Determinants of Early Mortality for Critically Ill Patients awaiting Intensive care in Ethiopian Emergency Department at Tikur Anbessa Specialized Hospital and Zewditu Memorial Hospital, Addis Ababa, Ethiopia, 2025: A Prospective Observational Study

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Abstract

Background: Emergency department (ED) boarding delays before intensive care unit (ICU) admission are a major challenge in resource limited settings such as in Ethiopia. ICU capacity is severely constrained in developing countries. This can affect outcomes among critically ill patients.

Objective: To assess effect of delayed admission from ED to ICU. Their association with early clinical outcomes among critically ill adult patients at Tikur Anbessa Specialized Hospital (TASH) and Zewditu Memorial Hospital (ZMH) in Addis Ababa, Ethiopia.

Methods: A prospective observational cohort study was conducted from October 1 to November 15, 2025. 73 eligible adults (age >14) patients were enrolled, presenting to the EDs of TASH and ZMH with documented ICU admission decisions. Data on demographics, vital signs, TEWS scores, comorbidities, boarding times, and 7 day outcomes were collected using pretested data collection tool. Descriptive statistics, bivariable and multivariable logistic regression, Kaplan Meier survival analysis, and Cox proportional hazards regression were performed using SPSS version 26. A p value <0.05 was considered statistically significant.

Results: Among 73 critically ill patients, 57.5% experienced delayed ICU admission (≥6 hours), and the 7 day in hospital mortality rate was 42.5%. ICU admission delay was not significantly associated with mortality in bivariable, multivariable, or survival analyses. Patients who required vasopressor support or mechanical ventilation in the emergency department had higher mortality. This shows that greater illness severity at presentation has association with increased mortality. These factors remained independently associated with death after adjustment (AOR 9.55; 95% CI: 2.39–38.14 and AOR 4.68; 95% CI: 1.01–21.66, respectively). Kaplan Meier survival analysis and Cox proportional hazards regression showed no association between ICU admission delay and 7 day mortality.

Conclusion: ED boarding delays exceeding six hours are common among critically ill patients at major Ethiopian tertiary hospitals. Although there is no significant association with early mortality was observed, the high overall mortality indicates for system level interventions to improve timely access to critical care services.

Keywords: Critically ill patients, ICU admission delay, 7-day mortality, Ethiopia

Acronyms/Abbreviations

APACHE II	Acute Physiology and Chronic Health Evaluation II
EMCC	Emergency Medicine and Critical Care
EMR	Electronic Medical Record
ICU	Intensive Care Unit
MEWS	Modified Early Warning Score
NEWS	National Early Warning Score
PGY	Postgraduate Year
SBP	Systolic Blood Pressure
SOFA	Sequential Organ Failure Assessment
SPSS	Statistical Package for the Social Sciences
TASH	Tikur Anbessa Specialized Hospital
TEWS	Triage Early Warning Score
WHO	World Health Organization
ZMH	Zewditu Memorial Hospital

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1. Introduction

1.1 Background

Broadly, critical illness constitutes a state of illness involving vital organ dysfunction, a high risk of imminent death if care is not provided, and potential for reversibility with appropriate intervention. This condition manifests as acute impairment of one or more vital organ systems, such as the central nervous system, cardiovascular, or respiratory systems, resulting in a high risk of life-threatening deterioration. In clinical practice, such patients necessitate intensive monitoring, high-complexity decision-making, and organ support to prevent further decompensation (1).

The intensive care unit (ICU) plays a vital role in managing patients with life-threatening conditions requiring advanced organ support. Over the past decades advances in ventilatory support, hemodynamic monitoring, and renal replacement therapy have improved survival rates among critically ill patients (2). However, the demand for ICU care is still high. It continues to rise due to aging populations, increasing chronic disease burdens, and frequent infectious outbreaks (3).

Critically ill patients thus require prompt assessment and aggressive management to improve survival and reduce complications. The transition from the emergency department (ED) to the ICU is a vital step in the continuum of care. Delays in this process often associated with poorer clinical outcomes (4,5). Globally, prolonged waiting times before ICU admission have been linked to increased mortality, extended hospital stays, and increased resource utilization. This emphasize that the importance of timely transfer for the best outcomes (6–8).

High income countries typically maintain 10–25 ICU beds per 100,000 population. This is supported by favorable nurse to patient ratios and policy driven expansions to address rising demand. In contrast, low and middle income countries (LMICs), including Ethiopia, average just 0.3 ICU beds per 100,000 population, with Ethiopia's 51 public ICUs providing only 324 beds nationwide (9). These stark disparities can result in differing ED boarding time alongside short and long term outcomes.

Despite existing evidence, prospective studies in Ethiopia directly linking ED to ICU admission delays to specific patient outcomes remain scarce. Most of the research limited to retrospective audits or descriptive analyses. This study aimed to address that gap through a prospective observational design. It examines how prolonged boarding times in the ED influence early prognosis at Tikur Anbessa Specialized Hospital (TASH) and Zewditu Memorial Hospital (ZMH) in Addis Ababa, Ethiopia. Hoping it will outline the bottlenecks and guiding targeted interventions for better critical care pathway.

1.2 Statement of the Problem

Globally, shortage of ICU beds presents a challenge amid rising critical care demand and an aging population with multimorbidity (10). Sub-Saharan Africa faces a profound ICU bed shortage, averaging <2 beds per 100,000 population. These numbers are far below global benchmarks of 5–30 (11,12). This demand supply mismatch is even worsened by rising critical care needs from aging populations, chronic diseases, and infectious outbreaks (13).

Critically ill patients in resource limited settings such as Ethiopia experience delays in ED boarding before ICU admission. The median ED lengths of stay reaches 13.5 hours and 84.3% of cases exceeding recommended thresholds (14). These delays alongside factors such compromised health infrastructure and late presentations contribute to high ICU mortality rates in Ethiopia, which is 41.3% (15). When a patient has prolonged ED stays where overcrowding is a common scenario, worsen organ dysfunction, escalate mechanical ventilation requirements will increase overall hospital mortality (16,17).

Recent efforts to address these delays in Ethiopia include expanding public ICU capacity from 324 to 762 beds nationwide (0.6 beds per 100,000 population) and launching trauma centers. These relatively have reduced some ED stays relative to prior trends (11,18). Tertiary public hospitals like TASH have implemented cross sectional audits to identify bottlenecks. Such as bed shortages, alongside governmental and NGO initiatives for health facility upgrades (14,19). However, these measures remain fragmented, focusing primarily on infrastructure rather than systemic process improvements.

Despite audits, key gaps persist which is prospective studies quantifying how ED to ICU delays directly impact early outcomes at TASH and ZMH are yet to be done. Existing Ethiopian research relies predominantly on retrospective designs. This overlooks temporal associations and failing to evaluate interventions amid evolving demands from sepsis, trauma, and respiratory failure. This leaves policymakers without robust data to prioritize critical care pathways in LMICs and guide targeted interventions and reduce mortality in Ethiopia.

1.3 Significance of the Study

This prospective study holds significant value by generating locally relevant data quantifying ED to ICU delays impact on mortality at TASH and ZMH. These findings will empower clinicians with context specific evidence for refined triage and prioritization. It will also equips administrators to advocate ICU expansions, staffing, and diagnostics. By identifying key delays and their effects on early clinical outcomes, these findings aim to pinpoint bottlenecks. It will also guides targeted interventions for better critical care pathways in resource limited settings. From a systems perspective, the study aligns well with Ethiopia's Health Sector Transformation Plan II and WHO Emergency Care Systems Framework, supporting equitable access. Thus, this study aims to narrow evidence gap in prospective delay outcome research, informing policy and future interventions in resource limited critical care. Finally, the findings of this study could serve as an additional database for future research undertakings focusing on the subject matter.

2. Literature Review

2.1 Overview

The idea of **“**time-to-ICU” emphasizes that every hour a critically ill patient remains in the ED To understand how sick patients are, clinicians use severity scores like Acute Physiology and Chronic Health Evaluation II (APACHE II) and SOFA**,** which measure how badly organs are functioning when patients arrive. These scores help researchers adjust their analyses to make fair comparisons between patients. Additionally, early warning systems such as MEWS and NEWS assist healthcare workers in quickly spotting patients whose condition is getting worse (20).

2.2 Duration of delays and early clinical outcome

Studies from wealthy countries have consistently shown that longer stays in the ED before ICU admission lead to higher death rates and more resource use. For example, Chalfin and colleagues found that patients who stayed more than six hours in the ED had two times risk of dying in the hospital compared to those admitted sooner (4).

Another large study by Wunsch et al. which involves over 220,000 patients across multiple countries showed that for every extra hour a patient waited in the ED, their chances of surviving to discharge decreased by 0.5%. They also found that longer ED stays increased ICU length of stay by nearly half a day (3). Similarly, Cardoso et al. reported that delays longer than four hours raised the risk of death in the ICU by 34%, again after adjusting for severity scores (21). Santos et al. found that waiting more than six hours added over two days on ventilators and almost two extra ICU days, which also increased the risk of complications (5).

A retrospective study was carried out in the emergency department of a tertiary center in New Delhi, India, from March 2017 to November 2019. The study enrolled 3,429 patients, with a mean age of 62.7 years. Category 1 patients comprised 42.1% of the cohort. Among these, 49.6% had a LOS in the ED between 0 and 4 hours, while 19.4% stayed between 4 and 8 hours. The overall mortality rate was 52.5% (22).

In South Korea, a nationwide prospective cohort study (September 2019–December 2020) examined hospital-onset sepsis patients admitted to ICUs at 19 tertiary hospitals, including 470 with early admission and 286 with delayed admission. Early ICU admission did not significantly reduce in-hospital mortality in unmatched or propensity score-matched cohorts (8). Similarly, a retrospective cohort study in KwaZulu-Natal, South Africa (September 2014–August 2018), analyzed 2,040 consecutive adult ICU admissions from a regional hospital. Median pre-ICU hospital length of stay was 1 day (IQR 0–2 days), with ICU mortality at 16% (327/2,040); pre-ICU stay showed no association with mortality (23).

A retrospective chart review was done at Aga Khan University Hospital, Karachi, Pakistan. Of the 49,532 patients who attended the Emergency Department, 17,968 (36.3%) were admitted during the study period. Of them, 2356 (13%) were admitted to intensive care units, 1595 (67.7%) of this subset patients who were eligible for ICU admission were boarded at the ED for >6 hours before being transferred to ICU (24).

A retrospective observational cross-sectional study was conducted in Jordan, and it analyzed 1323 patients admitted to the Jordan University Hospital (JUH) ICU from 1 January 2022 to 31 December 2023. Patients' mean age was 65 ± 17 years, of whom 442 (34%) died during their ICU stay. A delay of ≥6 hours before ICU admission occurred in 77% of participants (25).

In countries with middle income levels, similar patterns appear. For instance, a study in Saudi Arabia b**y** Aletreby et al. found that patients waiting more than 24 hours in the ED had over twice the odds of dying compared to those transferred within six hours, even after adjusting for SOFA scores (26). Qualitative research in South Asia adds that delays are sometimes caused by poor communication between referral centers and delays in getting consent, even when ICU beds are available.

In sub saharan Africa, the situation is even more challenging. ICU resources are extremely limited with an average of only 0.5 ICU beds per 100,000 people. There are lack of ventilators and trained staff and mortality rates also remain high (27). One study noted that ICUs in Africa often have one nurse for every six patients. It also faces frequent equipment failures and subjective decisions on who gets admitted, which contributes to longer waits and inequity in care (2).

A study at Tikur Anbessa Specialized Hospital (TASH) by Teklie et al. (2021) found that over 84% of critically ill patients experienced ICU admission delays exceeding six hours. The median ED stay was 13.5 hours. The main reasons were a shortage of ICU beds (65.1%) and delays in imaging studies (15.1%). Their study analysis showed that being male and the lack of ICU beds were significantly linked to delays. This highlights urgent system problems and provides a basis for future research in this setting (14).

In another prospective cohort study by Sultan et al. (2018) at TASH and St. Paul's Hospital Millennium Medical College, researchers enrolled 291 patients who needed ICU care but stayed in the emergency centres for over six hours. They found the median stay was 48 hours, with a high mortality rate of 32%, and 30% were discharged directly from the emergency centre without being admitted. The main reasons for critical illness were neurological and cardiovascular diseases, including severe head trauma and sepsis. This situation puts a heavy burden on emergency centres, which sometimes provide ICU level care in hallways for several days, increasing the risk of bad outcomes (17).

Beyond crude mortality comparisons, several studies have employed time to event analytical approaches to evaluate the impact of ICU admission delays on patient survival. Survival analysis techniques, such as Kaplan Meier curves and Cox proportional hazards regression, allow for assessment of both the timing and risk of death while accounting for censoring and varying follow up durations. These methods are particularly valuable in emergency and critical care research, where early mortality may occur before ICU admission and follow up periods are short (21,23,26).

Using advanced analytical approaches, Cardoso et al. reported an increased hazard of death associated with delayed ICU transfer after adjusting for severity scores using multivariable models (21). Similarly, studies from other low and middle income settings have demonstrated worse outcomes among patients experiencing prolonged emergency department stays prior to ICU admission (23,24). However, other investigations have found no significant difference in survival between delayed and non delayed ICU admission groups after accounting for illness severity and early resuscitative interventions, particularly in resource limited settings (26). These mixed findings highlight the importance of contextual factors, early emergency department care, and analytical approach in interpreting delay outcome relationships.

Given the limitations of binary outcome analyses alone, the present study incorporates survival analysis to better characterize early clinical outcomes, particularly 7 day in hospital mortality. It also assess whether ICU admission delay independently influences time to death among critically ill patients in a resource constrained setting.

In summary, evidence from high income countries clearly shows that ED boarding times beyond four to six hours harm patient outcomes. Middle and low income countries show similar patterns but with added system challenges. In sub saharan Africa and specifically at TASH, long ED stays before ICU admission are common. Yet detailed patient level data accounting for illness severity are lacking. These findings underscore the importance of analytical approaches that account for both mortality and time to event outcomes when evaluating the impact of ICU admission delays. This study aims to fill that gap and provide evidence that can guide clinical practice, hospital management, and policy decisions to improve critical care in resource constrained environments.

2.3 Conceptual Framework

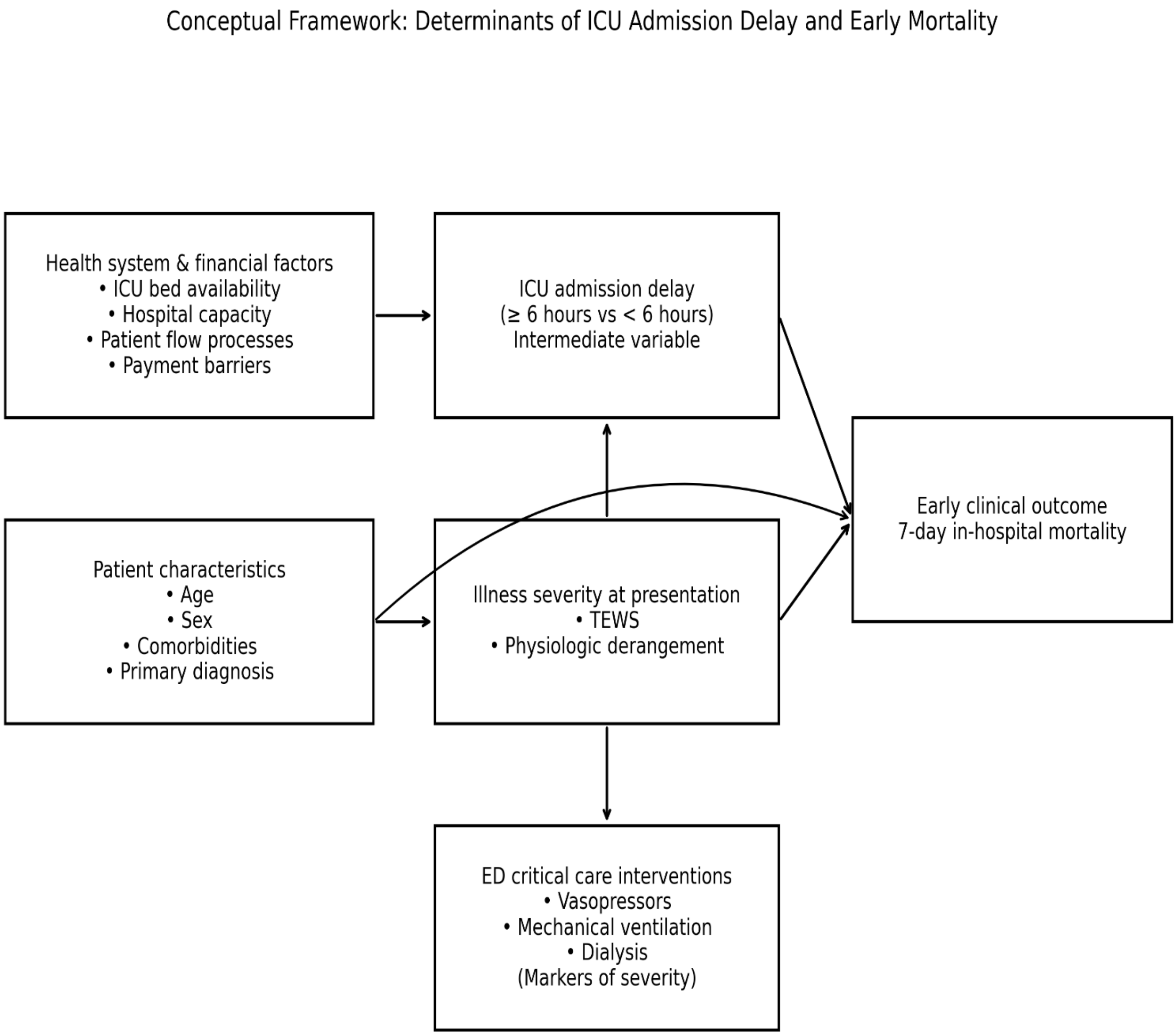


Figure 1. Potential factors associated with delays in emergency care for critically ill patients

3. Objectives

3.1 General Objective

- To assess delays in the emergency department before ICU admission and their effect on early clinical outcomes among critically ill patients at Tikur Anbessa Specialized Hospital (TASH) and Zewditu Memorial Hospital in Addis Ababa, Ethiopia, in 2025.

3.2 Specific Objectives

1. To measure the duration of delays experienced by critically ill patients in the emergency departments of the two tertiary hospitals before admission to ICU.
2. To evaluate early clinical outcomes, particularly 7 day in hospital mortality among critically ill patients presenting to the emergency departments.
3. To analyze the relationship between emergency department delays and early clinical outcomes in critically ill patients.

4. Methods

4.1 Study Area and Period

The study was conducted at TASH and ZMH, from October 1st, 2025 to November 15th, 2025. Both public hospitals are located in Addis Ababa, the capital city of the country. They are among the largest and oldest public hospitals in the country, each providing a high level of clinical care for nearly a million people in their catchment area and training for health science students.

Both study sites provide advanced emergency and critical care services. TASH is a university-affiliated tertiary care referral center. The adult emergency department of TASH manages about 18,000 patients per year, while that of ZMH served approximately 12,000. The adult ICU in TASH consisted of 30 beds (medical, surgical, cardiac and general ICU) dedicated for medical and surgical patients whereas at ZMH there are 10 ICU beds serving both adult and pediatric patients. Equipped with functional mechanical ventilators, the critical care services at each hospital were provided by specialized nurses, ECCM specialists and specializing residents, anesthesiologists, pulmonologists, internists, and neurosurgeons.

4.2 Study Design

A prospective observational cohort design was used.

4.3 Population

4.3.1 Source Population

All critically ill adult patients who were kept at the emergency department at TASH and ZMH who were deemed eligible for ICU admission by the treating physician constituted the study population.

4.3.2 Study Population

All critically ill adult patients from the source population who met the predefined inclusion and exclusion criteria during the study period (October 1 to November 15, 2025).

4.4 Inclusion and Exclusion Criteria

4.4.1 Inclusion Criteria

- Adult patients aged 14 years and older.

- Critically ill patients presenting to the emergency department at TASH or ZMH who were deemed eligible for ICU admission by the treating physician based on standard criteria such as respiratory failure, hemodynamic instability, or severe neurological compromise.
- Patients with a formal, documented decision by the treating team to admit to adult ICU.

4.4.2 Exclusion Criteria

- Patients admitted directly to ICU without emergency department presentation.
- Patients with incomplete medical records
- Patients with terminal illness or conditions unlikely to benefit from ICU care, such as imminent death or advanced directives limiting intervention

4.5 Sample Size and Sampling Technique

4.5.1 Sample Size Determination

The sample size for this study was calculated using the single population proportion formula, assuming 84.3% proportion delayed ICU admission to ICU at the study setting from a previous Ethiopian study (14). Mathematically, the calculation for parameters was as follows:

n = the required sample size

p = the proportion of delayed ICU admission =0.843

Zα\2 = the critical value at 95% confidence level = 1.96

d = precision (margin of error) = 5%

Accordingly,

$$n = \frac{z^2 p(1-p)}{d^2}$$

$$n^0 = \frac{(1.96)^2 * 0.843(1-0.843)}{0.05^2}$$

$$n^0 = \frac{(1.96)^2 * 0.843(0.157)}{0.05^2}$$

$$n^0 = 204$$

Since the total target population from the study sites is less than 10,000 (N=102), the calculated sample size was subjected to a finite population correction formula for adjustment:

$$n = \frac{n^0 N}{n^0 + (N - 1)}$$

$$n = \frac{204^* 102}{204 + (102 - 1)}$$

$$n = \frac{20808}{305} = 68$$

After accounting for a 10% contingency, the final sample size was adjusted to 76.

4.5.2 Sampling Technique

Consecutive sampling was applied, enrolling all consecutive eligible adult emergency department patients at the study sites for whom an ICU admission decision was made during the study period.

4.6 Data Collection Procedures

A structured, pretested checklist was used to collect socio-demographic information, initial clinical presentation, ICU triage and timing of admission, interventions during the wait for ICU transfer, and patient outcomes. Trained emergency and critical care nurses collected the data following standardized training sessions that minimized observer bias. Data were gathered prospectively through direct observation and review of electronic medical records (EMR), with key time points such as ICU request and admission recorded from ED logs, EMR, and ICU records; patients were followed at 24 hours, 48 hours, 72 hours till the 7^{th} day to assess their early clinical outcome after the treating team decided for ICU admission.

4.7 Study Variables

4.7.1 Dependent Variable

- 7- day in-hospital mortality

4.7.2 Independent Variables

- Patient characteristics

- Clinical diagnosis
- Interventions before ICU admission
- Delay in ICU admission (defined as boarding time >6 hours)

4.8 Operational Definitions

- **Delayed ICU Admission:** More than six hours between ICU request and actual transfer (14,28).
- **Early clinical outcome:** Vital status (alive or dead) at day 7 following emergency department arrival, irrespective of ICU admission status.
- **Critically Ill Patient***:* An individual with acute failure of one or more vital organs who requires intensive monitoring and support in an ICU setting (1).
- **Organ Support:** Medical treatments that sustain or replace failing organ function, including mechanical ventilation, vasopressors, renal replacement therapy, and others (29).
- **Event:** Death within seven days of ICU admission decision.
- **Censoring:** Patients alive at seven days were censored.
- **Time to event:** Time in hours from ICU admission decision to death or censoring.

4.9 Data Analysis Procedures

Data were entered using Microsoft Excel version 2016 and analyzed with SPSS version 26. Descriptive statistics, including means, medians, proportions and percentages, were calculated for demographics, delays, and outcomes as appropriate.

Bivariate analysis was performed to assess associations between ICU admission delay and 7-day in-hospital mortality. Multivariable logistic regression was used to identify independent predictors of 7- day in-hospital mortality.

Time-to-event analysis was conducted to evaluate the effect of ICU admission delay on survival. Kaplan–Meier survival curves were generated to compare delayed (≥6 hours) and non-delayed (<6 hours) ICU admission groups, and Cox proportional hazards regression was used to assess predictors of time to death.

A p value less than 0.05 was considered statistically significant.

4.10 Data Quality Management

A structured, pretested checklist was used. Data collectors, comprising trained emergency and critical care nurses has received training and daily supervision with cross checks. Double data entry was performed to minimize errors. Missing or unclear data were clarified with clinical staff when feasible.

4.11 Ethical Considerations

The study was conducted after ethical approval was obtained by department IRB approval.
The objective of the study has been briefed to the staff of the documentation department.
Documents and Information obtained at each course of study have been kept confidential.

4.12 Dissemination Plan

The findings of the study will be presented to the Department of Emergency Medicine & Critical Care/AAU. Then, copies of the research paper will be submitted to MOH and AAU College of Health Science Emergency Medicine & Critical Care Department. If possible, it will be published in journals as well

5. Results

5.1 Patient demographics

Among the 73 critically ill patients, the mean age was 43.75 years (SD 15.72), with most patients (68.5%) aged 50 years or younger. 52.1% were males, with a male to female ratio of 1.1:1. The majority resided in Addis Ababa (84.9%), while 15.1% came from outside the city. Regarding source of referral, 39.7% were self-referred, 34.2% were referred from health centers, 15.1% from public hospitals, and 11.0% from private hospitals. More than half of the patients (53.4%) paid out-of-pocket, 41.1% used health insurance, and 5.5% were exempted from payment (Table 1).

5.2 Vital signs and clinical characteristics of patients at arrival

Of the 73 critically ill patients, hemodynamic instability was common. 16.4% exhibits systolic blood pressure <90 mmHg. Tachycardia (>100 bpm) was observed in 54.8% and tachypnea (>20 breaths/min) in two-thirds (65.8%) of the patients, while 41.1% had hypoxemia (SpO_2 <90%) (Table 1).

TEWS scores indicated elevated acuity, with 32.9% classified as very urgent (5–6), 20.5% as emergency (≥7), and only 19.2% as low risk (0–2), despite most (84.9%) exhibiting normal consciousness (GCS 13–15). Comorbidities affected more than three-fourths (76.7%) of the patients, most commonly cardiac disorders (37.5%), diabetes mellitus (32.1%), and hypertension (21.4%) (Table 1).

Table 1. Demographic and clinical characteristics on emergency department arrival among critically ill patients eligible for ICU Admission at TASH and ZMH, October 1–November 15, 2025 (n=73)

Variable	Frequency	Percent (%)
Age category		
≤50 years	50	68.5
>50 years	23	31.5
Sex		
Male	38	52.1
Female	35	47.9
Residence		
Addis Ababa	62	84.9
Out of Addis Ababa	11	15.1
Source of referral		
Self-referred	29	39.7
Health center	25	34.2
Public health	11	15.1
Private hospital	8	11.0
Method of receiving care		
Health insurance	30	41.1
Out-of-pocket	39	53.4
Exempted	4	5.5
Systolic blood pressure (mmHg)		
<90	12	16.4
90–129	36	49.3
≥130	25	34.2
Pulse rate		
<60 beats per minute	1	1.4
60-100 beats per minute	32	43.8
>100 beats per minute	40	54.8
Respiratory rate		
12-20 breaths per minute	25	34.2
>20 breaths per minute	48	65.8
Oxygen saturation (%)		
<90	30	41.1
90–95	33	45.2
>95	10	13.7
GCS		
≤8	6	8.2
9–12	5	6.8
13–15	62	84.9
TEWS score		
Low risk (0–2)	14	19.2
Urgent (3–4)	20	27.4
Very urgent (5–6)	24	32.9
Emergency (≥7)	15	20.5
Comorbidity		
No	17	23.3
Yes	56	76.7
Type of comorbidity (n=56)		

Hypertension	12	21.4
Diabetes mellitus	18	32.1
Cardiac disorders	21	37.5
Malignancy	3	5.4
Autoimmune disorder	4	7.1
Chronic obstructive lung disease	4	7.1
Seizure disorder	1	1.8
Other	1	1.8

ICU: Intensive care unit, GCS: Glasgow Coma Scale, TASH: Tikur Anbessa Specialized Hospital, TEWS: Triage Early Warning Score, ZMH: Zewditu Memorial Hospital

5.3 Primary emergency diagnosis of patients for ICU admission

Among the emergency diagnosis, acute coronary syndrome predominated (26.0%), followed by acute respiratory failure (21.9%) and acute kidney injury (12.3%). Cardiovascular emergencies were most prevalent overall. Cardiogenic shock affecting 8.2%; septic shock and complicated relapsing fever also contributed significantly at 11.0% and 8.2%, respectively. Neurological conditions occurred in 23 (31.5%), including stroke (10.9%) and coma (8.2%), with greater representation in delayed admissions. Eight cardiovascular cases involved chronic rheumatic heart disease (CRHD) alongside frequent comorbidities driving multiorgan involvement (Table 2).

Table 2. Primary emergency diagnoses among critically ill patients eligible for ICU admission at TASH and ZMH Emergency Departments, October 1–November 15, 2025 (n=73)

Variable	Delay category		Total	Percent (%)
	<6 hours	≥6 hours	(Frequency)	
Neurological condition				
Traumatic brain injury	1	1	2	2.7
Raised intracranial pressure	0	2	2	2.7
Coma	1	5	6	8.2
Status epilepticus	2	2	4	5.5
Guillain-Barré syndrome	0	1	1	1.4
Stroke	2	6	8	10.9
Cardiovascular disorder*				
Cardiogenic shock	3	3	6	8.2
Acute coronary syndrome	13	6	19	26.0
Cardiogenic pulmonary edema	5	3	8	11.0
Hypertensive emergency	1	0	1	1.4
Life threatening dysrhythmia	5	2	7	9.6
Postcardiac arrest	2	0	2	2.7
Respiratory diagnosis				
ARDS	12	4	16	21.9
Type 2 respiratory failure	0	5	5	6.8
Pulmonary embolism	0	2	2	2.7
Renal pathology				
Acute kidney injury with uremic complication	3	6	9	12.3
Gastrointestinal pathologies				
Acute hepatic failure	0	1	1	1.4
Cirrhosis with complication	0	1	1	1.4
Endocrine disorders				
Severe diabetic ketoacidosis	1	4	5	6.8
Thyroid storm	1	0	1	1.4
Hematological disorder				
Severe coagulopathy	1	2	3	4.3
Infections				
Septic shock	3	5	8	11.0
Complicated malaria	1	0	1	1.4
Complicated relapsing fever	2	4	6	8.2
Toxicological diagnosis				
Drug intoxication	1	0	1	1.4
Others	1	4	5	6.8

*Eight patients had chronic rheumatic heart disease.
ICU: Intensive care unit, TASH: Tikur Anbessa Specialized Hospital, ZMH: Zewditu Memorial Hospital

5.4 Delay to ICU admission, management and related details

Majority (57.5%) of the studied patients experienced delayed ICU admission (≥6 hours), with median delay of 12.52 hours (IQR 3.09–27.92 hours), primarily due to lack of vacant beds (35.6%) and financial constraints (17.8%). Emergency department interventions included vasopressors (34.2%) and mechanical ventilation (26.0%). Most patients were admitted to cardiac ICU (32.9%) and Zewditu ICU (26%) with 5.5% not admitted (Table 3).

Table 3. Delay to ICU admission, management and related details of critically ill patients eligible for ICU admission at TASH and ZMH Emergency Departments, October 1–November 15, 2025 (n=73)

Characteristic	Frequency	Percent (%)
Delay category		
<6 hours	31	42.5
≥6 hours	42	57.5
Documented reasons for delay		
Lack of vacant beds	26	35.6
Financial constraints	13	17.8
Lack of mechanical ventilator	4	5.5
Undecided	1	1.4
Intervention given at the ED		
Mechanical ventilator	19	26.0
Vasopressor	25	34.2
Dialysis	5	6.8
Type of ICU admitted		
Not admitted	4	5.5
Medical ICU	17	23.3
Cardiac ICU	24	32.9
General ICU	9	12.3
Zewditu ICU	19	26

ICU: Intensive care unit, TASH: Tikur Anbessa Specialized Hospital, ZMH: Zewditu Memorial Hospital

5.5 Early clinical outcomes of the studied patients

The 7-day mortality rate among the study patients was 42.5% (95% CI: 31–54%) (Figure 2).

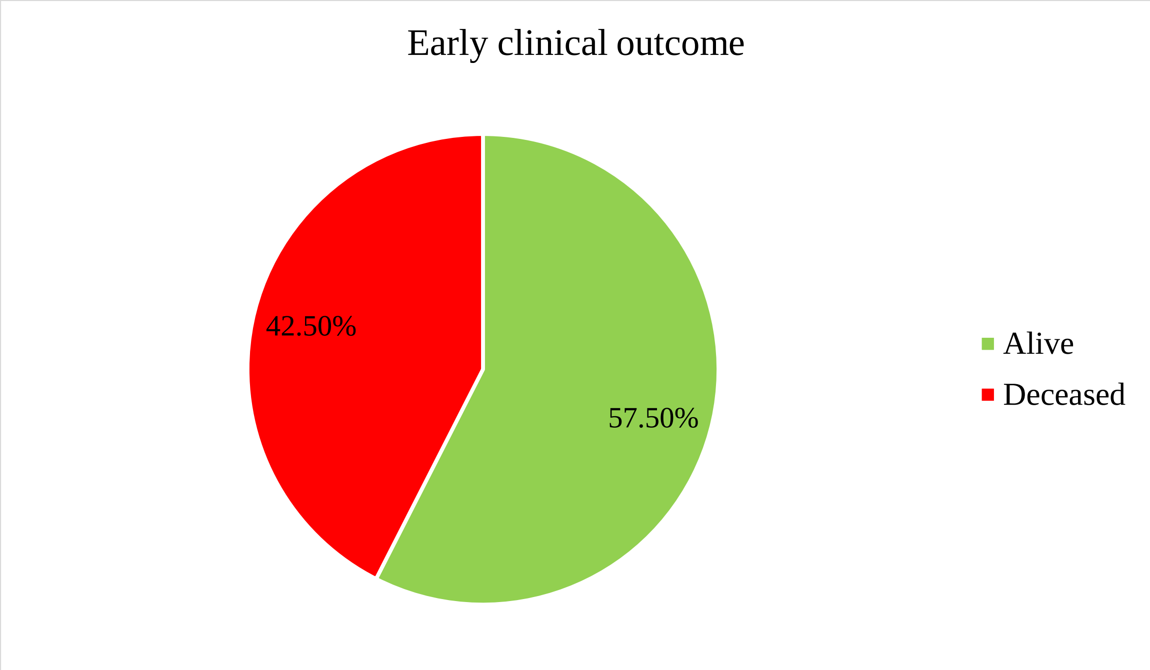


Figure 2. Early clinical outcome of critically ill patients eligible for ICU admission at TASH and ZMH Emergency Departments, October 1–November 15, 2025 (n=73)

5.6 Association of delay and early outcome

Among the 73 critically ill patients included in the analysis, 31 (42.5%) died within 7 days of ICU admission decision, while 42 (57.5%) survived. In the bivariable analysis, patients who required vasopressor support or mechanical ventilation in the emergency department had markedly higher mortality compared with those who did not. Delayed ICU admission, admission to a non-cardiac ICU, presence of comorbidity, and insurance-based payment showed higher crude odds of death, although not all reached statistical significance. Age, sex, TEWS score, and dialysis use were not significantly associated with mortality at the crude level.

After adjustment in the multivariable logistic regression model, vasopressor use and mechanical ventilation in the emergency department remained strong independent predictors of 7-day mortality. The presence of any comorbidity and non–out-of-pocket method of payment were also independently associated with increased odds of death. In contrast, age, sex, TEWS score, ICU admission delay, type of ICU admitted, and dialysis use were not independently associated with 7-day mortality after adjustment.

Table 4. Bivariable and multivariable logistic regression analysis of factors associated with 7-day in hospital mortality among critically ill adult patients admitted from the emergency department at Tikur Anbessa Specialized Hospital and Zewditu Memorial Hospital, Addis Ababa, Ethiopia, October 1 – November 15,2025(n=73)

Variable	Category	Dead n (%)	Alive n (%)	COR (95% CI)	p-value	AOR (95% CI)	p-value
Age (years)	Per 1-year increase	—	—	0.99 (0.96–1.02)	0.66	0.98 (0.93–1.03)	0.36
Sex	Male (Ref)	18 (47.4)	20 (52.6)	1	—	1	—
	Female	13 (37.1)	22 (62.9)	0.66 (0.26–1.67)	0.38	0.51 (0.11–2.41)	0.40
Method of paying	Out-of-pocket (Ref)	10 (33.3)	20 (66.7)	1	—	1	—
	Insurance / Exempted	21 (48.8)	22 (51.2)	1.91 (0.73–5.02)	0.19	4.52 (1.08–18.83)	**0.038**
Any comorbidity	No (Ref)	6 (35.3)	11 (64.7)	1	—	1	—
	Yes	25 (44.6)	31 (55.4)	1.48 (0.48–4.56)	0.50	8.28 (1.15–59.73)	**0.036**
TEWS score	Per 1-point increase	—	—	1.06 (0.80–1.40)	0.29	1.06 (0.80–1.40)	0.68
ICU admission delay	< 6 hours (Ref)	10 (32.3)	21 (67.7)	1	—	1	—
	≥ 6 hours	21 (50.0)	21 (50.0)	2.10 (0.80–5.52)	0.13	0.48 (0.11–2.22)	0.35
Type of ICU admitted	CICU (Ref)	7 (29.2)	17 (70.8)	1	—	1	—
	Non-CICU	24 (49.0)	25 (51.0)	2.33 (0.82–6.62)	0.11	2.60 (0.52–13.03)	0.24
Vasopressor use	No (Ref)	13 (27.1)	35 (72.9)	1	—	1	—
	Yes	18 (72.0)	7 (28.0)	6.92 (2.35–20.40)	<0.001	14.45 (2.97–70.37)	**<0.001**
Mechanical ventilation	No (Ref)	18 (33.3)	36 (66.7)	1	—	1	—
	Yes	13 (68.4)	6 (31.6)	4.33 (1.41–13.29)	0.010	7.57 (1.47–38.91)	**0.015**
Dialysis	No (Ref)	28 (41.2)	40 (58.8)	1	—	1	—
	Yes	3 (60.0)	2 (40.0)	2.14 (0.34–13.67)	0.42	7.25 (0.42–125.19)	0.17

Abbreviations: OR = odds ratio; CI = confidence interval; ED = emergency department; ICU = intensive care unit; TEWS = Triage Early Warning Score.

Bivariable analysis shows crude associations with 7-day in-hospital mortality, while multivariable analysis includes variables with $p < 0.25$ in bivariable analysis. 1: Reference category

Kaplan–Meier survival analysis demonstrated no statistically significant difference in 7-day survival between patients with delayed ICU admission (≥6 hours) and those admitted within 6 hours of ICU decision (log-rank test, $p = 0.50$). The estimated 7-day survival was 67.7% among non-delayed patients and 50.0% among delayed patients.

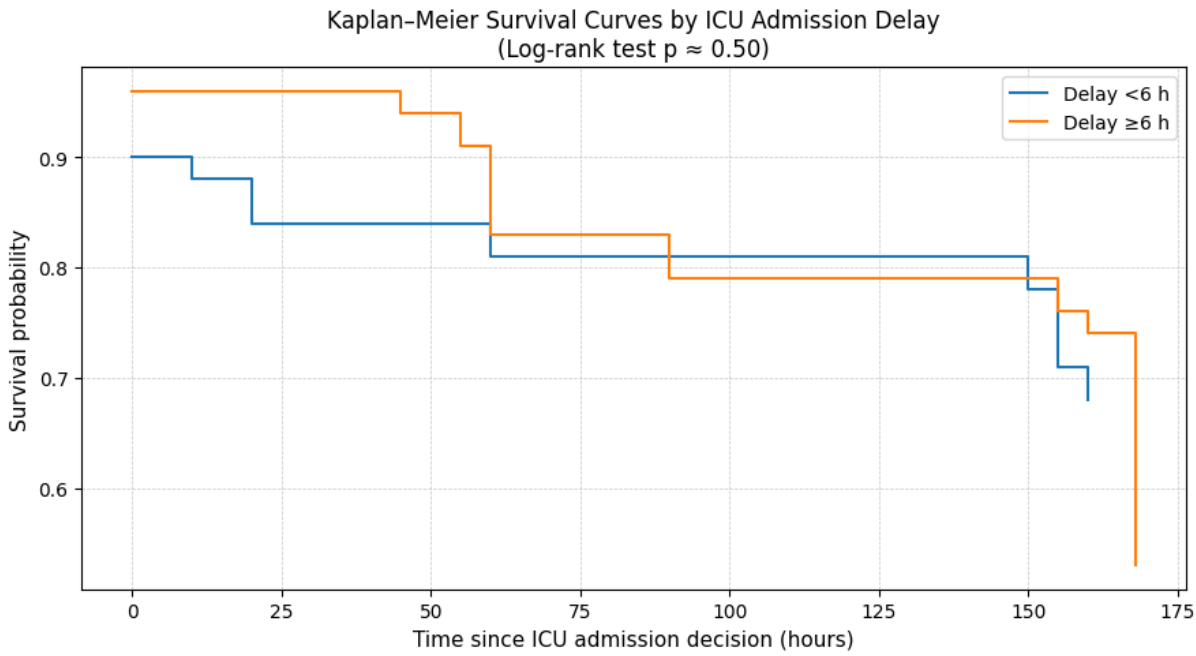
Table 5. Kaplan–Meier estimates of 7-day survival by ICU admission delay

ICU admission delay (factor)	Number of patients	Number of deaths	7-day survival (%)
< 6 hours (0)	31	10	67.7
≥ 6 hours (1)	42	21	50

Log-rank test p-value: 0.50

Survival time was calculated from ICU decision time to death. Patients alive at day 7 were censored.

Figure 3. Kaplan–Meier survival curves comparing delayed (≥6 hours) versus non-delayed (<6 hours) ICU admission



During the 7-day follow-up period, 31 of the 73 critically ill patients (42.5%) died. In the Cox proportional hazards analysis, emergency department interventions were the strongest predictors of early mortality. Patients who required vasopressor support had a markedly higher hazard of death compared with those who did not, both in the crude analysis and after adjustment for potential confounders. Similarly, the use of mechanical ventilation in the emergency department was independently associated with an increased hazard of 7-day mortality.

Other patient- and system-related factors, including age, sex, method of payment, comorbidity status, TEWS score at presentation, ICU admission delay, type of ICU admitted, and dialysis use, were not independently associated with 7-day mortality after adjustment. Overall, the Cox regression findings were consistent with the logistic regression results indicating the severity of illness and need for advanced life support interventions as the primary determinants of early mortality in this cohort.

Table 6. Cox proportional hazards regression analysis for predictors of 7-day in-hospital mortality among critically ill adult patients admitted from the emergency department at Tikur Anbessa Specialized Hospital and Zewditu Memorial Hospital, Addis Ababa, Ethiopia, October 1 – November 15,2025(n=73)

Variable	**Category**	**Dead n (%)**	**Alive n (%)**	**Crude HR (95% CI)**	**p-value**	**Adjusted HR (95% CI)**	**p-value**
Age (years)	Per 1-year increase	—	—	0.99 (0.97–1.02)	0.63	0.99 (0.97–1.02)	0.61
Sex	Male (Ref)	18 (47.4)	20 (52.6)	1	—	1	—
	Female	13 (37.1)	22 (62.9)	0.96 (0.40–2.33)	0.93	0.93 (0.39–2.24)	0.87
Method of paying	Out-of-pocket (Ref)	10 (33.3)	20 (66.7)	1	—	1	—
	Insurance / Exempted	21 (48.8)	22 (51.2)	1.78 (0.90–3.52)	0.10	1.61 (0.71–3.66)	0.25
Any comorbidity	No (Ref)	6 (35.3)	11 (64.7)	1	—	1	—
	Yes	25 (44.6)	31 (55.4)	1.29 (0.56–2.98)	0.55	1.29 (0.56–2.98)	0.55
TEWS score	Per 1-point increase	—	—	1.06 (0.92–1.28)	0.34	1.08 (0.92–1.28)	0.34
ICU admission delay	< 6 hours (Ref)	10 (32.3)	21 (67.7)	1	—	1	—
	≥ 6 hours	21 (50.0)	21 (50.0)	0.48 (0.17–1.36)	0.17	0.75 (0.32–1.76)	0.50
Type of ICU admitted	CICU (Ref)	7 (29.2)	17 (70.8)	1	—	—	—
	Non-CICU	24 (49.0)	25 (51.0)	1.61 (0.42–6.19)	0.51	—	—
Vasopressor use	No (Ref)	13 (27.1)	35 (72.9)	1	—	1	—
	Yes	18 (72.0)	7 (28.0)	6.92 (2.35–20.40)	<0.001	5.98 (2.01–17.82)	**0.001**
Mechanical ventilation	No (Ref)	18 (33.3)	36 (66.7)	1	—	1	—
	Yes	13 (68.4)	6 (31.6)	4.33 (1.41–13.29)	0.010	3.41 (1.18–9.88)	**0.024**
Dialysis	No (Ref)	28 (41.2)	40 (58.8)	1	—	—	—
	Yes	3 (60.0)	2 (40.0)	2.14 (0.34–13.67)	0.42	—	—

HR = hazard ratio; CI = confidence interval; ICU = intensive care unit; CICU = cardiac intensive care unit; TEWS = Triage Early Warning Score. Reference category indicated as (Ref).

Variables with $p < 0.25$ in bivariable analysis were entered into the multivariable Cox proportional hazards model.

6. Discussion

This prospective study evaluated emergency department delays prior to ICU admission and their association with 7-day mortality among 73 critically ill patients eligible for ICU care at tertiary public hospitals in Addis Ababa, Ethiopia, analyzed as a single cohort. Pertinent findings include delayed admission (≥6 hours) in 57.5% of patients and overall, 7-day mortality of 42.5%. No significant association was observed between ICU admission delay and mortality.

In this study, delayed admission (≥6 hours) occurred in 57.5% of the patients. This was comparable to the same study done in Pakistan in which 67.7% of patients stayed in the ED for more than 6 hours before transferred to the ICU (24). This rate represents improvement over prior Ethiopian and Jordanian observations, where 84.3% and 77% of patients prolonged ED stays (14,25). Conversely, the present finding is considerably higher than what was observed in India, where 48.15% of patients achieved transfers within 4 hours (22).

In general, the prolonged boarding time of critically ill patients in this study is concerning as multiple studies demonstrate associations between extended stays and increased in-hospital mortality risk and underscore the need to reduce boarding time to less than six hours (4,14,30). The primary contributors to the prolonged boarding periods and congestion in low-resource contexts can include lack of vacant ICU beds and financial constraints, alongside laboratory/radiology backlogs and specialist consultation delays, issues less prevalent in well-resourced settings with higher ICU bed ratios and streamlined triage (14,16,31). In particular, lack of vacant beds (35.6%) and financial constraints (17.8%) were the leading reasons for delay among the studied cohorts.

In low-resource settings with limited ICU capacity, such as the present study setting, aggressive resuscitation usually occurs in emergency corners despite delays in intra-hospital transfer, in an attempt to address bottlenecks through available means. While not optimal, severely critical patients receive stabilization in the emergency department's high-acuity area pending ICU admission. This setup provides improved clinician-to-patient ratios and advanced monitoring, supporting major ICU interventions such as mechanical ventilation, dialysis, and vasopressor therapy.

The overall 7-day mortality among the studied critically ill patients was 42.5% (n=31), with 20 deaths in the ICU and 11 in the ED. Central Ethiopia and Jordan has also showed similar mortality rates with this study, 34% to 46% (25,32,33). In contrast, the mortality rate is high when it is compared to the overall mortality rate of the ICU admitted patients documented in Northwest Ethiopia (29.6%) and Finland (24%), respectively (16,25).

There are a lot of factors contributing for the discrepancies among the studies. Such as sample size, endpoint timing, and patient clinical acuity. Particularly this study included small sample (n=73) compared to the Finnish study, which analyzed thousands of patients. The 7 day endpoint shows early decompensation during ED boarding. But other comparator studies uses 28 or 30 day ICU/hospital mortality metrics that include post admission stabilization periods. Inclusion of non admitted patients (5.5%) increases short term rates versus ICU exclusive cohorts in Northwest Ethiopia (29.6%). In Finland's advanced infrastructure enables timely transfers and effective resuscitation (24%) (16,34). Thus comparing the studies directly as it is may need caution due to methodological differences.

In this study, ICU admission delay beyond six hours was not associated with increased mortality, and this finding remained consistent across different analytical approaches. When survival was examined using Kaplan–Meier analysis, the survival curves for delayed and non-delayed ICU admission groups largely overlapped, with no statistically significant difference observed during the 7-day follow-up period. This was further supported by Cox proportional hazards regression, which showed that delayed ICU admission did not increase the hazard of death after adjusting for relevant clinical factors. The agreement between logistic regression and survival analysis strengthens confidence in these findings and suggests that ICU admission delay alone did not independently influence early mortality in this cohort.

The survival findings of the present study are in line with several reports from resource-limited settings, where no significant difference in survival was observed between delayed and non-delayed ICU admissions after accounting for illness severity and early resuscitative care (21,23,26). These studies, similar to ours, highlight the potential role of timely and appropriate critical care delivered in the emergency department in reducing the adverse impact of delayed ICU transfer. In contrast, studies from some high-income settings have reported worse survival with prolonged ICU admission delays, particularly when delays were longer or when advanced critical care interventions were not readily available outside the ICU (24). Differences in healthcare infrastructure, patient populations, definitions of delay, and follow-up duration may explain these contrasting results. Importantly, survival analysis allowed assessment of the timing of death and censoring, providing insight into early mortality patterns that could not be captured by binary outcome analysis alone.

In contrast to several reports (4,22,24), this study found no significant association between prolonged pre ICU hospital LOS and patient outcomes. This finding is supported by certain reports done in South Africa and South Korea (8,23). This finding may partly reflect early initiation of advanced care in the ED, including mechanical ventilation, dialysis, and vasopressors, that mitigates some delay effects. In addition this emphasizes the complexity of factors influencing mortality beyond admission timing alone. This supports the need to interpret delay mortality relationships within broader clinical contexts.

The fact that this study has relatively small sample size limiting the statistical power to detect subtle effect can justify the result. Along with this , differences in study endpoints should be considered. This study measured mortality at 7 days post boarding, showing early outcomes possibly influenced by multiple confounders including illness severity and initial resuscitation quality. In contrast, many prior studies demonstrating significant associations have used longer follow up periods, such as 28 or 30 day mortality. Using longer end points allows more comprehensive capture of mortality related to delayed care (16,33,34). In addition variations in baseline patient acuity, triage protocols, and resource availability may modify the impact of delay on mortality outcomes.

In this study we can observe that there is strong association between markers of acute illness severity and mortality. The need for vasopressor support and mechanical ventilation was consistently associated with poorer outcomes in both logistic regression and survival analyses,. This indicates that patients with advanced physiological derangement at presentation were at higher risk of early death. Similar findings have been reported in Ethiopian and other low- and middle-income country studies, where the requirement for mechanical ventilation and vasoactive support has been identified as a key predictor of ICU mortality (32,33). These markers reflect underlying cardiovascular and respiratory failure and are well-established indicators of severe critical illness and organ dysfunction (20).

This pattern suggests that early mortality among critically ill patients is driven primarily by the severity of illness rather than ICU admission delay alone. In settings where advanced supportive care can be initiated in the emergency department, the adverse impact of delayed physical transfer to the ICU may be mitigated. Consequently, these findings underscore the importance of early recognition and aggressive stabilization of critically ill patients in the emergency department, particularly in resource-limited settings with constrained ICU capacity (4,22).

Overall, these findings suggest that in resource-limited settings, early illness severity and the quality of emergency department based critical care may play a more decisive role in early mortality than ICU admission delay alone.

7. Strengths and Limitations

7.1 Strengths

- The prospective design employed by the study enabled real-time data capture on ED boarding times, interventions, and early outcomes.
- The study employed a multicenter design across two tertiary hospitals, which is believed to enhance its generalizability to similar tertiary care settings in urban Ethiopia.

7.2 Limitations

- The small sample size of 73 patients, derived from consecutive sampling, limits statistical power to detect associations, such as between delays and mortality.
- Findings may not generalize to rural Ethiopian hospital with varying ICU capacities and patient demographics.
- Reliance on short term 7 day outcomes excludes long term mortality or post discharge events

8. Conclusions and Recommendations

8.1 Conclusions

To conclude, in TASH and ZMH delays more than 6hours prior to ICU admission is common. This is mainly due to lack of ICU bed availability and financial constraints. During these delays, many patients received advanced life support care in the emergency department.

The 7 day in hospital mortality was high (42.5%). However ICU admission delay was not associated with 7 day in hospital mortality. Instead, patients who required vasopressors or mechanical ventilation in the emergency department which indicates more severe illness at presentation had a higher risk of death. Overall, early outcomes appeared to be driven more by illness severity than by the length of time spent waiting for ICU admission.

8.2 Recommendations

For Healthcare Professionals

- Maintain and strengthen the provision of ICU-level care in the emergency department for critically ill patients awaiting ICU admission, as prolonged boarding was common and many patients required advanced support during this period.
- Focus on early recognition and aggressive management of patients with severe physiological derangement in the emergency department, given the strong association between the need for vasopressors or mechanical ventilation and mortality.
- Encourage early multidisciplinary involvement for critically ill patients to support timely stabilization and decision-making while ICU admission is pending.

For Hospital and Health System Administrators

- Prioritize strategies to improve ICU bed availability at tertiary hospitals, as bed shortages were the most frequently documented reason for delayed ICU admission.
- Strengthen hospital-level patient flow and ICU bed allocation processes to reduce prolonged emergency department boarding of critically ill patients.
- Address financial barriers that delay ICU transfer by improving access to existing exemption mechanisms and insurance coverage during emergency care.

For Future Researchers

- Conduct larger multicenter prospective studies to improve statistical power for detecting associations between ICU admission delay and mortality in similar resource-limited settings.
- Include longer follow-up periods, such as 28- or 30-day mortality, to better assess outcomes beyond the early phase of critical illness.

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Annex: Data collection tool

SECTION 1: PATIENT IDENTIFICATION AND DEMOGRAPHICS

1. Patient MRN: ______________________
2. Study ID: ______________________
3. Hospital Site: ☐ TASH ☐ ZMH
4. ED Arrival Date & Time: ______________
5. Age: _____ years
6. Sex: ☐ Male ☐ Female
7. Residence: ☐ Urban ☐ Rural
8. Referral Source: ☐ Self ☐ Health Center ☐ Government Hospital ☐ Private Hospital
9. Method of Receiving Service: ☐ Health Insurance ☐ Out of Pocket ☐ Social Work ☐ Exempted

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SECTION 2: VITAL SIGNS AT ED ARRIVAL

10. Heart Rate (HR): _______
11. Respiratory Rate (RR): _______
12. Systolic BP (SBP): _______
13. Oxygen Saturation (SpO_2): _______
14. Temperature (Temp): _______
15. Glasgow Coma Scale (GCS): _______
16. TEWS: _______

SECTION 3: COMORBIDITIES

17. Tick all that apply:
    ☐ Hypertension ☐ Diabetes Mellitus ☐ Chronic Kidney Disease ☐ HIV ☐ Cancer ☐ Vascular Disease ☐ Autoimmune Disorder ☐ COPD ☐ CVA ☐ Epilepsy ☐ Others (specify): __________ ☐ None

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SECTION 4: PRESENTING DIAGNOSIS / REASON FOR ICU ADMISSION

18. CNS: ☐ TBI ☐ Raised ICP ☐ Coma ☐ Status Epilepticus ☐ Guillain-Barré ☐ Stroke (Hemorrhagic) ☐ Stroke (Ischemic)
19. Cardiovascular: ☐ Cardiogenic Shock ☐ Acute Coronary Syndrome ☐ ADHF ☐ Hypertensive Emergencies ☐ Life-threatening Dysrhythmias ☐ Post-cardiac arrest
20. Respiratory: ☐ ARDS ☐ Type 2 RF ☐ Acute Pulmonary Embolism
21. Renal: ☐ AKI with complications
22. Gastrointestinal: ☐ Acute Hepatic Failure ☐ Cirrhosis with complications
23. Endocrine: ☐ Severe DKA ☐ Thyroid Storm
24. Surgical: ☐ Polytrauma ☐ Acute Abdomen with Shock
25. Hematological: ☐ DIC ☐ Severe coagulopathy/bleeding diathesis
26. Infectious: ☐ Sepsis with Septic Shock ☐ Complicated Malaria ☐ Complicated Relapsing Fever
27. Toxicology: ☐ Specify: __________
28. Others: ☐ Specify: __________

SECTION 5: ICU DECISION AND DELAY

29. ICU Decision Date & Time: ______________
30. ICU Arrival Date & Time: ______________
31. Delay in hours: _______
32. Delay in days: _______
33. Delay Category: ☐ ≤6 hours ☐ >6 hours
34. Reasons for Delay (tick all that apply):
    ☐ ICU Bed unavailable ☐ Bed available but no machine ☐ Financial constraint ☐ Type of ICU not yet determined ☐ Deferred by ICU team ☐ Others: __________

SECTION 6: INTERVENTIONS PROVIDED IN ED

35. Tick all that apply: ☐ Mechanical Ventilation ☐ Vasopressors ☐ Dialysis

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SECTION 7: PATIENT DISPOSITION AFTER ICU DECISION

36. Patient disposition: ☐ Admitted to ICU ☐ Died before ICU admission ☐ Improved and transferred to ward ☐ Left AMA ☐ Still in ED awaiting ICU ☐ Transferred to other hospital
37. Which ICU admitted (if admitted): ☐ MICU ☐ CICU ☐ GICU ☐ SICU ☐ Zewditu ICU
38. Death date (if died): ______________
39. Discharge date (if discharged): ______________
40. ICU LOS: ______________
41. Total Hospital LOS: ______________

SECTION 8: FOLLOW-UP AFTER ICU ADMISSION

8.1 Follow-up at 24h

42. Organ support ongoing: ☐ Ventilation ☐ Vasopressors ☐ Dialysis
43. Patient disposition: ☐ Still in ICU ☐ Died in ICU ☐ Transferred to ward ☐ Discharged ☐ Still in ED ☐ Died in ED

8.2 Follow-up at 48h

44. Organ support ongoing: ☐ Ventilation ☐ Vasopressors ☐ Dialysis
45. Patient disposition: ☐ Still in ICU ☐ Died in ICU ☐ Transferred to ward ☐ Discharged ☐ Still in ED ☐ Died in ED

8.3 Follow-up at 72h

46. Organ support ongoing: ☐ Ventilation ☐ Vasopressors ☐ Dialysis ☐ Others: __________
47. Patient disposition: ☐ Still in ICU ☐ Died in ICU ☐ Transferred to ward ☐ Discharged ☐ Still in ED ☐ Died in ED

8.4 Follow-up at 7 days

48. Organ support ongoing: ☐ Ventilation ☐ Vasopressors ☐ Dialysis ☐ Others: __________
49. Patient disposition: ☐ Still in ICU ☐ Died in ICU ☐ Transferred to ward ☐ Discharged ☐ Still in ED ☐ Died in ED

SECTION 9: OUTCOMES

50. ED LOS: _______ (hours/days)
51. ICU LOS: _______ (days)
52. Total Hospital Stay: _______ (days)
53. Final Outcome: ☐ Alive ☐ Dead