

Readmissions to Intensive Care from Palliative Care Units: Risk Factors, Incidence, and Outcome

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ABSTRACT

Introduction: Palliative care units (PCUs), which offer medical, psychological, and physical support to patients in need of care, have become increasingly prevalent worldwide. A significant portion of the patient load in the PCU constitutes those transferred from the intensive care unit (ICU), yet a fraction of these patients are readmitted to the ICU for different reasons. It is a well-known fact that readmitted patients to the ICU exhibit higher morbidity and mortality.

Methods: Our study was designed retrospectively. Patients transferred from our hospital's ICU to the PCU were screened using our hospital's information system software dating back 10 years. Readmission to the ICU was defined as patients transferred from the ICU to the PCU and readmitted to the ICU within 72 h.

Results: Two hundred and seventy patients were included in the study. Of the 270 patients, 66 (24.4%) were readmitted to the ICU within 3 days. Logistic regression analysis was conducted to assess the risk factors for readmission to the ICU, which revealed that the use of home ventilators, high initial the Acute Physiology and Chronic Health Evaluation II (APACHE II) score, presence of stroke, and vasoactive agent use during the hospital stay were independent risk factors for readmission to the ICU.

Conclusion: In patients transferred to palliative care following an ICU stay and readmitted to the ICU within 72 h, factors such as high APACHE II scores during admission, discharge with home ventilator, use of vasopressors in the ICU, intubation during ICU stay, and presence of stroke were identified as independent risk factors for readmission.

Keywords: Readmissions, intensive care units, palliative care, hospice care

Introduction

Palliative care centers, which offer medical, psychological, and physical support to patients in need of care, regardless of whether they extend life expectancy or not, have become increasingly prevalent worldwide (1). In our country as well, palliative care units (PCUs) have been established for years, effectively providing care and palliation for patients. The concept of palliative care, as defined by the World Health Organization, involves an approach that enhances the quality of life for patients facing problems associated with life-threatening illnesses and their families through early diagnosis, comprehensive assessment, prevention, and alleviation of suffering by treating pain and other physical, psychological, and spiritual issues (2). However, globally, it has been reported that only approximately 14% of patients in need of palliative care can access palliative care facilities (3).

Patients can be transferred to PCUs from various hospital departments and from their homes. In our country, PCUs work as units that require continuous care for end-stage cancer patients, provide training for patient relatives, and aim to ensure that patients and their relatives

adapt to the process before discharge home. A significant portion of the patient load in PCUs constitutes those transferred from intensive care units (ICUs), yet a fraction of these patients are readmitted to the ICU for different reasons. Readmissions to intensive care have been recommended as a quality criterion for countries and ICUs in numerous studies (4,5). Because of the above-mentioned reasons, clinicians might adopt a more cautious and protective approach during intensive care discharges. Similarly, tools are being developed to identify patients at an increased risk of readmission (6,7).

It is a well-known fact that readmitted patients to the ICU exhibit higher morbidity and mortality (7-9). In addition, these patients significantly increase hospital costs. Readmissions to intensive care have been studied multiple times, with reported frequencies ranging from approximately 1.2% to 14.5% (10-12). However, there are limited specific studies on patients transferred to PCUs. Moreover, globally, there is a new concept shaping the development of palliative care within intensive care and the adaptation of PCU fundamentals to ICUs. In our study, we aimed to investigate the risk factors, causes, and frequency of patients readmitted



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to the ICU within three days after being transferred from the 3rd level ICU to the PCU.

Methods

Our study was designed retrospectively at University of Health Sciences Turkey, İzmir Bozyaka Training and Research. Patients transferred from University of Health Sciences Turkey, İzmir Bozyaka Training and Research's 2nd and 3rd level ICUs to the PCU were screened through University of Health Sciences Turkey, İzmir Bozyaka Training and Research's information system software dating back 10 years. The study was approved by the University of Health Sciences Turkey, İzmir Bozyaka Training and Research Ethics Committee (approval number: 2023/182, date: 18.10.2023).

Data regarding patients were compiled by scanning both the hospital information system program and patient records. Our intensive care service is a multidisciplinary unit managed 24/7 by at least one intensive care specialist or anesthesiology and reanimation specialist, comprising 17 beds, with 10 in the 3rd level and 7 in the 2nd level.

Patients over 18 years of age admitted to the ICU for any reason were included. Patients diagnosed with cancer, those with pregnancy, and those admitted due to coronavirus disease-2019 (COVID-19) concerns were excluded because their inclusion could impact the results. Readmission to intensive care was defined as patients transferred from the ICU to the PCU and readmitted to the ICU within 72 h without a new pathology being detected. Data recorded included patients' admission diagnoses, comorbidities, previous units of admission, laboratory findings, the Acute Physiology and Chronic Health Evaluation II (APACHE II) scores, discharge status (survival or exitus), mechanical ventilator needs during intensive care stay, use of vasopressors throughout their stay, and requirements for blood transfusion and blood sugar imbalance (defined as the need for at least one intervention per day). In addition, the presence of tracheostomy upon referral to the PCU, discharge with a home ventilator, and the day and time of patient transfers were noted. Weekdays from Monday to Thursday were categorized as weekdays, whereas Friday to Sunday were considered weekends. Working hours were defined as 08.00-16.00 and non-working hours as 16.00-08.00.

Statistical Analysis

IBM SPSS 22.0 (IBM Corp, Somers, NY, USA) was used for statistical analysis. The normal distribution of data was evaluated using the Kolmogorov-Smirnov test. Normally distributed continuous data were compared using independent sample t-tests and presented as mean \pm standard deviation. Non-normally distributed data were presented as median and interquartile range (IQR) and compared using the Mann-Whitney U test. Categorical data were expressed as counts (n) and percentages (%) and compared using Pearson's chi-square or Fisher's exact test. Data were analyzed at a 95% confidence level, with significance at $p < 0.05$. Univariate logistic regression analysis was conducted to determine the variables associated with readmission to intensive care and in-hospital mortality. Multivariate logistic regression analysis was performed including all variables with $p < 0.05$ in univariate analysis, applying backward elimination procedures to obtain adjusted odds ratios

with 95% confidence intervals and identify variables independently associated with readmission to intensive care.

Results

Throughout the duration of the study, 334 patients were transferred from the ICU to the PCU. However, because of inaccessible files for 24 patients and exclusion of 32 patients transferred to the palliative unit because of cancer diagnosis and 8 because of COVID-19, 270 patients were included in the study. Of the 270 patients, 66 (24.4%) were readmitted to the ICU within 3 days. The number of female patients was 114, whereas the number of male patients was 156 ($p = 0.886$). The median (IQR) age for readmitted patients was 78.5 (11) compared to 69 (17) for non-readmitted patients. Among the reasons for intensive care admission, 112 patients were admitted most frequently because of respiratory problems; the second most common reason was neurological diseases (Table 1).

The APACHE II score median (IQR) 28 (4) for the readmitted group, whereas it was 20 (4) for the non-readmitted group ($p < 0.001$). The Glasgow Coma Scale scores during intensive care admission were median 9 (6) for the readmitted group and 11 (4) for the non-readmitted group ($p < 0.001$). Upon examination of patient comorbidities, statistical differences were found among factors such as vasopressor use, presence of multiple comorbidities, receiving renal replacement therapy during admission, use of blood products, and home ventilator use (Table 2).

Logistic regression analysis was conducted to assess the risk factors for readmission to the ICU, which revealed that the use of home ventilators, high initial APACHE II score, presence of stroke, and vasoactive agent use during the hospital stay were independent risk factors for readmission to the ICU (Table 3).

Discussion

In our study, factors such as high APACHE II score during admission, discharge with home ventilator, vasopressor use during ICU stay, intubation during ICU stay, and presence of stroke were identified as independent risk factors for readmission to the ICU from the PCU. Furthermore, we observed a significantly higher mortality rate and longer hospital stay in the readmission group than in the non-readmission group.

PCUs are relatively new departments in our country. Since 2010, PCUs have been recognized as a medical discipline by the Ministry of Health of the Republic of Turkey, and their number and standards have gradually increased since this year (13). In addition to end-stage cancer patients in our country, it serves various patient populations, from bedridden patients who cannot take care of themselves and their families to patients with chronic diseases and education requirements. In addition, they have undertaken a higher burden compared to many other countries because it is a discipline in which the care of patients who do not need intensive care and will be discharged, especially those in need of care, the education of patients and their relatives, psychological support, and pain palliation.

Previous studies on ICU readmissions have reported rates ranging from 1.2% to 14.5% (10-12). However, our study showed a readmission rate

of 24.4%. We believe that the primary reason for our higher rate lies in our focus on patients solely transferred to and readmitted from the PCU. The majority of patients referred to the PCU had one or more additional comorbidities, a relatively higher average age compared with other studies, and incurable or life-limiting illnesses, which could have contributed to these outcomes.

Studies have demonstrated higher mortality rates among patients readmitted to the ICU. In previous studies, the mortality rate in patients with readmission to intensive care was found to be 12%-58% (14-16), and it was reported that there was a 4-11-fold increase in patients with readmission compared with patients without readmission (5,8,17). Similarly, we observed higher mortality in the readmission group

Table 1. Characteristics of the study participants

	Non-readmitted	Readmitted	p-value
Gender F/M, (n)	87/117	27/39	0.886
Age ¹	69 (17)	78.5 (11)	0.003
APACHE II ¹	20 (4)	28 (4)	<0.001
GCS ¹	11 (4)	9 (6)	<0.001
ICU admission disease n (%)			0.066
Respiratory diseases	91 (44.6)	21 (31.8)	
Sepsis	18 (8.8)	9 (13.6)	
Acute stroke	41 (20.1)	9 (13.6)	
Gastrointestinal diseases	14 (2)	5 (7.6)	
Renal diseases	9 (4.4)	6 (9.1)	
Trauma	24 (11.8)	9 (13.6)	
Postoperative	14 (6.9)	4 (6.1)	
Post-CPR	3 (1.5)	3 (4.5)	
Comorbidities n (%)			
Diabetes mellitus	51 (25)	21 (31.8)	0.337
Alzheimer's/dementia	48 (23.5)	23 (34.8)	0.078
Hypertension	84 (41.4)	33 (50)	0.253
Cardiological diseases	48 (23.5)	18 (27.3)	0.621
Hematologic diseases	3 (1.5)	3 (4.5)	0.158
COPD	33 (16.2)	6 (9.1)	0.226
Stroke	57 (27.9)	30 (45.5)	0.010

¹: Median (interquartile range), n: Count, F: Female, M: Male, ICU: Intensive care unit, GCS: Glasgow Coma Scale, APACHE II: Acute Physiology and Chronic Health Evaluation II, COPD: Chronic Obstructive Pulmonary Disease

Table 2. Factors associated with readmission

	Non-readmitted	Readmitted	p-value
Weekdays/weekend discharge, (n)	162/42	49/17	0.394
Working hours/nighttime discharge, (n)	183/21	55/11	0.189
Vasopressors (n, %)	20 (9.8)	32 (48.5)	<0.001
RRT (n, %)	12 (5.9)	18 (27.3)	<0.001
Blood transfusion (n, %)	11 (5.4)	8 (12.1)	0.063
Blood sugar imbalance	63 (30.9)	27 (40.9)	0.137
Additional disease (n, %)			<0.001
1	105 (51.5)	18 (27.3)	
2 or more	99 (48.5)	48 (72.7)	
Homevent (n, %)	27 (13.2)	30 (45.5)	<0.001
Entubation ² (n, %)	114 (55.9)	51 (77.3)	0.002
Length of hospital stay ¹	17 (19)	30 (21)	<0.001
Exitus (n, %)	44 (21.6)	31 (47)	<0.001

¹: Median (interquartile range), ²: Intubation history in the intensive care unit, n: Count, RRT: Renal replacement therapy

Table 3. Multivariable logistic regression analysis

	Beta	Wald	p	OR	OR 95% safety margin
Age	0.003	0.049	0.825	1.003	0.977-1.038
GKS	0.140	2.077	0.150	1.150	0.951-1.391
APACHE II	0.442	34.117	<0.001	1.556	1.341-1.804
Homevent	2.101	12.083	0.001	8.177	2.501-26.739
Stroke	1.251	6.608	0.010	3.492	1.346-9.061
Additional disease	0.876	3.397	0.065	2.401	0.946-6.093
Vp	2.083	16.911	<0.001	8.027	2.975-21.660
RRT	0.542	0.621	0.431	1.720	0.447-6.622
Entubation	-1.193	3.032	0.082	0.303	0.079-1.162

OR: Odds ratio, GKS: Glasgow Coma Scale, APACHE II: Acute Physiology and Chronic Health Evaluation II, Vp: Vasopressor, RRT: Renal replacement therapy

compared with the other group in our study. Additionally, our observed rate was higher than that reported in other literature, possibly due to the specific focus of our study on a distinct group. This underscores the importance of identifying patients at risk of readmission during ICU discharge. Identifying and mitigating these risks beforehand could limit readmissions, ensure maximum coordination among healthcare providers for the continuation of treatment, and enhance healthcare quality.

Our study revealed that patients requiring respiratory support systems were readmitted to the ICU more frequently. Similar studies have highlighted respiratory diseases and failure as significant risk factors for readmission (18,19). In contrast to other studies, we found that the use of home ventilator support and tracheostomy triggered more frequent readmissions. This suggests that patients with tracheostomy and home mechanical ventilator support carry additional risks compared with others and are more prone to acute complications.

Another finding of our study was that readmitted patients had longer hospital stays. This may significantly increase per-patient costs. Previous studies have also observed increased hospital costs in patients with ICU readmission (7,11,20,21). A more systematic approach to ICU discharges, inter-team coordination, and minimizing factors leading to readmission could limit the risk of readmission and better use hospital and economic resources.

In our study, more readmissions were observed in the group receiving vasopressors and having infectious diseases (pneumonia, sepsis, etc.) during hospitalization in the ICU. In a study conducted by Öngel Çayören et al. (19) in Turkey, a high Sequential Organ Failure Assessment score at any time during hospitalization was found to be a risk factor for readmission. Our results support this finding.

In our study, high APACHE II scores were identified as independent risk factors for high readmission risk. Several studies evaluating ICU readmission have similarly found high disease severity scores as an independent risk factor for readmission, consistent with our findings (7,11,20,22-24).

Study Limitations

Our study has some limitations. First, it was a single-center study. While it is challenging to estimate the impact of a larger multi-center cohort

on outcomes, we believe that similar results can be obtained. Second, our study was retrospective, and the third limitation is that PCUs and patient populations may differ across countries, which unfortunately our study overlooks.

Conclusion

In patients transferred to palliative care following an ICU stay and readmitted to the ICU within 72 h, factors such as high APACHE II scores during admission, discharge with home ventilator, use of vasopressors in the ICU, intubation during ICU stay, and presence of stroke were identified as independent risk factors for readmission. Additionally, the mortality rate and hospital stay were significantly higher in the readmission group than in the non-readmission group. Formun Üstü

Ethics Committee Approval: The study was approved by the University of Health Sciences Turkey, İzmir Bozyaka Training and Research Ethics Committee (approval number: 2023/182, date: 18.10.2023).

Informed Consent: Retrospective study.

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