

Prognosis and Associated Factors in Patients Transferred from a Tertiary Intensive Care Unit to the Pulmonology Ward

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ABSTRACT

Objective: The transfer of patients from the intensive care unit (ICU) to general wards is a clinically challenging process. A carefully considered decision to transfer and close monitoring on the ward may reduce mortality and the need for ICU readmission. This study aimed to evaluate prognostic factors associated with one-month mortality in patients transferred from a tertiary intensive care unit to a pulmonary medicine ward.

Methods: This retrospective observational study included patients who were transferred from a tertiary ICU to the pulmonary medicine ward between January 2024 and July 2024. Demographic, clinical, and laboratory data, as well as discharge status and one-month mortality outcomes, were evaluated.

Results: A total of 114 patients were included in the study. The one-month mortality rate was 23.7% (27 patients). Patients who died had significantly lower levels of albumin and hemoglobin, as well as a higher mean heart rate upon admission to the ward. Additionally, ICU readmission and the presence of malignancy were significantly associated with mortality in univariate analysis. However, in multivariate logistic regression, only ICU readmission remained an independent predictor of mortality ($p=0.032$), while malignancy and elevated heart rate were not statistically significant ($p=0.297$ and $p=0.092$, respectively).

Conclusion: Patients transferred from a tertiary ICU to a pulmonary medicine ward are at high risk for short-term mortality. ICU readmission was identified as an independent prognostic factor. Moreover, high heart rate, low albumin and hemoglobin levels, and the presence of malignancy may help in identifying high-risk patients. Early identification and close monitoring of these patients may reduce mortality and ICU readmissions.

INTRODUCTION

Patients may become vulnerable to medical errors and adverse events during the transition from the intensive care unit (ICU) to general wards.^[1,2] This transitional period is considered one of the most critical phases of hospitalization. The ICU provides continuous monitoring and multidisciplinary care, whereas such resources are more limited on general wards. Moreover, the healthcare team responsible for the patient's care changes during this transition. For these reasons, post-ICU care demands rigorous monitoring and standardized protocols.^[3]

Among hospital wards, pulmonary medicine units hold a distinctive position. These wards commonly manage patients with acute or chronic respiratory conditions and are equipped to provide close respiratory monitoring—such as continuous oxygen saturation monitoring—and Non-

invasive ventilation support. This makes them particularly well-suited for post-ICU patients with ongoing respiratory needs.

Patients transferred from the ICU to the ward often include individuals who have received treatment for severe infections, respiratory failure, sepsis, or multiple organ dysfunction. Even after discharge from the ICU, these patients remain at risk of complications and clinical deterioration.^[4] This may lead to unfavorable outcomes such as ICU readmission or mortality.^[5] Therefore, close monitoring of patients in the post-ICU period and early identification of high-risk individuals are essential.

Several clinical parameters have been identified as being associated with in-hospital mortality during the post-ICU period. These include advanced age, altered mental status, hypoxia, need for mechanical ventilation, and elevated

blood urea levels.^[6,7] However, studies focusing specifically on patients transferred to pulmonary medicine wards remain limited.^[8] Early assessment of prognosis in this patient group is crucial for optimizing clinical management.

The aim of this study is to evaluate one-month mortality and identify prognostic factors in patients transferred from a tertiary ICU to a pulmonary medicine ward.

MATERIALS AND METHODS

This retrospective cohort study was conducted at a tertiary care hospital in Istanbul, Türkiye. The study included adult patients who were transferred from the hospital's third-level general ICU to the pulmonary medicine ward between January 2024 and July 2024. Medical records were reviewed retrospectively through the hospital's electronic database.

Data collected for each patient included demographic characteristics, primary diagnoses and comorbidities, laboratory parameters at the time of ICU-to-ward transfer, need for mechanical ventilation and history of endotracheal intubation, and microbiological culture results obtained from blood, sputum, urine, or tracheal aspirates. Information regarding the length of ICU stay and subsequent ward stay, ICU readmission status, discharge outcomes, and one-month post-discharge mortality were also recorded.

Patients were eligible for inclusion if they were aged 18 years or older, were transferred from the ICU to the chest diseases ward within the specified study period, had complete medical and follow-up data, and remained in the ward for at least 24 hours after transfer. Patients were excluded if they were discharged to another hospital or department directly from the ICU, if their medical or follow-up records were incomplete, or if they left the hospital against medical advice.

Total serum calcium levels were used without correction for albumin.

Data regarding one-month mortality following transfer to the pulmonary medicine ward were obtained through the hospital's electronic medical record system.

The primary outcome of the study was one-month mortality following transfer to the pulmonary medicine ward. Secondary outcomes included identification of clinical factors associated with mortality and need for ICU readmission.

The study protocol was approved by the Kartal Dr. Lütfi Kırdar City Hospital Ethics Committee (No: 2025/010.99/16/8, Date: 27/05/2025). All procedures were conducted in accordance with the principles of the Declaration of Helsinki.

Statistical Analysis

Data analysis was performed using IBM SPSS Statistics version 25.0. The distribution of continuous variables was assessed using the Kolmogorov–Smirnov test. The Mann–

Whitney U test was used for comparisons of non-normally distributed continuous variables. Categorical variables were analyzed using the Chi-square test. A p-value of <0.05 was considered statistically significant.

To identify factors associated with one-month mortality, univariate analyses were initially performed. Variables found to be statistically significant in univariate analysis were included in a multivariate logistic regression model. In this model, the variables included were “presence of malignancy,” “whether ICU readmission occurred during ward follow-up,” and “heart rate measured during ward stay.” A p-value of <0.05 was considered statistically significant in the regression analysis.

RESULTS

Baseline Characteristics

A total of 114 patients who were transferred from a tertiary ICU to the pulmonary medicine ward between January and July 2024 were included in this study. The mean age of the patients was 71.7±15.1 years, and 53.5% (n=61) were male. The most common comorbidities were hypertension (65.8%), diabetes mellitus (35.1%), and heart failure (20.2%). Additionally, 21.9% (n=25) of the patients had malignancy. Of the patients, 40.4% (n=46) were intubated. The median ICU length of stay was 9 days (IQR: 5–17), while the median length of stay on the pulmonary ward was 10 days (IQR: 6–16). During follow-up, 14.0% (n=16) of patients required readmission to the ICU (Table 1).

Mortality Rate and Comparison Between Groups

Among the 114 patients included, 23.7% (n=27) died within one month after discharge from the pulmonary medicine ward. Comparison between survivors and non-survivors revealed that the mean age was significantly higher in the mortality group (78.8±10.3 vs. 71.0±14.1 years, p=0.013).

Table 1. Baseline characteristics of 114 patients

Variables	Value
Age, mean±SD (years)	71.7±15.1
Male sex, n (%)	61 (53.5)
COPD, n (%)	49 (43)
Hypertension, n (%)	75 (65.8)
Diabetes Mellitus, n (%)	40 (35.1)
Heart failure, n (%)	23 (20.2)
Malignancy, n (%)	25 (21.9)
Intubation, n (%)	46 (40.4)
ICU length of stay, median (IQR), days	9 (5–17)
Pulmonary ward stay, median (IQR), days	10 (6–16)
Readmission to ICU, n (%)	16 (14.0)

COPD=Chronic obstructive pulmonary disease, ICU=Intensive care unit, IQR=Interquartile range.

Table 2. Comparison between survivors and non-survivors

Variable	Survivors (n=87)	Non-Survivors (n=27)	p-value
Age, mean±SD (years)	71.0±14.1	78.8±10.3	0.013
Malignancy, n (%)	16 (18.6)	13 (48.1)	0.001
ICU readmission, n (%)	6 (6.9)	9 (33.3)	0.001
Heart rate, median (IQR) (bpm)	88	101	0.005
CRP, mean±SD (mg/L)	67.4±87.2	84.0±61.8	0.010
WBC count, mean±SD (10 ³ /μL)	9.71±4.69	11.15±3.94	0.019
Serum albumin, mean±SD (g/dL)	3.01±0.43	2.67±0.44	0.001
Hemoglobin, mean±SD (g/dL)	12.21±2.10	9.93±1.74	0.020
Hematocrit, mean±SD (%)	34.15±6.34	30.45±4.72	0.018
Calcium, mean±SD (mg/dL)	8.44±0.60	8.12±0.75	0.044
Potassium, mean±SD (mmol/L)	3.90±0.57	4.00±0.49	0.035

CRP: C-reactive protein; WBC: White blood cell; ICU: Intensive care unit; SD: Standard deviation; bpm: beats per minute.

Table 3. Clinical outcomes of patients transferred from ICU to pulmonary ward

Outcome	n	Percentage (%)
Discharged home	87	76.3
Died in the pulmonary ward	1	0.9
Transferred back to ICU	22	19.3
Transferred to another department	4	3.5
Total	114	100.0

Other parameters significantly associated with mortality were as follows:

- The presence of malignancy was more frequent in the mortality group (48.1% vs. 18.6%, $p=0.001$).
- ICU readmission was significantly more common among non-survivors (33.3% vs. 6.9%, $p=0.001$).
- Median heart rate measured on the ward was higher in non-survivors (101 vs. 88 bpm, $p=0.005$).
- C-reactive protein (CRP) and white blood cell (WBC) counts were significantly elevated in the mortality group ($p=0.010$ and $p=0.019$, respectively).
- Serum albumin was significantly lower in non-survivors ($p=0.001$).
- Hemoglobin, hematocrit, and calcium levels were also

lower in the mortality group, whereas potassium levels were significantly higher ($p=0.020$, $p=0.018$, $p=0.044$, and $p=0.035$, respectively) (Table 2).

Clinical Outcomes

Among the 114 patients included, 23.7% ($n=27$) died within one month after discharge from the pulmonary medicine ward. A total of 16 patients (14.0%) required readmission to the ICU, and 4 patients (3.5%) were transferred to other departments for further management (Table 3).

Logistic Regression Analysis

Logistic regression analysis revealed that ICU readmission was an independent prognostic factor for mortality ($p=0.001$, OR=5.85, 95% CI: 1.95–17.54) (Table 4).

DISCUSSION

In this study, we evaluated the one-month mortality rate and associated prognostic factors in patients transferred from a tertiary ICU to a pulmonary medicine ward. The one-month mortality rate was found to be 23.7%. One-month mortality after ICU discharge has been reported to range from 10% to 25% in previous studies.^[9-11] Our result (23.7%) is near the upper end of this range. This may be because our hospital does not have an intermediate care

Table 4. Multivariate logistic regression analysis of 1-month mortality

Variable	B	SE	Wald	P	OR (Adjusted)*	OR 95% CI
Malignancy (vs no malignancy)	-0.576	0.553	1.086	1.201	1.78	0.562 (95% CI: 0.190–1.661)
ICU readmission (vs no)	-1.767	0.548	10.394	0.001	5.85	0.171 (95% CI: 0.058–0.500)
Heart rate (per bpm)	0.027	0.016	2.833	0.092	1.027	1.027 (95% CI: 0.981–1.076)
Constant	-1.912	1.744	1.201	0.273	-	-

*Adjusted ORs were calculated as $1/\text{Exp}(B)$ due to reverse coding in the logistic regression model. B: Regression coefficient; SE: Standard error; Wald: Wald chi-square test statistic, P: p-value; OR: Odds ratio; CI: Confidence interval; ICU: Intensive care unit; bpm: Beats per minute.

unit, so patients with more serious conditions are transferred directly to the pulmonary ward. Therefore, our patient group may have had more severe illnesses compared to those in hospitals with step-down care.

Several laboratory parameters were significantly associated with mortality in our study, including hemoglobin, hematocrit, WBC, international normalized ratio (INR), calcium, albumin, and potassium levels. These findings suggest that patients were transferred with ongoing systemic inflammation, nutritional deficiencies, organ dysfunction, or coagulation abnormalities.

Hemoglobin levels were significantly lower in the mortality group (mean 9.9 g/dL). In a large-scale study by Lin et al.,^[12] a hemoglobin level below 10 g/dL within the first week was associated with a 26-34% increase in one-year mortality risk. This supports the potential prognostic significance of anemia in critically ill patients post-ICU.

Similarly, INR was significantly higher in non-survivors (mean 1.26). Benediktsson et al.^[13] reported that in patients with sepsis, each unit increase in PT-INR upon ICU admission increased in-hospital mortality by 42% (HR=1.422). Our findings are in line with these data, indicating that elevated INR may reflect coagulopathy and poor prognosis.

In our study, serum calcium levels were also significantly lower in the mortality group (mean 8.11 mg/dL, $p=0.013$). Hypocalcemia is frequently observed in ICU patients and may contribute to complications involving the cardiovascular, neuromuscular, and coagulation systems. This is consistent with the findings of Iqbal et al.,^[14] who reported the common occurrence of hypocalcemia among ICU patients.

Serum albumin levels were significantly lower in the mortality group (mean 2.6 g/dL, $p=0.001$). Hypoalbuminemia is considered a marker of inflammation and malnutrition and has been strongly associated with increased mortality in critically ill patients. A large meta-analysis by Vincent et al.,^[15] which included acutely ill patients, confirmed that hypoalbuminemia is an independent predictor of poor outcomes, even in ICU populations.

In addition to laboratory parameters, clinical variables such as heart rate and ICU readmission were also associated with increased mortality in our study. Patients in the mortality group had significantly higher heart rates at the time of ward admission. Tachycardia may reflect ongoing physiological stress, unresolved systemic inflammation, or underlying cardiovascular dysfunction. Previous studies have suggested that abnormal vital signs—particularly heart and respiratory rate—at the time of ICU discharge may serve as consistent but not yet well-validated indicators of ICU readmission risk.^[16]

Moreover, ICU readmission emerged as the only independent predictor of one-month mortality in our multivariate analysis. ICU readmission is widely recognized as a marker of clinical deterioration and has been associated with increased in-hospital mortality. In a meta-analysis including over two million ICU discharges, Hosein et al.^[11] reported

that among every 100 patients discharged alive from the ICU, approximately 4 to 6 were readmitted, and 3 to 7 died before hospital discharge. These findings emphasize the prognostic value of ICU readmission and highlight the importance of structured discharge planning and close monitoring during the post-ICU period.

Limitations

This study has several limitations. First, as a single-center retrospective study, the generalizability of the findings may be limited. Additionally, the relatively small sample size may have reduced the statistical power to detect significance in some variables during multivariate analysis. Important prognostic indicators such as functional scoring systems (e.g., APACHE, SOFA) could not be evaluated. Laboratory parameters such as CRP, albumin, and calcium were available only as single measurements at the time of transfer, and were not analyzed, which may have limited the assessment of disease progression. These limitations highlight the need for future multicenter prospective studies to validate and expand upon our findings.

Conclusion

This study highlights that patients transferred from a tertiary intensive care unit to the pulmonary medicine ward have a substantial short-term mortality risk, with a 1-month mortality rate of 23.7%. ICU readmission was identified as an independent predictor of mortality. Although elevated heart rate, low serum albumin and hemoglobin levels, and presence of malignancy were not independently associated with mortality in multivariate analysis, they were significantly different in univariate analysis and may still warrant clinical attention. These findings emphasize the importance of early risk stratification and close monitoring of patients following ICU discharge. Future multicenter, prospective studies with larger cohorts and inclusion of dynamic clinical scores and follow-up data are warranted to validate these findings and improve post-ICU care strategies.

Ethics Committee Approval

The study was approved by the Kartal Dr. Lütfi Kırdar City Hospital Hospital Ethics Committee (Date: 27.05.2025, Decision No: 2025/010.99/16/8).

Informed Consent

Retrospective study.

Peer-review

Externally peer-reviewed.

Authorship Contributions

Concept: B.Z.E., N.K., A.F.; Design: N.K., A.F.; Supervision: S.C., N.K., B.Z.E.; Materials: N.K., S.C., A.F.; Data collection &/or processing: B.Z.E., Y.F.A.; Analysis and/or interpretation: A.F., Y.F.A.; Literature search: B.Z.E., Y.F.A.; Writing: B.Z.E., N.K.; Critical review: S.C., N.K., A.F.

Conflict of Interest

None declared.

REFERENCES

- World Health Organization. Transitions of care: Technical series on safer primary care. Available at: <https://apps.who.int/iris/handle/10665/252272>. Accessed Aug 11, 2025.
- Hervé MEW, Zucatti PB, Lima MADS. Transition of care at discharge from the intensive care unit: A scoping review. *Rev Latino-Am Enfermagem* 2020;28:e3325. [CrossRef]
- Hosein FS, Bobrovitz N, Berthelot S, Zygun D, Ghali WA, Stelfox HT. A systematic review of tools for predicting severe adverse events following patient discharge from intensive care units. *Crit Care* 2013;17:R102. [CrossRef]
- Lee J, Cho YJ, Kim SJ, Yoon HI, Park JS, Lee CT, et al. Who dies after ICU discharge? Retrospective analysis of prognostic factors for in-hospital mortality of ICU survivors. *J Korean Med Sci* 2017;32:528–33. [CrossRef]
- Ponzoni CR, Corrêa TD, Filho RR, Serpa Neto A, Assunção MSC, Pardini A, et al. Readmission to the intensive care unit: Incidence, risk factors, resource use, and outcomes. A retrospective cohort study. *Ann Am Thorac Soc* 2017;14:1312–9. [CrossRef]
- E Silva LGA, de Maio Carrilho CMD, Talizin TB, Cardoso LTQ, Lavado EL, Grion CMC. Risk factors for hospital mortality in intensive care unit survivors: A retrospective cohort study. *Acute Crit Care* 2023;38:68–75. [CrossRef]
- Keegan MT, Gajic O, Afessa B. Severity of illness scoring systems in the intensive care unit. *Crit Care Med* 2011;39:163–9. [CrossRef]
- Santhosh L, Lyons PG, Rojas JC, Ciesielski TM, Beach S, Farnan JM, et al. Characterising ICU-ward handoffs at three academic medical centres: Process and perceptions. *BMJ Qual Saf* 2019;28:627–34. [CrossRef]
- Goldhill DR, Sumner A. Outcome of intensive care patients in a group of British intensive care units. *Crit Care Med* 1998;26:1337–45. [CrossRef]
- Moreno R, Miranda DR, Maros R, Fevereiro T. Mortality after discharge from intensive care: The impact of organ system failure and nursing workload use at discharge. *Intensive Care Med* 2001;27:999–1004. [CrossRef]
- Hosein FS, Roberts DJ, Turin TC, Zygun D, Ghali WA, Stelfox HT. A meta-analysis to derive literature-based benchmarks for readmission and hospital mortality after patient discharge from intensive care. *Crit Care* 2014;18:715. [CrossRef]
- Lin IH, Liao PY, Wong LT, Chan MC, Wu CL, Chao WC. Anaemia in the first week may be associated with long-term mortality among critically ill patients: Propensity score-based analyses. *BMC Emerg Med* 2023;23:32. [CrossRef]
- Benediktsson S, Frigyesi A, Kander T. Routine coagulation tests on ICU admission are associated with mortality in sepsis: An observational study. *Acta Anaesthesiol Scand* 2017;61:790–6. [CrossRef]
- Iqbal M, Rehmani R, Hijazi M, Abdulaziz A, Kashif S. Hypocalcemia in a Saudi intensive care unit. *Ann Thorac Med* 2008;3:57–9. [CrossRef]
- Vincent JL, Dubois MJ, Navickis RJ, Wilkes MM. Hypoalbuminemia in acute illness: Is there a rationale for intervention? A meta-analysis of cohort studies and controlled trials. *Ann Surg* 2003;237:319–34. [CrossRef]
- Rosenberg AL, Watts C. Patients readmitted to ICUs* : A systematic review of risk factors and outcomes. *Chest* 2000;118:492–502. [CrossRef]

Üçüncü Basamak Yoğun Bakım Ünitesinden Göğüs Hastalıkları Servisine Devredilen Hastalarda Prognoz ve İlişkili Faktörler

Amaç: Yoğun bakım ünitesinden (YBÜ) servise hasta transferi, klinik açıdan zorlu bir süreçtir. Devir kararının titizlikle verilmesi ve serviste yakın izlem sağlanması, mortaliteyi ve yoğun bakıma tekrar yatış gereksinimini azaltabilir. Bu çalışmanın amacı, üçüncü basamak yoğun bakım ünitesinden göğüs hastalıkları servisine devredilen hastalarda bir aylık mortalite ile ilişkili prognostik faktörleri değerlendirmektir.

Gereç ve Yöntem: Bu retrospektif gözlemsel çalışmaya, Ocak 2024-Temmuz 2024 tarihleri arasında üçüncü basamak yoğun bakım ünitesinden göğüs hastalıkları servisine devredilen hastalar dahil edilmiştir. Hastalara ait demografik, klinik ve laboratuvar bulgular ile taburculuk durumu ve bir aylık mortalite verileri değerlendirilmiştir.

Bulgular: Çalışmaya toplam 114 hasta dahil edildi. Bir aylık mortalite oranı %23.7 (27 hasta) idi. Mortalite gelişen hastalarda albümin ve hemoglobin düzeyleri anlamlı olarak daha düşük, servise yatış sırasında ortalama kalp atış hızı ise daha yüksekti. Ayrıca, tek değişkenli analizde yoğun bakım ünitesine yeniden yatış ve malignite varlığı mortalite ile anlamlı şekilde ilişkiliydi. Ancak çok değişkenli lojistik regresyon analizinde yalnızca yoğun bakım ünitesine yeniden yatış, mortalitenin bağımsız bir öngörücüsü olarak kaldı ($p=0.032$); malignite ve yüksek kalp atış hızı ise istatistiksel olarak anlamlı bulunmadı (sırasıyla, $p=0.297$ ve $p=0.092$).

Sonuç: Üçüncü basamak yoğun bakım ünitesinden göğüs hastalıkları servisine devredilen hastalarda kısa dönem mortalite riski yüksektir. Bu çalışmada, yoğun bakıma yeniden yatışın bir aylık mortalitenin bağımsız bir öngöstergesi olduğu gösterilmiştir. Ayrıca, yüksek nabız sayısı istatistiksel olarak sınırdan anlamlılık göstermiştir. Bu parametreler, yüksek riskli hastaların belirlenmesinde klinik açıdan dikkate alınmalı; bu hastaların erken tanımlanması ve yakından izlenmesi, klinik sonuçları iyileştirmeye katkı sağlayabilir.

Anahtar Sözcükler: Hasta transferi; mortalite; prognoz; yoğun bakım.