

ORIGINAL ARTICLE

Correlation of national early warning score 2 with outcomes of acute exacerbation of chronic obstructive pulmonary disease.

Warda Ajmal¹, Muhammad Ashraf², Shanzay Haider³

ABSTRACT... Objective: To evaluate the correlation of the National Early Warning Score 2 (NEWS2) at admission with the clinical outcomes in patients presenting with acute exacerbation of chronic obstructive pulmonary disease (AECOPD). **Study Design:** Prospective Longitudinal Observational study. **Setting:** Department of Medicine, Shifa International Hospital, Islamabad. **Period:** Sep-2025 to Feb-2026. **Methods:** A total of 207 patients aged ≥ 18 years with a confirmed diagnosis of chronic obstructive pulmonary disease and presenting with acute exacerbation requiring hospital admission, were enrolled. The NEWS2 was calculated at the time of presentation and patients were categorized into low (0–4), medium (5–6), and high (≥ 7) risk categories accordingly. In-hospital mortality was recorded during the hospital stay, while 3-month mortality and recurrence of exacerbation were assessed using hospital records and/or telephonic follow-up. Spearman correlation was used for statistical analysis considering $p < 0.05$ as significant. **Results:** When assessed using the NEWS2, the majority of patients fell in the high-risk category (52.66%) followed by medium-risk (30%) and low risk (17.39%). A statistically significant but weak correlation was observed between NEWS2 risk category and in-hospital mortality ($r = 0.183$, $p = 0.008$), which indicates that higher NEWS2 risk category was associated with increased in-hospital mortality. A clinically meaningful progressive gradient across risk categories was also shown for 3-month mortality and exacerbation frequency; however, these did not reach statistical significance. **Conclusion:** NEWS2 demonstrates directional utility as an early bedside risk stratification tool in patients presenting with AECOPD, supporting its integration into the routine decision-making at emergency departments.

Key words: Acute Exacerbation, Chronic Obstructive Pulmonary Disease, National Early Warning Score 2, Risk Stratification.

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a respiratory disorder characterized by persistent airflow limitation, not fully reversible, despite administration of optimal bronchodilator therapy.¹ The disease is a major global health-care burden, currently ranked as the 3rd leading cause of global deaths, and projected to remain at this position through 2030.²

COPD was related to approximately 3.3 M global deaths in the year 2019, with low- and middle-income countries bearing a disproportionately higher share of this mortality. The increasing prevalence in these countries is driven primarily by factors such as continued smoking habits, occupational exposures, and air pollution.^{3,4}

Acute exacerbation of COPD (AECOPD) is an

event which is characterized by worsening of the baseline respiratory such as dyspnea, cough, and/or sputum production, and represents a critical inflection point in disease progression, warranting a change in pharmacological management beyond routine maintenance therapy. AECOPD is found to be a major contributor to reduced quality of life (QoL), increased healthcare utilization, and mortality. Particularly, those exacerbations requiring hospitalization are related with an accelerated decline in lung function and a significantly increased risk of subsequent readmission and death.^{5,6} Early physiological abnormalities such as hypoxemia, tachypnea, tachycardia, and altered consciousness reflect clinical deterioration in AECOPD. These abnormalities are crucial to guide early intervention to prevent clinical deterioration and improve patient outcomes.⁷

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The importance of early identification has led to the development of a standardized bedside tool, the National Early Warning Score 2 (NEWS2). This tool is based on six routinely measurable parameters developed to detect patients at increased risk of clinical decline. These parameters include respiratory rate, oxygen saturation (SpO_2), systolic blood pressure (SBP), pulse rate, temperature, and level of consciousness (using the AVPU scale). An extra parameter accounting for supplemental oxygen is also included where needed. The aggregate score based on NEWS2 stratifies the patients into low (0–4), medium (5–6), and high (≥ 7) risk categories. The NEWS2 score is practical and useful to apply in acute clinical settings as the higher scores demonstrate a significant association with mortality and more frequent exacerbations. The early physiological abnormalities of AECOPD, such as hypoxemia, tachypnea, and tachycardia, are promptly recognized through this simple, rapid, and reproducible tool, supporting its utility as a practical risk stratification instrument in such cases.^{8,9}

The need for a reliable and easily applicable tool for risk stratification at the time of hospital admission is driven by the substantial burden of COPD-related morbidity and mortality in health care emergency units. Studies on the prognostic utility of the NEWS2 score in COPD populations have shown to facilitate targeted management strategies and help to optimize resource utilization and patient outcomes.¹⁰

However, the data regarding the utility of NEWS2 from South Asian tertiary care centers, where the clinical epidemiology of COPD may differ meaningfully from European cohorts, remains sparse. This research was therefore conducted to assess the correlation of the NEWS2 score at admission with key clinical outcomes in patients presenting to the emergency department (ED) with AECOPD, including in-hospital mortality, 3-month mortality, and frequency of exacerbations within 3-months follow up period. These results aim to support the integration of NEWS2 into routine clinical assessment in our local emergency units to promote early intervention and improve patient outcomes.

METHODS

This prospective longitudinal observational study was conducted at the Department of Medicine, Shifa International Hospital, Islamabad, from Sep-2025 to Feb-2026, following institutional ethical review board approval (IRB No-185-25/30-5-26).

A written informed consent was secured from each participant prior to their enrollment. The sample size ($n=200$) was calculated using a correlation coefficient of 0.3, with a level of significance 5% and power of 80%.¹¹

A total of 207 patients, aged ≥ 18 years, with confirmed diagnosis of COPD presenting with acute exacerbation, requiring hospital admission for at least 24 hours, were included in this study using non-probability consecutive sampling. The COPD diagnosis was determined using spirometry post-bronchodilator $\text{FEV}_1/\text{FVC} < 0.70$ or pulmonary function tests, supported by radiological findings.¹²

The exclusion criteria included patients with alternative causes of respiratory deterioration such as pneumothorax, pulmonary embolism, pleural effusion, myocardial infarction, heart failure (patients with acute presentation attributed primarily to heart failure), arrhythmias, or pericardial effusion. Moreover, cases involving confirmed COVID-19 infection were not considered for inclusion.

All the relevant baseline demographic and clinical data were recorded on a predesigned proforma. Presence of any comorbidities were also documented.

The NEWS2 score was calculated for each participant at the time of presentation to the hospital based on physiological parameters recorded by trained nursing staff as per standard hospital protocols.

Based on NEWS2 score, patients were then categorized into three risk groups including low risk (0–4), medium risk (5–6), and high risk (≥ 7).

Any incidence of in-hospital mortality was recorded during the hospital stay. After discharge from the hospital, follow-up was conducted at 3 months either through hospital records or telephonic interviews to

assess mortality or the recurrence of exacerbations requiring medical intervention or readmission.

Data were analyzed using SPSS 26. Descriptive statistics were used to present the study variables where continuous variables (such as age, BMI, and NEWS2 score) were reported as mean $\pm$ standard deviation, and categorical variables were summarized as frequencies and percentages. Pearson correlation analysis was applied (Spearman correlation for non-normally distributed or ordinal data) to determine the relationship between NEWS2 score and the study outcomes. A p-value of <0.05 was considered statistically significant.

RESULTS

The mean age in this study was 73.18 ± 13.68 years which ranged from 18-99 years. A higher frequency of female patients was recorded (51.69%) than the male patients (48.31%). The details of demographics and baseline clinical profile are shown in Table-I.

The application of NEWS2 score on the enrolled patients showed that, the majority (52.66%) belonged to the high-risk category followed by medium risk (30%) and low risk (17.39%) as shown in Table-II.

TABLE-I

Demographics and baseline clinical profile n= 207

Demographics and clinical profile

Age (Mean $\pm$ SD) years	73.18 $\pm$ 13.68
Gender	
Male n (%)	100 (48.31)
Female n (%)	107 (51.69)
BMI (Mean $\pm$ SD) kg/m ²	30.59 $\pm$ 3.95
Diabetes mellitus n (%)	126 (60.87)
Hypertension n (%)	118 (57)
Coronary Artery Disease n (%)	115 (55.56)
Heart Failure n (%)	77 (37.20)

TABLE-IV

Correlation of NEWS2 risk category with clinical outcomes of AECOPD n= 207

Clinical Outcomes	Low Risk (n=36)	Medium Risk (n=62)	High Risk (n=109)	Spearman r	P-Value
In-hospital mortality n (%)	2 (5.56)	10 (16.13)	13 (11.93)	-0.183	0.008
3-month mortality n (%)	0 (0)	0 (0)	5 (4.59)	-0.125	0.072
Patients with exacerbations during 3-months n (%)	11 (30.56)	31 (50)	66 (60.55)	-0.124	0.075

Smoking history n (%) 98 (47.34)

TABLE-II

Distribution of patients as per NEWS2 risk categories n= 207

NEWS2 Category	n (%)
Low risk (0–4)	36 (17.39)
Medium risk (5–6)	62 (30)
High Risk (≥ 7)	109 (52.66)

The data at the completion of three months follow up period for each patient showed that in-hospital mortality occurred in 25 patients (12.08%) while 5 patients (2.42%) died within the next 3-month period. Among survivors, 108 patients (52.17%) had recurrent exacerbations during the follow up period as shown in Table-III.

TABLE-III

Clinical outcomes at 3-month follow-up n= 207

Clinical Outcomes	n (%)
In-hospital Mortality	25 (12.08)
3-months mortality	5 (2.42)
3-month Exacerbation	108 (52.17)

Spearman correlation analysis demonstrated a meaningful statistical relationship between NEWS2 risk category and the incidence of in-hospital mortality ($r = -0.183$, $p = 0.008$), with in-hospital deaths more concentrated in the medium- and high-risk groups. The 3-month mortality occurred exclusively in the high-risk group (4.59%), and the proportion of patients experiencing recurrent exacerbations increased progressively across the risk categories: 30.56% in low-, 50% in medium-, and 60.55% in high-risk groups. This suggests a clinically meaningful gradient that, while not reaching statistical significance ($p = 0.072$ and $p = 0.075$), supports the directional utility of NEWS2 as an early risk stratification tool in AECOPD.

DISCUSSION

When assessed using NEWS2, the majority of patients fell in the high-risk category (52.66%) followed by medium-risk (30%) and low risk (17.39%). The results showed a meaningful statistical correlation of in-hospital mortality with NEWS2 ($r=-0.183$, $p=0.008$) while a clinically meaningful progressive gradient across risk categories was exhibited for 3-month mortality and exacerbation frequency; however, these did not reach statistical significance.

These findings are broadly consistent with the existing evidence which supports the prognostic utility of NEWS2 in COPD patients presenting with acute exacerbation. Stone PW et al. conducted a large-scale study for evaluating NEWS2 in AECOPD across 52,284 patients with external validation. The NEWS2 predicted inpatient mortality (AUC 0.72) and requirement for non-invasive ventilation (AUC 0.70). There was step wise increase in mortality at 2.2%, 3.6%, and 6.5% across the low, medium, and high-risk categories respectively predicted by NEWS2. Thus, with its moderate discriminative performance, NEWS2 remained a practical tool for the classification of severity in hospitalized cases of AECOPD.¹³ These findings are supported by further studies conducted in ED settings validating the utility of NEWS2 as a useful predictive tool.

A study conducted in Malaysia by Mhd Yunin NS et al. involved 1,906 patients reporting to the ED to determine the utility of NEWS2 for predicting hospitalization, and in-hospital mortality. The NEWS2 exhibited a moderate-to-excellent discriminative performance with AUROCs of 0.71, 0.75, and 0.86 for these outcomes respectively. Although less effective, NEWS2 remained a valuable routine risk stratification tool in the ED.¹⁴ Goodacre S et al. studied 3,990 ED patients to evaluate the NEWS2 for predicting time-critical treatment need and incidence of 7-day mortality. The tool demonstrated a good discriminative performance for time-critical interventions (AUC 0.807) and an excellent performance for 7-day mortality (AUC 0.865). However, sensitivity of this tool was only 51.8%, highlighting significant limitations in identifying condition-specific and time-critical interventions.¹⁵ A recent study by Castro-

Portillo E et al. with 1,703 COPD patients compared five early warning scores for 2-day mortality prediction. NEWS2 demonstrated a high overall discriminative performance (AUC 0.880); however, its performance was notably reduced in cases of AECOPD (AUC 0.775). This suggested that while NEWS2 represents a superior tool for early warning signs, its interpretation is cautiously warranted specifically in AECOPD patients.¹⁶ However, variable predictive performance of NEWS2 has been reported in some studies depending on timing and clinical context. Triantafyllidou C et al. evaluated NEWS scores at admission and found no significant correlation between admission scores and in-hospital mortality, which was recorded at 4.7% in their cohort. However, the elevated NEWS2 scores calculated on day two successfully predicted 6-month mortality and frequent re-exacerbations, and prolonged hospital stay, supporting the use of NEWS 2 in post-admission risk stratification in AECOPD patients.¹¹

Evidence from studies conducted in South Asian context also reinforces these observations. Thomas A et al. prospectively observed 101 patients presenting to the ED in South India to determine the performance of NEWS2 for mortality prediction. The results showed that the non-survivors had demonstrated significantly higher NEWS2 scores (13.14 ± 1.406) at admission compared to the survivors (4.36 ± 2.698). These findings validated NEWS2 as an effective and practical risk stratification tool for early identification of deteriorating patients.¹⁷

With this growing evidence for the use of NEWS2 in international studies, Yasin J et al. worked on its predictive value in Pakistani population. This study compared the NEWS2 for predicting the in-hospital mortality in 79 AECOPD patients and demonstrated 100% sensitivity but poor specificity and weak discriminative ability for NEWS2 (AUC 0.549). These findings suggested a limited standalone prognostic accuracy and therefore necessitating larger multicenter validation studies.¹⁸

Similarly, Kumari N et al. validated NEWS2 for predicting clinical deterioration in local Pakistani cohort where NEWS2 was used to predict the in-hospital mortality (18.4%). The tool demonstrated

100% sensitivity and NPV but a poor specificity (32.4%) and diagnostic accuracy (45%), limiting its standalone utility as a definitive prognostic tool in AECOPD.¹⁹

The correlation between NEWS2 risk categories and clinical outcomes did not follow a perfectly graded pattern in our study; however, the overall trend consistently favored worse outcomes in higher-risk groups. The incidence of post-discharge mortality exclusively in the high-risk category, and the progressive rise observed in exacerbation recurrence across risk groups, reinforce the directional validity of this tool even when formal statistical significance was not achieved. These findings suggest that NEWS2 performs most reliably at the extremes of risk, and is able to distinguish high-risk from non-high-risk patients, offering a practical discriminatory value in our medical EDs.

This research was performed at a tertiary level healthcare care center where cases are also referred from other smaller medical centers with limited facilities. The low-risk group was relatively small within the overall study cohort, thereby reducing the generalizability of conclusions and the capacity to statistically detect graded outcome differences across all three risk categories. Additionally, our reliance on telephonic follow-up for post-discharge outcomes may have introduced recall bias in our final results.

CONCLUSION

The NEWS2 score at admission demonstrates a statistically significant association with in-hospital mortality while offering a clinically meaningful directional gradient across the risk categories for 3-month mortality and recurrence of exacerbation in patients presenting with AECOPD. The predominance of high-risk COPD patients in South Asian countries including Pakistan, and the high burden of AECOPD in emergency medical units underscore the importance of these findings. Its integration in the routine assessment protocols may provide a practical, reproducible, and cost-effective tool for early risk stratification for prompt management.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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REFERENCES

1. Agarwal AK, Raja A, Brown BD. **Chronic obstructive pulmonary disease**. [Updated 2023 Aug 7]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2026 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK559281/>.
2. Al Wachami N, Guennouni M, Iderdar Y, Boumendil K, Arraji M, Mourajid Y, et al. **Estimating the global prevalence of chronic obstructive pulmonary disease (COPD): A systematic review and meta-analysis**. BMC Public Health. 2024; 24(1):297.
3. Safiri S, Carson-Chahhoud K, Noori M, Nejadghaderi SA, Sullman MJM, Ahmadian Heris J, et al. **Burden of chronic obstructive pulmonary disease and its attributable risk factors in 204 countries and territories, 1990-2019: results from the Global Burden of Disease Study 2019**. BMJ. 2022; 378:e069679.
4. Boers E, Barrett M, Su JG, Benjafield AV, Sinha S, Kaye L, et al. **Global burden of chronic obstructive pulmonary disease through 2050**. JAMA Netw Open. 2023; 6(12):e2346598.
5. Ritchie AI, Wedzicha JA. **Definition, causes, pathogenesis, and consequences of chronic obstructive pulmonary disease exacerbations**. Clin Chest Med. 2020; 41(3):421-38.
6. Kim V, Aaron SD. **What is a COPD exacerbation? Current definitions, pitfalls, challenges and opportunities for improvement**. Eur Respir J. 2018; 52(5):1801261.
7. Voulgareli I, Antonogiannaki EM, Bartzioakas K, Zaneli S, Bakakos P, Loukides S, et al. **Early identification of exacerbations in patients with chronic obstructive pulmonary disease (COPD)**. J Clin Med. 2025; 14(2):397.
8. Treacy M, Wong G, Odell M, Roberts N. **Understanding the use of the National Early Warning Score 2 in acute care settings: A realist review protocol**. BMJ Open. 2022; 12(7):e062154.
9. Vergara P, Forero D, Bastidas A, Garcia JC, Blanco J, Azocar J, et al. **Validation of the National Early Warning Score (NEWS)-2 for adults in the emergency department in a tertiary-level clinic in Colombia: Cohort study**. Medicine (Baltimore). 2021; 100(40):e27325.
10. Johnson M, Rigge L, Culliford D, Josephs L, Thomas M, Wilkinson T. **Primary care risk stratification in COPD using routinely collected data: a secondary data analysis**. NPJ Prim Care Respir Med. 2019; 29(1):42.

11. Triantafyllidou C, Effraimidis P, Vougas K, Agholme J, Schimanke M, Cederquist K. **The role of early warning scoring systems NEWS and MEWS in the acute exacerbation of COPD.** Clin Med Insights Circ Respir Pulm Med. 2023; 17:11795484231152305.

12. Darawshy F, Abu Rmeileh A, Kuint R, Goychmann-Cohen P, Fridlender ZG, Berkman N. **How accurate is the diagnosis of “chronic obstructive pulmonary disease” in patients hospitalized with an acute exacerbation?** Medicina (Kaunas). 2023; 59(3):632.

13. Stone PW, Minelli C, Feary J, Roberts CM, Quint JK, Hurst JR. **“NEWS2” as an Objective Assessment of Hospitalised COPD Exacerbation Severity.** Int J Chron Obstruct Pulmon Dis. 2022; 17:763-72.

14. Mhd Yunin NS, Tan TL. **National Early Warning Score 2 (NEWS2) as a prognostic tool for adult patients in emergency department: A retrospective observational study.** PLoS One. 2025; 20(6):e0326058.

15. Goodacre S, Sutton L, Fuller G, Trimble A, Pilbery R. **Accuracy of the National Early Warning Score version 2 (NEWS2) in predicting need for time-critical treatment: Retrospective observational cohort study.** Emerg Med J. 2025; 42:396-402.

16. Castro-Portillo E, Soriano JB, López-Izquierdo R, del Pozo Vegas C, Martín-Conty JL, Sánchez Soberón I, et al. **Accuracy of early warning scores for predicting clinical worsening in COPD patients.** ERJ Open Research. 2025 Mar; 11(2):00744-2024.

17. Thomas A, Mohan N, Varghese J, Kumar G, Trikkur, Nair SB, et al. **Predictive and prognostic importance of national early warning score 2 (NEWS2) in emergency room patients.** Cureus. 2025; 17(2):e79538.

18. Yasin J, Tariq M. **Comparing Modified DECAF and NEWS-2 Scores in Predicting In-Hospital Mortality in Acute Exacerbations of COPD.** J Coll Physicians Surg Pak. 2026; 36(12):358.

19. Kumari N, Kumar A, Akhter R, Saifullah N. **Comparison of NEWS2 and CURB65 score in predicting mortality of hospitalized patients with AECOPD.** Pak J Med Health Sci. 2023; 17(11):41-43.

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1	Warda Ajmal: Writing, analysis.
2	Muhammad Ashraf: Review.
3	Shanzay Haider: Data collection.