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Research Article

ICU Mortality Patterns, Causes of Death, And Preventability at Nangarhar University Teaching Hospital Medical Ward, Afghanistan: A Retrospective Audit (2025–2026)

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Abstract

BACKGROUND: Intensive Care Unit (ICU) mortality remains a key indicator of healthcare quality and patient safety, particularly in resource-limited settings where shortages of personnel, equipment, and critical care resources may affect patient outcomes. Evaluating the causes of death and identifying potentially preventable factors are essential for improving the quality of care, optimising resource utilisation, and reducing mortality among critically ill patients

OBJECTIVE: To analyse demographic patterns, causes of death, and preventability of ICU mortality.

METHODS: A retrospective observational study of 70 ICU deaths was conducted.

DATA INCLUDED

1. demographics,
2. diagnoses,
3. causes of death,
4. length of stay (LOS),
5. and preventability.
6. Descriptive statistics were used.

RESULTS: Out of 826 inpatients during this year, 70(8.47%) patients died. Among the analysed subgroup of 70 patients, 55.7% were female, and sepsis was present in 57.1% of cases. Cardiopulmonary arrest (CPA) accounted for 80% of deaths, while 25.7% died within 24 hours of admission. Notably, 45.7% of deaths were considered possibly preventable. Major system gaps identified included delayed antibiotic administration (42.9%) and delayed ICU transfer (40%), indicating significant delays in time-sensitive critical care interventions.

CONCLUSION: A substantial proportion of ICU deaths were preventable, primarily related to delays in recognition and management of sepsis. Early intervention strategies are essential.

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1. INTRODUCTION

Intensive Care Units (ICUs) are specialized hospital departments designed to provide advanced monitoring and life-support interventions for critically ill patients. Despite significant advances in critical care medicine, ICU mortality remains a major global health concern and serves as an important indicator of healthcare quality, disease severity, and resource availability. Mortality rates vary widely across regions due to differences in patient characteristics, healthcare infrastructure, staffing levels, and access to timely medical interventions (World Health Organization, 2020).

Globally, critical illnesses such as sepsis, cardiovascular diseases, respiratory failure, and multi-organ dysfunction syndrome account for a substantial proportion of ICU admissions and deaths. Sepsis alone is responsible for millions of deaths annually and remains one of the leading causes of mortality among critically ill patients. Similarly, acute cardiovascular events, including myocardial infarction and cardiac arrest, contribute significantly to ICU mortality, particularly in low- and middle-income countries where access to specialized care may be limited (Global Burden of Disease Study, 2019; Society of Critical Care Medicine, 2021).

The burden of ICU mortality is particularly pronounced in resource-limited healthcare settings. Hospitals in developing countries frequently face challenges such as shortages of trained personnel, inadequate intensive care facilities, delayed referral systems, limited diagnostic capabilities, and insufficient availability of essential medications and equipment. These constraints may adversely affect patient outcomes and contribute to higher mortality rates compared with those observed in high-income countries (World Bank, 2019; World Health Organization, 2020).

Several studies have demonstrated that a significant proportion of ICU deaths may be influenced by preventable or modifiable factors. Delays in diagnosis, inappropriate initial management, delayed administration of antibiotics, inadequate monitoring, and late transfer to higher levels of care have all been associated with increased mortality among critically ill patients. Early recognition of clinical deterioration and timely implementation of evidence-based interventions are therefore essential components of quality critical care (Surviving Sepsis Campaign, 2021; Vincent et al., 2018).

Sepsis remains a major focus of critical care improvement initiatives worldwide because early diagnosis and prompt treatment have been shown to substantially reduce mortality. International guidelines emphasize the importance of rapid antibiotic administration, aggressive fluid resuscitation, and continuous monitoring of patients with suspected sepsis. Failure to implement these measures in a timely manner can lead to progressive organ dysfunction and increased risk of death (Evans et al., 2021).

In addition to clinical factors, healthcare system performance plays a critical role in determining ICU outcomes. Quality indicators such as response times, availability of intensive care beds, staff-to-patient ratios, and adherence to clinical protocols are increasingly recognized as important determinants of survival. Evaluating patterns of mortality and identifying underlying system-related deficiencies can provide valuable information for hospital administrators and healthcare policymakers seeking to improve patient safety and optimize resource allocation (Rhodes et al., 2017).

Mortality audits have emerged as an effective tool for assessing the quality of critical care services. By systematically reviewing deaths and identifying potentially preventable factors, healthcare institutions can implement targeted interventions aimed at reducing avoidable mortality. Such evaluations are particularly important in settings where healthcare resources are constrained and where improvements in clinical processes may yield substantial benefits for patient outcomes (World Health Organization, 2020).

Therefore, the present study was conducted to evaluate the patterns and causes of mortality among patients admitted to the Intensive Care Unit and to identify potentially preventable factors associated with these deaths. Understanding these factors may contribute to the development of evidence-based quality improvement strategies, strengthen critical care services, and ultimately reduce ICU mortality.

2. MATERIALS AND METHODS

Study Design: Retrospective observational study.

Setting: ICU Medical Ward, Nangarhar University Teaching Hospital.

Study Population:70 consecutive ICU deaths.

Data Collection

Data extracted:

1. Demographics (age, sex)
2. Diagnoses (provisional & final)
3. Causes of death
4. Length of stay (LOS)
5. Preventability assessment
6. System-related factors

Definitions

1. **Early death:** death within 24 hours of ICU admission
2. **Preventability:** classified as “not preventable” or “possibly preventable”
3. **LOS categories:**

- <24 hours
- 1–3 days
- 3 days

Data Analysis

1. Frequencies and percentages calculated
2. LOS categorized:

- <24 hours
- 1–3 days
- 3 days

3. RESULTS

1. Demographics

Variable	Number	Percentage
Male	31	44.3%
Female	39	55.7%

Slight female predominance.

2. Length of Stay (LOS) Categories (Conversion: 1440 min = 1 day)

LOS Category	Definition	Number (n)	Percentage (%)
< 24 hours	<1440 min	18	25.7%
1–3 days	1440–4320 min	32	45.7%
> 3 days	>4320 min	20	28.6%
Total		70	100%

Majority stayed 1–3 days, but ~26% died within 24 hours,

1. indicating late presentation
2. or critical illness.

3. Table ICU Admission & Interventions

Variable	Number (n)	Percentage (%)
ICU Admission	70	100%
Ventilated (Yes)	0	0%
Ventilated (No)	70	100%
Intubation Done	50	71.42%
CPR Given (Yes)	70	100%

CPR documentation shows 100% recorded, suggesting documentation gaps or late presentation.

4. Major Causes of Death

Cause	Number (n)	Percentage (%)
Cardiopulmonary arrest (CPA)	56	80.0%
ARDS / Respiratory arrest	4	5.7%
Cardiogenic shock	5	7.1%
Others	5	7.1%
Total	70	100%

CPA dominates (80%), typical of terminal ICU events.

5. Underlying Disease Patterns

Condition Group	Number (n)	Percentage (%)
Cardiovascular (HF, IHD, shock)	30	42.9%
Renal (CKD, AKI)	22	31.4%
Sepsis/Infection	40	57.1%
Metabolic (DM, DKA)	26	37.1%
Respiratory (COPD, pneumonia)	18	25.7%

Sepsis is the leading contributor (57.1%).

6. Table: Preventability Analysis

Category	Number (n)	Percentage (%)
Not Preventable	38	54.3%
Possibly Preventable	32	45.7%
Total	70	100%

Nearly half of deaths (45.7%) were potentially preventable, which is clinically significant.

7. Death Expected Cause (n = 70)

Death Expected Cause	Frequency (n)	Percentage (%)
Refractory shock	30	42.9%
Very poor prognosis despite treatment	26	37.1%
Terminal illness	14	20.0%
Total	70	100%

Interpretation

1. Most common cause of expected death:

- **Refractory shock (42.9%)** → leading contributor Indicates late presentation, severe sepsis, or inadequate response to resuscitation.

3. Second major contributor:Very poor prognosis despite treatment (37.1%)

3. Least common but important:

1. **Terminal illness (**End-stage heart failure, End-stage chronic kidney disease (ESRD, End-stage liver disease, Advanced COPD (chronic obstructive pulmonary disease) **(20%).**
2. 50 patients underwent **INTUBATION** → indicates **high severity**
3. Majority deaths are **potentially preventable/partially reversible** (shock + poor prognosis ≈ 80%)

4. Suggests:

- Need for **early sepsis management (Sepsis Bundle)**
- Better **triage & ICU admission criteria**
- Consider **palliative care pathways** for terminal cases

8. Key System Failures (from Learning Points)

Issue Identified	Number (n)	Percentage (%)
Delayed ICU transfer	28	40.0%
Delayed antibiotic administration	30	42.9%
Late recognition of sepsis	35	50.0%
Need for early dialysis	20	28.6%

1. **Sepsis remains the leading contributor to ICU mortality**
2. **Early intervention is critical**
3. **System delays significantly affect outcomes**
4. **Multimorbidity increases mortality risk**

4. DISCUSSION

1. This study demonstrates that ICU mortality is strongly associated with both clinical severity and system-level failures.
2. Sepsis was the most common underlying condition, consistent with international data (Rudd et al., 2020).
3. Cardiopulmonary arrest was the predominant immediate cause of death, reflecting the terminal pathway rather than the underlying disease.
4. Nearly half of deaths were potentially preventable, highlighting significant opportunities for intervention.
5. Delayed antibiotic administration and delayed ICU transfer were the most critical modifiable factors, both strongly linked to increased mortality (Seymour et al., 2017).
6. The high proportion of early deaths suggests delayed presentation or referral, which has been reported in similar healthcare settings (Adhikari et al., 2018).

7. Multimorbidity, particularly involving cardiovascular, renal, and metabolic diseases, further complicates management and increases mortality risk (Vincent et al., 2016).

5. CONCLUSION

ICU mortality is significantly influenced by preventable factors, particularly delays in:

1. Sepsis recognition
2. Antibiotic administration
3. ICU transfer

Addressing these gaps can substantially reduce mortality.

Final statistical summary

1. Female predominance: 55.7%
2. Sepsis involvement: ~57%
3. CPA deaths: 80%
4. Early deaths (< 24 h): 25.7%
5. Possibly preventable deaths: 45.7%

Interpretation

1. The dataset shows a high burden of sepsis-related mortality
2. Nearly half of deaths were preventable, mainly due to:

a. delayed ICU transfer
b. delayed antibiotics

3. Short LOS deaths indicate late referral or severe disease at admission
4. Strong overlap of:

a. cardiovascular + renal + metabolic diseases

Strengths

1. Identifies modifiable system-level contributors to mortality
2. Includes both clinical and process-related variables

Limitations

1. Small sample size
2. Missing severity scoring systems
3. Retrospective single-center design
4. Limited laboratory and severity scoring data
5. Single-centre design limits generalisability
6. Retrospective methodology introduces risk of missing data

Recommendations

1. Implement **sepsis early warning protocols (**sepsis bundle (Sepsis-6)
2. Ensure antibiotics within 1 hour of diagnosis
3. Strengthen early ICU referral systems
4. Introduce rapid response teams
5. Improve documentation and audit systems
6. Promote early dialysis in high-risk patients
7. Regular mortality audits
8. Strengthen CKD hyperkalemia protocol
9. Staff training in early recognition
10. Develop ICU registry database
11. Establish rapid ICU referral pathways (<1 hour target)
12. Introduce early warning scoring systems.
13. Improve multidisciplinary ICU response teams
14. Conduct monthly mortality review meetings
15. Improve emergency hyperkalemia management protocol
16. Enhance training of junior doctors in early recognition

Policy implications

1. Implementation of early sepsis screening protocols
2. Administration of antibiotics within one hour of diagnosis
3. Strengthening ICU referral pathways
4. Establishing rapid response systems
5. Regular mortality audits and feedback

Action Plan

Problem Identified	Action	Responsible Team	Timeline
Late sepsis management	Sepsis protocol training	ICU Team	3 months
Inappropriate intubation	Develop ICU criteria	Consultants	2 months
Lack of palliative care	Introduce DNR policy	Hospital admin	4 months

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CONFLICT OF INTEREST

The author declares **no competing interests**.

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Ethical Approval

Ethical approval was obtained from the Institutional Review Committee of Nangarhar University Teaching Hospital. As this study was based on retrospective audit data, patient confidentiality was strictly maintained, and no identifiable personal information was disclosed.

Patient Consent

Patient consent was waived due to the retrospective nature of the study and the use of anonymized clinical data, in accordance with institutional ethical guidelines.

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AUTHORS CONTRIBUTIONS

Dr. Saifullah Hadi: Conceptualization, study design, data collection, data analysis, manuscript writing, and correspondence.

Prof. Dr. Haythullah Ahmadzy: Study supervision, methodological guidance, critical revision of the manuscript, and approval of the final version.

Prof. Dr. Aimal Sherzy: Scientific supervision, interpretation of findings, critical review of the manuscript, and approval of the final version.

Prof. Dr. Naqueebullah hadi: Scientific supervision, interpretation of findings, critical review of the manuscript, and approval of the final version.

All authors read and approved the final manuscript and agree to be accountable for all aspects of the work.

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