atrial tachycardia, as recorded by an ECG; 5) a diagnosis of terminal stage malignancy; 6) death expectation in the following weeks due to chronic illness; 7) a diagnosis of unstable angina pectoris or myocardial infarction, which may affect prognosis other than acute exacerbation of COPD (AECOPD) in an ED; 8) chronic kidney failure requiring haemodialysis; 9) patients who have been included in the study within the last 2 months; and 10) failing to reach the outcome on the 30th day.

Consequently, only 300 patients diagnosed with ECOPD participated in the study. Eight of these 300 patients were included in the study for the second time (as they reapplied during the next 2–6 months). It was determined that a minimum of 240 patients should be included in the study, using 80% power and a

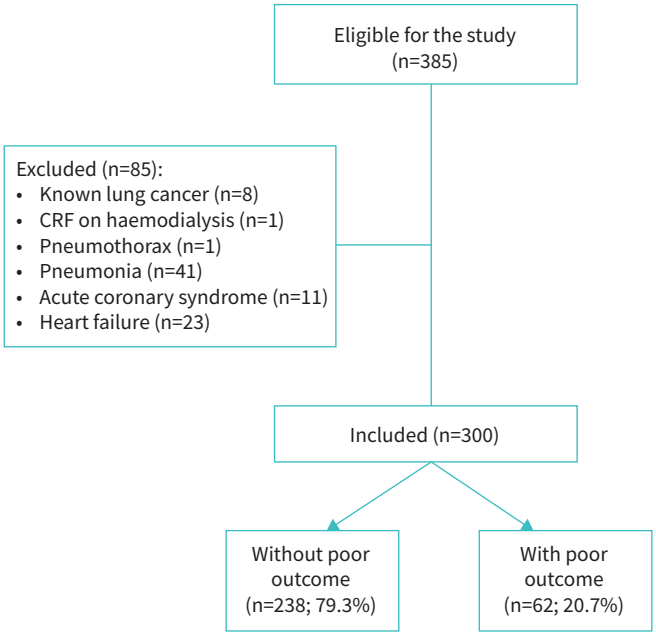

FIGURE 1 Patient flowchart. CRF: chronic renal failure.

95% confidence interval to show a difference of <10% (with a 0.07 margin error) between the two diagnostic tools [8].

Data collection

Information on the patients who met the criteria for inclusion in the study was included in the study data on the first admission using the study data collection form. Demographic information, vital signs and a detailed medical history were obtained, including smoking history, medications and devices used, history of previous hospitalisation, ED admissions and/or noninvasive mechanical ventilation (NIV) or invasive mechanical ventilation due to ECOPD, and most recent admission to a chest diseases outpatient clinic. After evaluating the disease histories of the patients, OCRS and DECAF scores were calculated [5, 7] by members of the research term. The ED and hospital outcomes of the patients were tracked. The 30-day survival of the patients was determined either by looking up the hospital records of the patients or calling them by telephone if there was no admission within this period.

The primary outcome of this study was poor outcome. Based on the study by Stiell *et al*. [7], a poor outcome was defined as any of the following: 1) readmission to the ED and hospitalisation within 14 days of discharge, with COPD-associated symptoms; 2) need for invasive mechanical ventilation or NIV on the first admission to the ED; 3) hospitalisation longer than 14 days for non-traumatic reasons; or 4) death of the patient within 30 days due to reasons other than trauma.

Statistical analysis

The SPSS 22.0 (IBM Corporation, Armonk, NY, USA) program was used to analyse the data, with descriptive statistics for categorical variables given as n (%). Pearson's chi-squared test was used for the comparison of categorical data, while the Fisher exact test was used along with the results. The normal distribution of continuous variables was evaluated using the Kolmogorov–Smirnov test. Among the variables, those that fit the normal distribution are given as the mean±SD, and those that do not fit the normal distribution are given as median (interval) or median (interquartile range (IQR)). The sensitivity, specificity, negative and positive predictivity and accuracy of the OCRS and DECAF scores for poor outcome and survival by the 30th day were determined using an online calculator, the MedCalc diagnostic test evaluation calculator (www.medcalc.org/calc/diagnostic_test.php), and all values were applied with a 95% confidence interval. OCRS and DECAF scores were evaluated with the receiver operating characteristic (ROC) curves in terms of detecting poor outcomes and mortality. Patients discharged from the ED for index visits were evaluated separately, and the same analysis was repeated for both the OCRS and DECAF risk scores. The data were analysed at a 95% confidence level and $p<0.05$ was considered significant.

Results

In our population, 66% of the patients were male (n=197) and the mean age was 70.15±10.36 years (range 36–94 years). 22% of the patients (n=67) were active smokers, 30% (n=90) had a history of previous hospitalisation due to COPD and 88.3% (n=265) had a history of admission to an ED during the previous year. 71.7% of the patients (n=215) did not visit an outpatient clinic during the previous year. 2.7% of patients (n=8) had never visited a chest disease outpatient clinic and 71.7% of patients (n=215) had their last admission to a chest diseases outpatient clinic more than 3 months prior. The median number of ED visits was two (IQR 0–37), and 11% of the patients (n=33) had a history of intensive care unit admission in the preceding year. 51% of the patients (n=153) used only inhaled medications as the usual therapy (table 1).

Among the patients who were discharged from the ED, one patient (0.40%) died, and 18 patients (8.0%) developed a poor outcome. The sensitivity of a poor outcome at an OCRS score of <1 for discharged patients was 100% (95% CI 81.47–100%) and specificity was 19.9% (95% CI 14.68–26.02%). The sensitivity of an OCRS score of 0–1 was 66.7% (95% CI 40.99–86.66%) and its specificity was 59.7% (95% CI 52.67–66.47%). Two patients with a DECAF score of <1 experienced a poor outcome. The sensitivity of a DECAF score of <1 for discharged patients was 88.9% (95% CI 65.3–98.6%) and specificity was 37.38% (95% CI 30.8–44.4%). The sensitivity of a DECAF score of 0–1 for discharged patients was 66.7% (95% CI 41.0–86.7%) and the specificity was 76.2% (95% CI 69.8–81.9%) (table 2).

20.7% of the patients (n=62) experienced poor outcomes. The reasons for the poor outcomes among these patients are presented in table 3. Because 27 of the patients who received NIV treatment in the ED used an NIV device in their everyday lives, these patients were not considered to be experiencing a poor outcome.

TABLE 1 Patient characteristics

Variable	Subjects n (%)
Gender	
Male	197 (65.7)
Female	103 (34.3)
Smoking	
Current	67 (22.3)
Ex-smoker	182 (60.7)
Never-smoker	51 (17.0)
ECOPD history in the last year	
Any hospitalisation	90 (30.0)
Intensive care unit admission	33 (11.0)
Noninvasive ventilation	67 (22.3)
Invasive ventilation	2 (0.7)
ED visit	265 (88.3)
Last visit to the outpatient clinic	
No visit	8 (2.7)
<1 week	26 (8.7)
<1 week to <1 month	27 (9.0)
<1 month to <3 months	24 (8.0)
>3 months	215 (71.7)
Usual medications and devices	
None	33 (11)
Only oxygen	10 (3.3)
Only BiPAP	2 (0.7)
Only inhaled medications (LABA or LAMA or ICS)	153 (51)
Oxygen and BiPAP	5 (1.7)
Oxygen and inhaled medications (LABA or LAMA or ICS)	45 (15)
Oxygen, BiPAP and inhaled medications (LABA or LAMA or ICS)	42 (14)
Oxygen, oral steroid and inhaled medications (LABA or LAMA or ICS)	8 (2.7)
Oxygen, BiPAP, oral steroid and inhaled medications (LABA or LAMA or ICS)	2 (0.7)

ECOPD: exacerbation of chronic obstructive pulmonary disease; ED: emergency department; BiPAP: bilevel positive airway pressure; LABA: long-acting β-agonist; LAMA: long-acting muscarinic antagonist; ICS: inhaled corticosteroid.

TABLE 2 Results of both risk scores for poor outcome in discharged patients

	Poor outcome (n)		Total (n)
	Yes	No	
OCRS total			
0	**0**	**41**	**41**
1	6	82	88
2	2	32	34
3	3	33	36
4	2	12	14
5	4	3	7
6	1	3	4
DECAF score			
0	**2**	**77**	**79**
1	4	80	84
2	6	34	40
3	5	15	20
4	1	0	1
Current practice of ED	**18**	**206**	**224**

OCRS: Ottawa Chronic Obstructive Pulmonary Disease Risk Scale; DECAF: Dyspnea, Eosinopenia, Consolidation, Acidemia, and Atrial Fibrillation; ED: emergency department.

Patients who did not own a personal NIV device and did not benefit from a personal device, and thus needed NIV devices in the ED, were evaluated as experiencing poor outcomes.

For all patients, the sensitivity of an OCRS score of <1 in predicting a poor outcome was 96.8% (95% CI 88.8–99.6%) and the specificity was 18.5% (95% CI 13.8–24.0%). For an OCRS score of <2, the sensitivity was 82.3% (95% CI 70.5–90.8%) and the specificity was 56.7% (95% CI 50.2–63.1%). The sensitivity of an OCRS score <2 was 83.3% (95% CI 35.9–99.6%) and the specificity was 65.5% (95% CI 59.6–70.7%).

The sensitivity of a DECAF score of <1 to predict a poor outcome was 88.7% (95% CI 78.1–95.3%) and the specificity was 34.5% (95% CI 28.4–40.9%). For a DECAF score of <2, the sensitivity was 69.3% (95% CI 56.4–80.4%) and the specificity was 74.8% (95% CI 68.8–80.2%). For predicting 30-day mortality with a DECAF score of <2, the sensitivity was 66.7% (95% CI 22.3–95.7%) and the specificity was 85.7% (95% CI 81.2–89.57%) (table 4).

OCRS and DECAF scores were evaluated with the ROC curves in terms of detecting poor outcomes and mortality. The area under the curve (AUC) for poor outcomes was 0.750 for OCRS and 0.722 for DECAF (figure 2), while the AUCs for determining mortality were 0.779 and 0.772, respectively (figure 3).

TABLE 3 Outcome of patients with poor outcomes

Reason	Subjects n (%)
Death within 30 days of hospitalisation	5 (8.1)
Death within 30 days after discharge from ED	1 (1.6)
Readmission to ED and hospitalisation within 14 days of discharge	17 (27.4)
Hospitalisation longer than 14 days	19 (30.6)
Noninvasive mechanical ventilation	20 (32.2)
Invasive mechanical ventilation	0 (0.0)
Total	62 (100.0)

ED: emergency department.

TABLE 4 Comparison of DECAF and OCRS scores and current practice in predicting poor outcomes

Method		Sensitivity	Specificity	NPV	PPV	Accuracy
Current practice		71.0 (58.05–81.8)	86.6 (81.6–90.6)	92.0 (88.6–94.4)	57.9 (49.0–66.3)	83.3 (78.6–87.4)
Score cut-off						
0	DECAF	88.7 (78.1–95.3)	34.5 (28.4–40.9)	92.1 (85.1–96.0)	26.1 (23.7–28.6)	45.7 (39.9–51.5)
	OCRS	96.8 (88.8–99.6)	18.5 (13.8–24.0)	95.7 (84.6–98.9)	23.6 (22.3–25.0)	34.7 (29.3–40.4)
<2	DECAF	69.3 (56.4–80.4)	74.8 (68.8–80.2)	90.4 (86.5–93.2)	41.8 (35.3–48.5)	73.7 (68.3–78.6)
	OCRS	82.3 (70.5–90.8)	56.7 (50.2–63.1)	92.5 (87.7–95.5)	33.1 (29.1–37.4)	62.0 (56.2–67.5)
<3	DECAF	41.9 (29.5–55.2)	92.0 (87.8–95.1)	85.9 (83.1–88.3)	57.8 (44.8–69.7)	81.7 (76.8–85.9)
	OCRS	71.0 (58.1–81.8)	73.5 (67.4–79.0)	90.7 (86.7–93.5)	41.1 (34.9–47.7)	73.0 (67.6–77.9)

Data presented as % (95% CI). NPV: negative predictive value; PPV: positive predictive value; DECAF: Dyspnea, Eosinopenia, Consolidation, Acidemia, and Atrial Fibrillation; OCRS: Ottawa Chronic Obstructive Pulmonary Disease Risk Scale.

Discussion

In this prospective observational study, we compared the efficacy of OCRS and DECAF scores in predicting the short-term poor outcome of patients admitted to an ED with ECOPD. We used a modified version of Stiell *et al.* [7] to determine a poor outcome in patients. We evaluated 300 patients and found that 20.7% of all patients and 8.0% of patients who were discharged experienced a poor outcome. We found that the OCRS had a higher sensitivity than the DECAF score for predicting a poor outcome, despite the low specificity of the OCRS at all threshold values. When we evaluated the patients who were discharged from the ED, we found that an OCRS score of 0 was predictive of a poor outcome; however, the specificity was low. The specificity of our current practice was high, but the sensitivity was insufficient. The use of a clinical decision rule along with the clinical decision-making process for discharging patients presenting with ECOPD from the ED may facilitate the achievement of particularly high sensitivity. However, because of the low specificity of the OCRS and the DECAF score, using these risk tools alone in making decisions on hospitalisation will increase the rate of unnecessary hospitalisations.

In Asia, admissions because of dyspnoea constitute 5.2% of all ED admissions, 11.4% of all hospital admissions and 11.9% of intensive care unit admissions, with the most common causes being lower

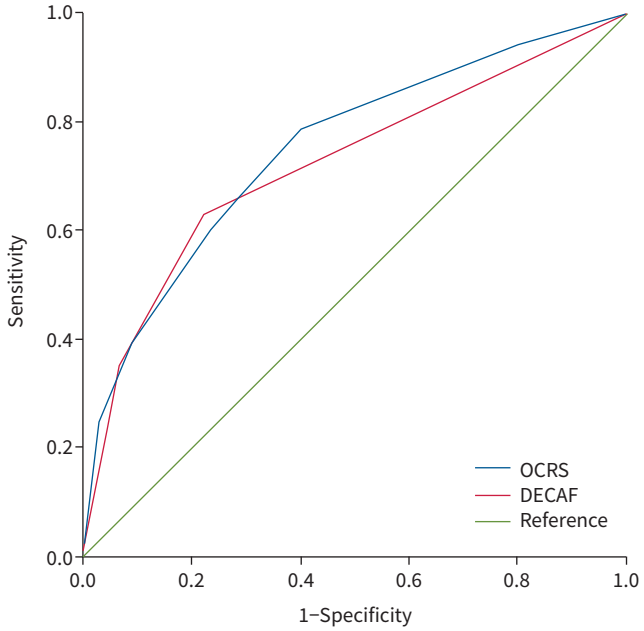

FIGURE 2 Comparing receiver operating characteristic curves for poor outcomes. OCRS: Ottawa Chronic Obstructive Pulmonary Disease Risk Scale; DECAF: Dyspnea, Eosinopenia, Consolidation, Acidemia, and Atrial Fibrillation.

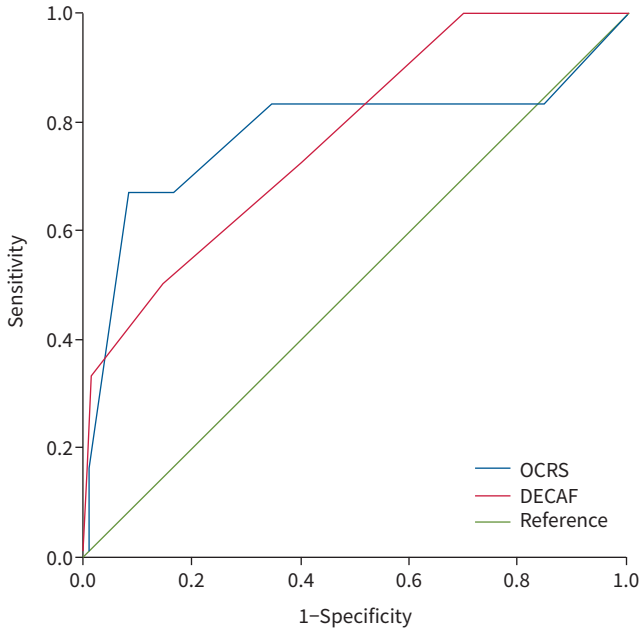

FIGURE 3 Comparing receiver operating characteristic curves for mortality. OCRS: Ottawa Chronic Obstructive Pulmonary Disease Risk Scale; DECAF: Dyspnea, Eosinopenia, Consolidation, Acidemia, and Atrial Fibrillation.

respiratory tract infections, heart failure and ECOPD [9]. More than three million ED visits are made every year in the USA because of dyspnoea [10]. In Asian and European countries, ∼16% of patients in an ED are individuals presenting with dyspnoea due to AECOPD [11]. In the USA, ∼16% of patients diagnosed with COPD made ED visits or were hospitalised within the same year [12]. Furthermore, ∼20% of patients who visited an ED because of ECOPD are hospitalised in the USA [13]. Patients with lower forced expiratory volume in 1 s and arterial oxygen tension have higher exacerbation frequencies [14], and patients with more frequent exacerbations are referred to an ED more often and record higher rates of hospitalisation. In our study, ∼90% of the patients who visited the Dokuz Eylul University Hospital ED because of ECOPD had visited an ED within the last year, and the most frequently admitted patient had visited an ED 37 times within the same 1-year period. In the follow-up of this patient, it was determined that the only point of application to the hospital was the ED and he had not applied to outpatient clinics. More than 70% of our study patients had not visited a chest diseases outpatient clinic in the last 3 months, and the rate of hospitalisation among patients presenting with ECOPD at our hospital was 25.3%. This information suggests that patients do not receive regular follow-up and treatment. In Turkey, the prevalence of COPD, standardised by age and gender based on respiratory function test results, is 5.3%, and fewer than half of these patients are on regular medication [15]. Many strategies, such as standard recommendations for the discharge of patients with COPD, hospital at home care programmes and telemedicine programmes, may be recommended to prevent frequent ED and hospital admissions and to reduce health costs. For this reason, the COPD National Action Plan was launched in the USA in 2017 to encourage cooperation between patients, caregivers, doctors, researchers and policymakers, and to optimise awareness, diagnosis and treatment of the disease [16]. In Turkey, systematic arrangements are urgently needed to reduce ED admissions and the frequency of exacerbations of patients with COPD.

COPD is one of the most common causes of emergency admissions worldwide and is also a major cause of morbidity and mortality. In the multicentre SUPPORT study conducted in the USA, the in-hospital mortality of patients hospitalised because of ECOPD was found to be ∼10% [17], while in-hospital mortality was reported as 8.3% in Turkey [18], 8% in the Netherlands [19] and 4% in China [20]. The in-hospital mortality of patients hospitalised in our hospital for ECOPD was 6.5%, which corresponds to the mortality rates reported in various countries as seen above.

For the primary outcome criterion in this study, we adopted the poor outcome criteria used in the study by Stiell *et al*. [7], in which they reported that 9.5% of patients had poor outcomes. A retrospective study conducted in England reported that 31% of patients had poor outcomes [21]. Kocak *et al*. [22], in a study

conducted using OCRS in Erzurum, Turkey, compared the integrated pulmonary index with the OCRS and reported that 74% of patients had poor outcomes, though they had wider exclusion criteria than the original OCRS study. In that study, classifying all secondary admissions to the ED as a poor outcome may have resulted in a high adverse outcome rate. In our study, we found poor outcomes in 20.7% of the patients. The cause, severity, effect, treatment and period of exacerbations vary from patient to patient and from country to country, in congruence with healthcare facilities and health systems. No standard applies to the timing and nature of discharge [7]. Developing clinical decision rules that determine the short-term prognosis of patients is important for the standardisation of patient care in EDs. Likewise, in this study, we have observed that our current practice is not sensitive enough to predict poor outcomes in these patients. Our findings suggest that the use of two scores increases the sensitivity of the clinical decision pathway. Testing these results in new multicentre studies will refine them for effective use in clinical practice.

A study evaluating readmissions of discharged patients with ECOPD symptoms reported a readmission rate of 7.54%. In the same study, when different patient groups were evaluated, the highest readmission rates were seen among health insurance and drug or substance users [21, 23]. Stiell *et al*. [7] reported that 21.8% of patients who were discharged were readmitted to the ED within 14 days, and ∼40% of these patients were hospitalised. Furthermore, when all discharged patients were evaluated, the rate of hospitalisation was reported as 8% on the second visit. In our study, ∼20% of the patients who were discharged returned to the ED within 14 days, and ∼40% of these patients were hospitalised. The rate of hospitalisation was 7.5% on the second admission. Using similar criteria as Stiell *et al*. [7], we obtained similar results for secondary ED visits and hospitalisation.

OCRS was created *via* an analysis of factors affecting the poor prognosis in 945 ECOPD patients admitted to six academic EDs in Canada [24] and it was subsequently tested on 1415 patients multicentrically [7]. OCRS consists of 10 criteria designed to identify patients in an ED with COPD who are at a high risk of severe consequences in the short term. The total score ranges from 0 to 10. In the study by Stiell *et al*. [7], the sensitivity of the test was 71.9% and the specificity was 54.6% in patients with a score of <2. The first study outside of Canada was done in Turkey. This study reported superior sensitivity and specificity than its validation study, and when the OCRS threshold value was >4, sensitivity was 99.3% and specificity 85.2% [22]. The results we obtained for sensitivity (82.3%) and specificity (56.7%) in patients with an OCRS score of <2 are similar to those obtained in the OCRS validation study for score thresholds of <2 [7]. However, when the score was 0, we found that there was greater sensitivity but lower specificity compared to the validation study. Based on the results of our study when the OCRS was used in making decisions on discharge, if the threshold value was taken as 0, the recommendation was for 46 patients to be discharged and 254 patients hospitalised. Here, we calculated that it would have erred with 4.3% wrong discharges and 76.3% unnecessary hospitalisations. A threshold value of <2 would have recommended incorrect discharge at a rate of 7.5% and unnecessary hospitalisation for 66.9% of the patients for whom it recommended hospitalisation. We found that the number of patients who were discharged and had poor outcomes can be reduced using the OCRS, but unnecessary hospitalisations may increase simultaneously.

The DECAF score was established in 2012 *via* a study evaluating markers for mortality in AECOPD patients [5]. A validation study reported that the DECAF score can be used for decisions on discharge and home follow-up (low-risk patients: DECAF 0–1) [25]. Compared with various clinical decision rules, the DECAF score has been reported to be more successful than other scores in guiding clinical decision-making on admission [26]. We found that when the threshold value was taken as 0, the DECAF score was more sensitive and specific than the OCRS in determining short-term mortality. In contrast, the sensitivity of the DECAF score in predicting a poor outcome was lower than that of the OCRS. Based on the results of our study, if the DECAF score was used in decision-making on discharge, with the threshold value taken as 0, then 7.9% of patients discharged would have a poor outcome and 73.9% of hospitalised patients would have been hospitalised unnecessarily. If the threshold value was taken as <2, 9.6% of patients discharged would have poor outcomes and 58.3% of the hospitalised patients would have been hospitalised unnecessarily. We found that the DECAF score, like the OCRS, provides information on excessive unnecessary hospitalisation and discharged patients with poor outcomes. Consequently, we are convinced that both the OCRS and the DECAF score alone are insufficient for decisions on discharge. However, they can guide physicians on safe discharge based on the results of clinical evaluations.

Limitations

First, our study is a single-centre study. There may be differences in the management of ECOPD between hospitals, regions and countries. Therefore, our results are not generalisable, and results may differ across various centres and multicentre studies. Second, all physicians at the Dokuz Eylul University Hospital ED

participated in our study. There may be inconsistencies in the discharge and hospitalisation of patients due to a lack of standard criteria for decisions on patient discharge specified in any guidelines and the fact that we did not intervene in physicians' decisions on discharge during the study. For some patients, physicians may have made their decisions based on the specific treatment requirements or social status of the patient, rather than the patient's clinical condition.

Furthermore, the limited bed capacity of the chest diseases outpatient clinic at the Dokuz Eylul University Hospital may have resulted in some patients being treated and discharged to the ED, only to revisit within a short time. This situation may have contributed to an increase in revisit rates and the number of poor outcomes.

The criteria of the Stiell *et al*. [7] study were used as the poor outcome criteria in our study. Accordingly, a patient's readmission to the ED was not considered a poor prognosis criterion, and only hospitalisation indication on the same admission was considered a bad prognosis.

Conclusion

In this study, we found that the OCRS was more sensitive than the DECAF score in predicting a poor outcome when all threshold values were evaluated. The DECAF score was more specific than the OCRS in predicting a poor outcome at all threshold values. However, we found that using either the OCRS or DECAF score alone may result in unnecessary hospitalisations and, albeit at a low rate, may result in the discharge of patients who have poor outcomes. We observed that our physicians had high specificity but low sensitivity in predicting a poor outcome. Consequently, we are convinced that evaluation using the OCRS before discharge by the patient's physician in cases where hospitalisation is not indicated will facilitate safe discharge by increasing both sensitivity and specificity.

Provenance: Submitted article, peer reviewed.

Conflict of interest: The authors certify that they have no affiliations with or involvement in any organisation or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements) or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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