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Determinants of Readmission in Chronic Obstructive Pulmonary Disease (COPD) Patients at Meuraxa Regional Hospital Banda Aceh

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Abstract
Introduction: *The high readmission rates in patients with chronic obstructive pulmonary disease (COPD) present a significant clinical and financial burden to the healthcare system. Identifying the dominant determinants is critical to maximizing targeted transitional nursing intervention strategies.* ***Objective:*** *This study aimed to analyze the determinants associated with readmission rates in COPD patients at Meuraxa Regional Hospital in Banda Aceh.* ***Methods:*** *This quantitative study employed a correlational approach with a cross-sectional design. The purposive sampling technique was used to select 121 respondents as the study sample. Data were gathered using medical records, the International Physical Activity Questionnaire (IPAQ), and the COPD Assessment Test (CAT) and thereafter analyzed using the chi-square test and logistic regression.* ***Results and Discussion:*** *The analysis revealed that diseases apart from COPD ($p=0.016$), history of exacerbations ($p=0.001$), COPD severity ($p=0.026$), smoking behaviors ($p<0.001$), history of ICU admission ($p<0.001$), and physical activity ($p<0.001$) were significantly associated with readmission rates. ICU admission history emerged as the predominant factor with the strongest association with readmission ($OR=17.024$).* ***Conclusion:*** *This finding confirms that absolute functional vulnerability after intensive care is the foremost predictor of readmission in COPD patients. Therefore, hospitals are recommended to implement a post-discharge multidisciplinary transitional management model to optimize education and social support, thereby disrupting the cycle of readmission.*

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Introduction

Chronic Obstructive Pulmonary Disease (COPD) remains a predominant cause of global morbidity and mortality, characterized by progressive and persistent airflow obstruction (2024 GOLD Report, 2024). Acute exacerbations of COPD that require intensive inpatient treatment frequently occur during the disease's clinical course. Acute management in the hospital focuses on immediate stabilization, but patients are most vulnerable during the post-discharge period, which frequently results in high rates of unplanned 30-day readmissions (Njoku et al., 2020). In hospitalization management, previous length of stay (LOS) and history of intensive care unit (ICU) admissions have long been considered key indicators of clinical stability and disease severity. In addition, behavioral and clinical factors such as daily physical activity levels and heavy smoking history are also recognized as essential components dictating the long-term progression of the disease (Watz, 2022).

Despite a well-established understanding of these individual risk factors, a significant research gap exists in the current literature. Most current studies assess determinants of hospital readmissions incompletely, concentrating exclusively on administrative data like length of stay or on lifestyle factors such as smoking behaviors. It is also unusual to discover comprehensive integrative models that simultaneously evaluate how acute healthcare utilization parameters (previous LOS and ICU stay) interact with daily physical activity and cumulative cigarette smoke exposure (measured in pack-years) in predicting readmission risk (Pitta et al., 2024). Furthermore, the relationship between previous LOS and readmission rates presents a clinical paradox: some studies suggest that longer lengths of stay lead to better stabilization, while others indicate that it reflects baseline frailty, which in turn increases readmission risk (Buja et al., 2020; Muchiri et al., 2026). This uncertainty creates barriers for clinicians in designing effective and individualized transitional care plans.

To address the discussed issues, this study evaluated these variables using an integrated epidemiological method, examining the direct and mediated impacts of clinical history and daily lifestyle behaviors on patient outcomes. Furthermore, this study offers a more comprehensive risk stratification framework by integrating acute institutional data with post-discharge physical behavior (Ran et al., 2026; Ruan et al., 2023). Therefore, the aim of this study was to analyze the associations between previous length of stay, ICU admission history, physical activity level, and smoking history with readmission rates in COPD patients. Comprehending these multidimensional dynamics is essential for healthcare professionals to enhance discharge planning, mitigate the "revolving door" phenomenon of hospital readmissions, and ultimately reduce the macroeconomic burden on the healthcare system (Hardiyanti et al., 2021; Simpson et al., 2024)

Method

This quantitative study, using a cross-sectional design, aimed to analyze the simultaneous relationship between clinical administrative factors (previous length of hospitalization and history of ICU admission) and behavioral factors (daily physical activity level and cumulative smoking history) and readmission rates in patients with Chronic Obstructive Pulmonary Disease (COPD). The target population consisted of all COPD patients treated at Meuraxa Regional General Hospital in Banda Aceh, from which a sample of 201 respondents was selected using a non-probability purposive sampling method based on clinical inclusion criteria (i.e., aged 40 years and having complete medical records). Data collection applied a dual-approach method: a retrospective

electronic medical record review for clinical administrative data (length of stay in days and history of ICU) and structured interviews using validated questionnaires for behavioral profiles, including a short version of the International Physical Activity Questionnaire (IPAQ) for physical activity and the cumulative pack-years index formula for smoking history. Frequency distributions were determined using univariate analysis, and the Pearson chi-square test was used for bivariate analysis with an alpha = 0.05 significant threshold. To ensure maximum statistical precision, the continuity correction (Yates correction) value is presented for 2x2 contingency tables that completely met the expected value assumption (expected count of 0.0% of cells < 5).

Result and Discussion

1. Result

Table 1
Correlation between Readmission Variables

Variable of Readmission	f	%	p	OR
History of Exacerbations				
Yes	130	100	<0.001	5.142
No	71	100		
Smoking Behaviors				
Yes	137	100	0.003	4.476
No	64	100		
ICU Admission History				
Yes	69	100	<0.001	15.553
No	132	100		
Physical Activity				
Mild-Moderate	109	100	0.002	3.433
Severe	92	100		

Based on the bivariate analysis results presented in the table, all independent variables studied, including history of exacerbations, smoking habits, history of ICU admission, and physical activity level, were statistically significantly associated with increased hospital readmission rates, with all p-values below the 0.05 threshold. Among these four factors, the history of previous ICU admission was the most dominant and critical predictor. Patients with a history of ICU admission had a 15.55-fold higher risk of readmission compared to patients without such a history ($p < 0.001$; OR = 15.553).

2. Discussion

The study analysis indicates that, from a clinical-administrative perspective, having a history of ICU admission is a crucial factor, significantly increasing the risk of readmission by up to 15.5-fold ($p < 0.001$; OR = 15.553). These findings are relevant to the clinical severity theory of COPD, where patients with a history of ICU admission represent a subpopulation with a significant degree of lung function impairment and minimal respiratory reserve. Empirically, these results align with the global analysis conducted by Alqahtani et al. (2020) related to the "revolving door" phenomenon, which confirmed that intensive care unit interventions are strongly correlated with high short-term readmission rates due to patients' high vulnerability to recurrent exacerbations post-discharge.

However, ICU history should not be interpreted as an isolated determinant. Other significant clinical variables, including the presence of diseases apart from COPD and the degree of COPD severity, also require equal analytical attention because they reflect the

broader burden of illness and physiological vulnerability that influence readmission risk. Patients with comorbid diseases may experience overlapping inflammatory, cardiovascular, metabolic, or functional disturbances that complicate recovery after discharge, increase medication complexity, and reduce the body's ability to compensate during recurrent respiratory deterioration. In this context, comorbidity acts as a compounding factor that can intensify the instability already caused by COPD.

COPD severity also provides an important explanatory pathway for readmission. Patients with more severe COPD generally have lower pulmonary reserve, greater airflow limitation, more frequent exacerbation episodes, and higher dependence on pharmacological or oxygen-support therapy. These conditions make post-discharge recovery more fragile, particularly when patients return to home environments without adequate monitoring, rehabilitation support, or adherence to long-term disease management. Therefore, the significant association between COPD severity and readmission indicates that clinical assessment at discharge should not only document previous ICU admission, but also stratify patients based on disease severity and comorbid burden.

This phenomenon is also exacerbated by patients' domestic behavioral factors, where low levels of physical activity and a history of heavy smoking simultaneously undermine post-discharge clinical stability. Low physical activity may worsen respiratory muscle deconditioning and reduce exercise tolerance, while heavy smoking history contributes to persistent airway inflammation and accelerates decline in lung function. When these behavioral risks interact with severe COPD and comorbid diseases, the probability of recurrent exacerbation and readmission becomes higher. The implications of these findings emphasize the importance of hospital clinical management paying special attention to the discharge planning pathway for post-ICU patients. Nevertheless, discharge planning should also be expanded to include patients with multiple comorbidities and higher COPD severity levels, as these groups represent clinically unstable populations with substantial risk of readmission. Healthcare practitioners, particularly critical care and community nurses, should prioritize structured education programs, safe physical activity prescriptions, smoking cessation support, comorbidity monitoring, medication reconciliation, symptom recognition training, and severity-based follow-up planning for this vulnerable subpopulation to break the readmission cycle and reduce the macroeconomic burden on hospitals

Conclusion

This study concludes that a history of ICU care is a significant clinical indicator of increased readmission risk in COPD patients at Meuraxa Regional Hospital, with a 15-fold increase. Moreover, behavioral factors such as inadequate physical activity and a history of heavy smoking further exacerbate the readmission risk. Consequently, hospital management is recommended to optimize discharge planning initiatives, particularly regarding the readiness of post-intensive care unit (ICU) patients for discharge.

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