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Causes of prolonged ICU stay: a retrospective study

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ABSTRACT

Aims: Patients with prolonged intensive care unit (ICU) stays constitute a significant portion of the patient population in ICUs. The aim of this study is to reveal the reasons for prolonged ICU stays and to describe the demographic and clinical characteristics of these patients.

Methods: In this single-center retrospective study, patients with an ICU stay exceeding 21 days were included. The parameters evaluated included age, sex, reason for ICU admission and length of stay, comorbidities, use of inotropic agents during ICU stay, requirement and duration of mechanical ventilation, renal replacement therapy (RRT), tracheostomy and PEG (percutaneous endoscopic gastrostomy) application, APACHE (Acute Physiology and Chronic Health Evaluation) II scores, and mortality rates. The patients were divided into two groups: those who died (group E) and those who survived (group S).

Results: In this study, respiratory failure was identified as the most frequent reason for ICU admission. Compared with survivors, non-survivors were older, had longer ICU stays, and exhibited higher APACHE II scores. Moreover, the requirements for inotropic support, invasive mechanical ventilation, and RRT during the ICU stay were significantly greater among non-survivors ($p<0.05$).

Conclusion: Identifying the causes of prolonged ICU stays may help in determining high-risk patient groups and contribute positively to their prognosis. In addition, it can support intensive care management by enabling more efficient utilization of healthcare resources.

Keywords: Intensive care unit, mortality, prolonged ICU stay

INTRODUCTION

The intensive care unit (ICU) is an essential component of the healthcare system, where patients with severe, life-threatening conditions requiring continuous life support are monitored by an experienced medical team.[1] Due to rapid population growth and recent advances in medical care, the demand for ICU beds is increasing faster than the available supply, leading to significant challenges in the optimal allocation of resources. Delays in ICU admission for patients requiring critical care have been shown to increase both mortality and morbidity. Therefore, effective triage during ICU admission has become increasingly important.[2]

It is estimated that approximately 2% to 11% of critically ill patients experience prolonged ICU stays, accounting for 25% to 45% of total ICU bed occupancy. In the literature, prolonged ICU stay has been defined as lasting 10, 21, or 30 days.[3-5] Several factors contribute to this condition, including age, comorbidities, presence of trauma, and the need for mechanical ventilation.[6,7] Moreover, prolonged ICU stays not only negatively impact patient prognosis but also increase healthcare system costs.[2,8]

Identifying the causes of prolonged ICU stays may help determine high-risk patient groups and contribute positively to their prognosis. Understanding the characteristics of patients who require extended ICU care is essential for optimizing resource utilization and improving outcomes. However, the demographic and clinical factors contributing to prolonged ICU hospitalization remain insufficiently defined.

The aim of this study was to identify the demographic and clinical characteristics of patients who remained in the ICU for more than 21 days and to elucidate the underlying reasons for their prolonged stay.

METHODS

This single-center retrospective study was conducted after obtaining approval from the Scientific Researches and Evaluation and Ethics Committee of Ankara Etlik City Hospital No. 2 (Date: 24.06.2025, Decision No: AEŞH-BADEK2-2025-284). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. The study included patients who had an ICU stay exceeding 21 days in the 16-bed adult ICU of our hospital between August 1, 2024, and May 1, 2025. This was a descriptive epidemiological study, and the study population comprised all patients who had ICU stays exceeding 21 days during the specified period. The aim was to include the entire eligible patient population.

All patients over 18 years of age with complete medical records were included in the study. Patients younger than 18 years, those with missing data in their medical records, and those who stayed in the ICU for less than 21 days were excluded.

Patient data were collected retrospectively from the hospital information system and ICU follow-up forms. The parameters evaluated included age, sex, reason for ICU admission and length of stay, comorbidities, use of inotropic agents during ICU stay, requirement and duration of mechanical ventilation, renal replacement therapy (RRT), tracheostomy and PEG (percutaneous endoscopic gastrostomy) application, APACHE (Acute Physiology and Chronic Health Evaluation) II scores, and mortality rates.

Additionally, patients were categorized into two groups based on mortality outcomes: survivors (group S) and non-survivors (group E). ICU admission diagnoses and other clinical characteristics were compared between the two groups.

RESULTS

During the study period, a total of 589 patients were admitted to the ICU. Among these, 41 patients who stayed for more than 21 days were included in the study. None of the eligible patients were excluded (Figure).

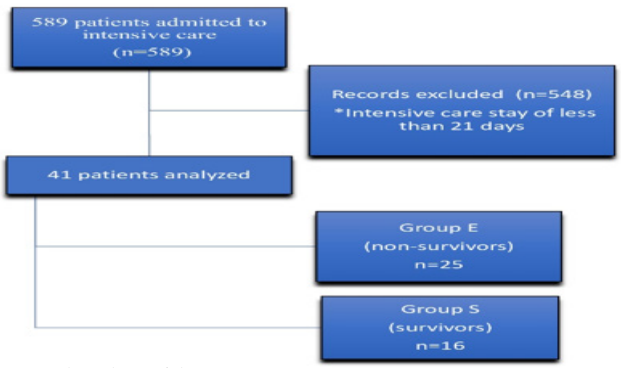

Figure. Flow chart of the patients

The demographic and clinical characteristics of the patients are presented in Table 1.

Table 1. Demographic and clinic characteristic

	All patients n=41	Group E n=25	Group S n=16	p
Age (year)	71.46±12.61	76.80±9.36	63.13±12.72	<0.001
Sex (n)				
Female	20 (48.7%)	12 (29.2%)	8 (19.5%)	0.901
Male	21 (51.2%)	13 (31.7%)	8 (19.5%)	
Length of stay in the ICU (day)	37.68±15.16	42.56±16.55	30.06±8.57	0.003
APACHE II score	20±6.76	23.52±5.97	14.50±3.44	<0.001
GCS	11.20±2.87	10.72±3.08	11.94±2.40	0.189
Mechanical ventilation				
+	34 (82.9%)	25 (60.9%)	9 (21.9%)	**<0.001**
-	7 (17.1%)	0 (0%)	7 (17.1%)	
Tracheotomy				
+	21 (51.2%)	12 (29.2%)	9 (21.9%)	0.606
-	20 (48.8%)	13 (31.7%)	7 (17.1%)	
Inotropic agent				
+	22 (53.7%)	18 (43.9%)	4 (9.7%)	**0.003**
-	19 (46.3%)	7 (17.1%)	12 (29.2%)	
RRT				
+	17 (41.5%)	15 (36.5%)	2 (4.8%)	**0.003**
-	24 (58.5%)	10 (24.3%)	14 (34.1%)	
Transfusion				
+	19 (46.3%)	9 (21.9%)	10 (24.3%)	0.097
-	22 (53.7%)	16 (39%)	6 (14.6%)	
PEG				
+	16 (39%)	7 (17.1%)	9 (21.9%)	0.07
-	25 (61%)	18 (43.9%)	7 (17.1%)	

APACHE II: Acute Physiology and Chronic Health Evaluation II, GCS: Glasgow Coma Scale, ICU: Intensive care unit, PEG: Percutaneous endoscopic gastrostomy, RRT: Renal replacement therapy. Values are presented as mean±standard deviation or number (percentage). p<0.05 was considered significant. Values in bold type were significant.

Regarding ICU admission diagnoses, the most common reason for admission was respiratory failure (n=15, 36.6%), followed by sepsis (n=6, 14.6%) and neurological pathologies (n=6, 14.6%) (Table 2).

Table 2. Indications for intensive care unit admission and patient comorbidities

	All patients n=41	Group E n=25	Group S n=16	p
Indications				
Respiratory failure	15 (36.6%)	10 (24.3%)	5 (12.2%)	
Cardiac pathologies	5 (12.2%)	4 (9.7%)	1 (2.4%)	
Sepsis	6 (14.6%)	4 (9.7%)	2 (4.8%)	
Acute renal failure	3 (7.3%)	1 (2.4%)	2 (4.8%)	
Neurological pathologies	6 (14.6%)	3 (7.3%)	3 (7.3%)	
Trauma	1 (2.4%)	0 (0%)	1 (2.4%)	
ROSC	1 (2.4%)	1 (2.4%)	0 (0%)	0.349
Intoxication	2 (4.8%)	2 (4.8%)	0 (0%)	
Gastrointestinal system bleeding	2 (4.8%)	0 (0%)	2 (4.8%)	
Comorbidity				
COPD	24 (58.5%)	13 (31.7%)	11 (26.8%)	0.288
CAD	23 (56.1%)	14 (24.1%)	9 (21.9%)	0.987
Diabetes mellitus	12 (29.3%)	6 (14.6%)	6 (14.6%)	0.354
Hypertension	14 (34.1%)	10 (24.4%)	4 (9.7%)	0.323
Renal disease	8 (19.5%)	6 (14.6%)	2 (4.8%)	0.365
Cerebrovascular disease	14 (34.1%)	7 (17%)	7 (17%)	0.300
Malignancy	13 (31.7%)	7 (17%)	6 (14.6%)	0.524

CAD: Coronary artery disease, COPD: Chronic obstructive pulmonary disease, ROSC: Return of spontaneous circulation. Values are presented as number (percentage). p<0.05 was considered significant.

A total of 34 patients (82.9%) required invasive mechanical ventilation, while tracheostomy was performed in 21 patients (51.2%) (Table 1).

The mean duration of mechanical ventilation was 30.79±19.01 days. The mean time to tracheostomy following intubation was 14.2±2.1 days.

At the time of ICU admission, 22 patients (53.7%) required inotropic support. During the ICU stay, a total of 19 patients (46.3%) received blood transfusions. RRT was required in 17 patients (41.5%); intermittent RRT was applied in 10 patients, while continuous RRT was used in 7 patients (Table 1).

Of the total cohort, 25 patients (61%) died during their ICU stay (group E), while 16 patients (39%) survived (group S).

The mean age of patients in group E was 76.8±9.36 years, compared to 63.13±12.72 years in group S ($p<0.001$). The total ICU length of stay was significantly longer in group E (42.56±16.55 days) compared to group S (30.06±8.57 days) ($p=0.003$) (Table 1).

Patients in group E had significantly higher APACHE II scores during ICU admission compared to group S. Moreover, the number of patients requiring inotropic support and those who underwent RRT during the ICU stay was higher in group E ($p<0.05$) (Table 1).

DISCUSSION

In this retrospective study of patients with prolonged ICU stays, we found that the most common reason for ICU admission was respiratory failure. Compared to survivors, non-survivors were older and had longer ICU stays as well as higher APACHE II scores. Furthermore, the need for inotropic support, invasive mechanical ventilation, and RRT during the ICU stay was significantly higher among non-survivors.

In a study investigating patients with ICU stays exceeding 21 days, 9.23% of all ICU admissions were classified as prolonged ICU stays.[8] Other studies have reported varying incidences of prolonged ICU stays, such as 4.7% and 8.57%.[4,9] In our study, consistent with the literature, 6.9% of all ICU admissions during the study period were prolonged ICU stays.

Respiratory failure is known to be one of the most common causes of prolonged ICU hospitalization.[10] In the literature, patients requiring prolonged invasive mechanical ventilation have been reported to have higher mortality rates and longer hospital stays.[11,12] Prolonged mechanical ventilation increases the risk of various pulmonary complications, such as ventilator-associated pneumonia and barotrauma. These complications, in turn, further extend the duration of mechanical ventilation and ICU stay.[13,14] Similarly, in this study, respiratory failure was the leading cause of prolonged ICU stay. A total of 34 patients (82.9%) required invasive mechanical ventilation, with a mean ventilation duration of 30.79 days. Among these, 21 patients (51.2%) underwent tracheostomy for continued airway management. Our findings are in line with the literature and suggest that prolonged mechanical ventilation contributes significantly to extended ICU stays.

Damuth et al.[15] reported a mortality rate of 62% among patients requiring invasive mechanical ventilation. In the literature, studies have reported varying mortality rates in patients with prolonged ICU stays, ranging from 4.7% to 51.2%.[9,16] In our study, the mortality rate was found to be 61%. We believe that these differences may be attributed to variations in ICU patient populations and sample sizes. Additionally, discrepancies among studies may arise from the absence of a standardized definition for prolonged ICU stay, which varies widely from 7 to 90 days.

Elderly patients, due to their existing comorbidities, constitute a substantial proportion of ICU admissions. Compared to younger populations, older patients have been reported to require ICU care more frequently and to have higher mortality rates.[17,18] However, some studies have suggested that age itself may not be an independent predictor of ICU mortality.[19,20] In the ICU, mortality is influenced by multiple factors associated with advanced age, such as the acute disease burden, comorbidities, frailty, and response to treatment. In our study, the mean age of patients with prolonged ICU stays was 70 years, and non-survivors were observed to be older than survivors.

APACHE II scoring system is one of the most commonly used tools for predicting mortality in the ICU. It has been utilized in the literature for mortality prediction across various disease groups.[21-23] Godinjak et al.[24] reported APACHE II scores above 27.5 as predictive values for mortality, while Oliveira et al.[6] identified APACHE II scores greater than 11 as a risk factor for prolonged ICU stay. In this study, consistent with the literature, non-survivors had higher APACHE II scores compared to survivors. Furthermore, APACHE II scores ranged from 10 to 33 in our patient cohort, with a mean score of 20. Based on our findings, we believe that higher APACHE II scores are valuable in predicting both prolonged ICU stays and mortality.

Different inotropic agents are used when hemodynamic stability cannot be achieved. In severe clinical conditions such as cardiogenic shock, sepsis, and multiple organ failure, vasopressor support is frequently required.[25] Similarly, severe acute kidney injury (AKI) is commonly associated with poor prognostic conditions, including multiple organ failure, sepsis, or significant hemodynamic instability, which often necessitates RRT.[26] In our study, the use of inotropic agents at ICU admission was more common among patients who did not survive. It is well known that patients with hemodynamic instability have worse prognoses. Additionally, the development of organ failure is expected to be more frequent in non-survivors compared to survivors. Therefore, the higher need for inotropic agents and the increased use of RRT observed in non-survivors is an anticipated outcome.

Limitations

This study has several limitations. First, due to its retrospective design, only a limited number of patients with prolonged ICU stays could be included. Moreover, as the study was conducted in a single center, the findings may reflect only a specific patient population. Therefore, multicenter studies

with larger sample sizes are needed to better identify the predictive factors associated with prolonged ICU stays.

CONCLUSION

In this study, respiratory failure was identified as the most common cause of prolonged ICU stay. Compared to survivors, non-survivors were older and had higher APACHE II scores. Furthermore, patients who required inotropic support and RRT during their ICU stay had higher mortality rates. Identifying the clinical characteristics and reasons for prolonged ICU stays may contribute to improving the prognosis of this patient group through closer monitoring and the implementation of appropriate treatment strategies. Additionally, early identification of high-risk patient groups and their timely referral to palliative care units could facilitate more efficient utilization of ICU beds.

ETHICAL DECLARATIONS

Ethics Committee Approval

This single-center retrospective study was conducted after obtaining approval from the Scientific Researches and Evaluation and Ethics Committee of Ankara Etlik City Hospital No. 2 (Date: 24.06.2025, Decision No: AEŞH-BADEK2-2025-284).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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