An-Najah National University

Faculty of Graduate Studies

PROGNOSIS OF PATIENTS WITH ACUTE RESPIRATORY FAILURE AND PROLONGED INTENSIVE CARE UNIT STAY AT A TERTIARY CARE HOSPITAL: A RETROSPECTIVE STUDY

By

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Dedication

This thesis is dedicated to my dear husband, whose unwavering support, encouragement, and understanding have been my greatest source of strength throughout this journey. I also thank my family for their endless love and guidance, which have fostered my resilience and dedication. Lastly, to all ICU healthcare professionals, may this work help enhance patient care and outcomes in some meaningful way. I am grateful to all of you for inspiring me to pursue excellence in research and make significant contributions to the healthcare field.

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First, I give all the glory to God, the source of my strength, for granting me both the mental and physical endurance to complete this monumental task.

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To everyone who gave me moral support for the completion of this task, Thank you.

Author

Manar Mallouh

Declaration

I, the undersigned, declare that I submitted the thesis entitled:

PROGNOSIS OF PATIENTS WITH ACUTE RESPIRATORY FAILURE AND PROLONGED INTENSIVE CARE UNIT STAY AT A TERTIARY CARE HOSPITAL: A RETROSPECTIVE STUDY

I declare that the work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

Student's Name: [illegible]

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Date: 16/3/2025

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Abstract

Background: Acute respiratory failure (ARF) is one of the greatest serious clinical conditions often need ICU admission and is linked with prolonged hospital stay. The main purpose of this study was to examine outcomes in order to identify risk factors related to the length of stay (LOS) in the intensive care unit (ICU) of patients with ARF.

Methods: In this retrospective cohort study, patients were admitted from 2018 to 2023 to the intensive care unit of a tertiary care hospital and were involved if they were adults diagnosed with ARF volunteer. We systematically retrieved demographic characteristics within electronic health records and documented clinical variables and interventions of every patient, including ventilation support. Logistic regression models, t-tests, and chi-square tests were completed using the Statistical Package for Social Sciences (SPSS) version 21 to govern potential predictors of mortality and LOS.

Results: Out of the 460 participants, 61–52 percent were male, with an average age of 59. However, neither age nor gender was found to significantly influence mortality rates. Vital clinical signs of impending death comprise of a systolic blood pressure below 110 mmHg, a heart rate of 100 bpm or higher, a temperature under 37°C, a Glasgow coma scale score below 14, a hematocrit value of fewer than 26, a sodium concentration below 139 mEq/L, and a pH value below 7.36. There appeared to be higher survival rates between patients who had lower acute physiology and chronic health evaluation (APACHE) scores. On the other hand, shorter periods on ventilators and less invasive procedures were connected with better outcomes. Significant issues that affected mortality are such as admission for pneumonia, acute respiratory distress syndrome, and post-operative cases while complications like vasopressor use, renal disease, and hepatic injury also improved the rates of death as well as longer LOS.

Conclusion: This study highlights the significance of thorough clinical assessment and modified management strategies for ICU patients with ARF who have long stays. To improve survival rates while reducing the period of hospital stays, standard risk assessment tools such as the APACHE score should be used alongside progressions in ventilation methods. Moreover, employing multidisciplinary approaches to tackle the patient's comorbidities and associated complications can improve the prognosis even more.

Keywords: Acute Respiratory Failure, ICU, Mortality, APACHE Score, Mechanical Ventilation Complications, Comorbidities Prognosis.

Chapter One

Introduction

1.1 Background

Acute respiratory failure (ARF) is a common and serious condition in hospitalized patients that results from various disorders such as pneumonia(Vanoni et al., 2019), chronic obstructive pulmonary disease(Calverley, 2003), adult respiratory distress syndrome (Fujishima, 2023), congestive heart failure(Stefan et al., 2013). ARF indicates a disturbance in the process of pulmonary gas exchange and subsequent development of lung failure and hypoxemia accompanied by pump failure, which results in hypercapnia (Villgran et al., 2022), Although the older and more precise definition of ARF quotes arterial oxygen and carbon dioxide tension values below 60 and above 45 mm Hg, respectively, it is necessary to take into consideration the patient's medical history and clinical context. These thresholds assist in enhancing the accuracy of the measurement and delivering a detailed understanding of the state of the patient's respiratory system (Heikkilä, Setälä, Jousi, & Nurmi, 2024)

Individuals confronting ARF frequently necessitate admission to Intensive Care Units (ICUs), where the implementation of mechanical ventilation (MV) emerges as a pivotal life-sustaining intervention (Ambrosino & Vitacca, 2018). While a subset of ARF patients experiences a favorable recovery trajectory, leading to an early exit from the ICU, others grapple with complications such as Septic shock(Moore, Weiss, Pascual, & Kaplan, 2018), acute kidney injury (Park & Faubel, 2021)ARF requiring MV, pulmonary embolism (Neuhaus, Bentz, & Weg, 1978), and disseminated intravascular coagulation (Bone, Francis, & Pierce, 1976)throughout prolonged ICU stay. Prolonged durations within the confines of the ICU are correlated with heightened hospital mortality, exacerbated morbidity, protracted hospital stays, and unfavorable long-term prognostication (C. C. Lai et al., 2019)

In tertiary hospitals where ARF cases are referred for specialty care, extended ICU stay of patients is a unique challenge. These hospitals deal with sicker patients, higher comorbidities and complex treatment requirements. Research from these institutions show that extended ICU stay for ARF patients is strongly associated with secondary infections including ventilator associated pneumonia (VAP) and catheter related bloodstream infections both of which worsen outcomes (Anesi et al., 2023). The overall impact of these complications and limited resources emphasizes the need for better care protocols to reduce the risk of bad outcomes and improve the prognosis of these patients.

ARF patients who stay longer in ICU also have systemic inflammation and immune dysfunction which can worsen organ failure. Markers like interleukin-6 and tumor necrosis factor-alpha are known to be bad outcomes especially in patients who need extended mechanical ventilation (Picod et al., 2022). Moreover, the nutritional status of ARF patients is important in their recovery pathway. Malnutrition is a common problem in these patients and is associated with weakened immune function, muscle loss and extended ICU stay. So early nutritional interventions like protein rich diet and immunopurified are essential components of comprehensive care protocols (Gea, Sancho-Muñoz, & Chalela, 2018).

The financial strain of extended ICU admissions in tertiary care hospitals cannot be ignored. Caring for ARF patients often necessitates sophisticated involvements like high-frequency oscillatory ventilation, extracorporeal membrane oxygenation, and invasive monitoring approaches, all of which rise the financial of treatment (Barbash & Gershengorn, 2022). Financial strains are additionally exacerbated by the extended use of ICU resources, such as medications, equipment, and staff. This highpoint the import of cost-effectiveness analyses in detecting the most effective allocation of healthcare resources while maintenance high standards of care. Joining telemedicine services alongside remote monitoring systems might provide probable solutions to tackle these issues by improving resource use and guaranteeing rapid interventions(Franzini, Sail, Thomas, & Wueste, 2011).

Consequences after ICU for ARF patients with prolonged stays highlight the importance of continuing follow-up care. Survivors often describe summary physical, cognitive, and mental health, a state usually recognized as post-intensive care syndrome (Rawal, Yadav, & Kumar, 2017). post-intensive care syndrome is noticeable by continuing physical disabilities including muscle weakness and restricted exercise ability, along with cognitive matters and mental health conditions like anxiety and depression. This complex syndrome requires a combined strategy that includes rehabilitation specialists, psychologists, and primary care doctors to efficiently meet the lifelong requirements of these patients.

Tertiary care centers play an important role in improving research on the prognosis of patients with ARF following long total ICU length of stay (LOS). Retrospective studies conducted in these institutions have provided important insights into the factors that influence patient outcomes, such as the timing of the intervention, involvement of multidisciplinary teams, and the impact of hospital-specific protocols(Anesi et al., 2023). The analysis of these studies emphasizes the vital role of early mobilization protocols, advanced monitoring systems, and personalized treatment in improving survival rates and quality of life for ARF patients(Zang et al., 2020). The implementation of artificial intelligence within medical contexts also offers new paradigms for predictive analysis concerning prognostic outcomes and treatment modulation for this population at risk in the near future (Davenport & Kalakota, 2019).

Concerns, particularly of gradually evolving ARF in intensive care, about nationwide treatment guidelines not being adequate, have led to calls for improved management strategies. With healthcare systems worldwide facing mounting demands due to a rising number of patients and limited resources, it is important to understand the factors associated with prolonged ICU stays. Studies have shown that prompt identification and treatment of ARF scenarios significantly improves patient outcomes and reduces length of stay in the ICU. (Vincent et al., 2002). This means we need to have standardised protocols for ARF management so we can use healthcare resources better and provide better patient care.

Prolonged ICU stay for ARF patients are getting more and more expensive and healthcare-related so we need to have efficient clinical management and intervention techniques. One of the factors associated with high mortality and morbidity and prolonged rehabilitation needs after discharge is 30% of ICU patients who need prolonged ventilatory support. Survivors of ARF often have significant disability, a condition acquired or worsened during their stay in the ICU (Fardanesh, Stavropoulou-Tatla, Grassby, & Elliott, 2021)

Acute respiratory failure survivors often face significant disability, which is often acquired or worsened during their time in the ICU. So, 30% of adults who recover from ARF are discharged to post-acute care facilities. Even those who go home have physical impairments that persist, so they are a treasure trove of information on what causes these outcomes (Gandotra et al., 2019).

Additionally, ARF's effects go beyond physical disability. Many survivors have mental health issues like anxiety, depression, and post-traumatic stress disorder which can impact their quality of life and ability to rejoin society(Fazzini et al., 2022). The interaction between physical and psychological healing highlights the necessity for a comprehensive method to patient care in the ICU, where both medical and psychological assistance are incorporated into the treatment strategy. This all-encompassing care model can enhance recovery results and boost the overall health of patients after their ICU stay (Feng, Liu, Liu, Chi, & Osmani, 2024).

Advancements in intensive care have elevated the survival rates of acute critical illnesses, resulting in a burgeoning population of patients reliant on prolonged MV and other intensive care therapies. Roughly 56% of ICU patients experience ARF, and one-third of them ultimately succumb to this condition (Nelson, Cox, Hope, & Carson, 2010).

Examining the prolonged length of time spent in the ICU is imperative for managers assessing the quality of care and hospital costs associated with specific diseases or institutions. The definition of a prolonged ICU stay varies across hospitals, ICU types, and different diseases, many studies adopt a minimum LOS in the ICU, such as 21 or 28 days, to delineate this condition. Several investigations have focused on patients undergoing extended MV, spanning from 24 hours to 28 days (Chan, Ting, & Huang, 2014).

The outlook for patients with ARF undergoing extended ICU stays is an important research area, as it involves multiple factors that affect results. The survival rate and recovery path largely depend on the duration of mechanical ventilation, the presence of comorbidities, and the severity of the underlying disease (C. C. Lai et al., 2019). Moreover, the timing of any interventions, e:g, initiation of MV and management of complications, are vital in affecting patient outcomes (Mistri, Badge, & Shahu, 2023).

In the mission to improve treatment and prognostic results for ARF, the process becomes more complicated, with the requirement of a multifaceted approach that includes professionals from various specialty fields such as respiratory therapists, intensivists, nursing, and ancillary staff (Rickards & Kitts, 2018).

Finally, the economic burden associated with prolonged ICU stay for ARF patients should not be overlooked. Long hospital stays result in costs related to the use of sophisticated technologies and prolonged nursing, which push healthcare systems to their limits(Tran et al., 2019). Understanding which management strategies are more effective in terms of cost is an important point in the setting of guidelines that would promote the improvement of clinical outcomes while leaving health care in the safest zone. New research points out that when the early mobilization protocols and rehabilitation projects are carried out during the ICU admissions, the duration of the stay will be shortened and functional results will be better, ones which generally represent lower overall healthcare costs (Singam, 2024).

In ARF and ICU patients, the prognosis is complicated and it includes medical, economic, and psychological aspects. As the healthcare systems advance, it becomes imperative to carry out research projects directed at the discovery of the most effective treatment for ARF patients. This is done by looking at the roles of diverse groups in dealing with ARF, collaboration that is, patient outcomes are better and the ICU stay is shortened (C.-C. Lai et al., 2019). Also, technology like telemedicine and remote monitoring that enables patient and healthcare provider interaction that is, can also render extra support for patients and healthcare providers, thus improving patient care through timely interventions, and generally, the healthcare system will move forward (Ezeamii et al., 2024).

To solve these problems, the healthcare systems should direct their attention to the research that can figure out the ones who can do a better job when it comes to treating ARF patients. This aspect is about investigating the role of the cooperation of the multidisciplinary units in treating ARF because the methods that have been proven to work are used in patient results and less ICU duration.(Taberna et al., 2020). Apart from that, the use of technology like telemedicine and remote monitoring people may provide some help to patients and healthcare great content includes a mixture of the most recent exploration in the area and original content to bring up every knowledge level (Liu et al., 2024).

1.2 Study aim

This study aimed to investigate the management of ICU resources by studying the key variables that contribute to ARF outcomes, the risk of stay in the intensive care unit, and the possible ways to reduce ICU dependence by early intervention.This research focused on addressing gaps in the literature through a detailed examination of the elements affecting ARF outcomes and duration of ICU stays. By pinpointing particular risk factors and their links to extended ICU durations, the study aimed to enhance clinical practice and direct upcoming interventions focused on bettering patient care.

1.3 Research question

- Is there an association between ARF and prolonged ICU stay?
- Are their specific risk factors associated with the development of ARF?

1.4 Study hypothesis

Ho: There is no association between ARF and prolonged ICU staying

Ho: There is no association between risk factors and developing AR

1.5 Independent variable

- Demographic variables (age, gender)
- Past history (e.g., cardiac disease)
- Chief complaints (e.g., septic shock, ARDS)
- The nature of ICU interventions (e.g., type of mechanical ventilation, use of vasopressors, sedation agents). Additional variables like acute physiology and chronic health evaluation (APACHE II) scores, blood gas and hemodynamic measurements, respiratory support requirements
- Complications (e.g.pulmonary embolism).

1.6 Dependent variable

- Outcomes (length of ICU stay)
- Survival and mortality

1.7 Problem statement

A prolonged stay in the ICU is associated with an increased likelihood of hospital mortality, elevated morbidity, prolonged hospitalization, and an unfavorable long-term prognosis(Otero et al., 2020). Additionally, critically ill patients enduring an extended ICU stay require a greater-than-average commitment of healthcare worker time and medical resources (Leong et al., 2023). Furthermore, individuals undergoing prolonged MV in the ICU exhibit a significantly higher probability of ICU readmission (Lone & Walsh, 2011)

According to studies longer ICU stays are not only a medical problem but also a financial one with readmission rates staffing needs and resource usage all being directly impacted by the length of ICU stay (Kumar et al., 2024). Improving patient outcomes and streamlining ICU operations may be possible if the clinical and financial effects of prolonged ICU stays are addressed.

Tackling these challenges necessitates a comprehensive strategy that encompasses both clinical treatments and policy reforms focused on enhancing resource distribution and refining care provision in the ICU. By addressing both the clinical and systemic factors leading to extended ICU stays, healthcare professionals can aim to improve patient outcomes and lessen the overall strain on healthcare systems (Bhati, Deogade, & Kanyal, 2023).

1.8 Importance of the study

Extended critical care support often stems from uncertainties surrounding patient prognosis, the complex dynamics between physicians and the patient's family, a general reluctance to accept unfavorable outcomes, and the intricate ethical, legal, and cultural considerations surrounding end-of-life discussions(Visser, Deliens, & Houttekier, 2014). Addressing these challenges remains a formidable aspect of caring for critically ill patients post-ARF, and finding straightforward solutions is improbable. A more comprehensive understanding of outcomes for these patients is crucial to facilitate decision-making (Lighthall & Vazquez-Guillamet, 2015).

According to McGuire et al. managing extended intensive care unit stays necessitates careful evaluation of resource allocation ethical considerations and family communication tactics because these elements affect choices about the limitations of intensive care and possible hospice transition (McGuire & McConnell, 2019)Insights from this study could help address these complexities and assist families and medical professionals in making important decisions for patients requiring prolonged intensive care unit treatment.

The results of this study are anticipated to greatly enhance the current understanding of ARF management within the ICU. By pinpointing essential factors that affect patient outcomes, the study seeks to guide clinical protocols and optimal practices, ultimately resulting in better treatment for patients suffering from ARF. Furthermore, the outcome of this study could be the cornerstone of the following research works that are looking for new treatments and approaches to make the patient recovery process a lot shorter, ICU overstay (Ajibowo et al., 2022).

1.9 Objectives

General objectives: To predict the effects of the future on a patient with acute respiratory failure and a long period of being in ICU, we need to know the changes in the patient's condition first.

Specific Objective: 1. to examine the results for patients with acute respiratory failure requiring a prolonged stay in the ICU.

2. To pinpoint the factors contributing to the risk of individuals facing acute respiratory failure

1.10 Literature review

Chih-Cheng Lai's article, which was published in 2019 and improved with the title "Prognosis of Patients with Acute Respiratory Failure and Prolonged Intensive Care Unit Stay," also contains an instance. To draw a summary on the results and risks found in the patients who need an extensive stay in the Intensive Care Unit (ICU) among patients with acute respiratory failure (ARF). The study goal is to explain the problems that these patients have in their management and the components required to decide on the subsequent treatment with the support of hospice care if appropriate. In a study conducted at the Chi Mei Medical Center, patient records of 1,189 patients admitted to the ICU for more than 24 hours were reviewed, and the study’s main finding was that sepsis was the main risk factor contributing to these cases. From this study, there is high in-hospital mortality estimated to be 53%. at 6%, to signify how important this group of patients is to the overall healthcare system. The potential predictors for mortality included age greater than 75 years, ICU length of stay of more than 28 days, presence of higher acute physiology and chronic health evaluation (APACHE II) scores, hemodynamic instability, renal and liver dysfunction, clinically significant gastrointestinal bleeding, and median FiO2 of the ICU in day 21 (C. C. Lai et al., 2019).

In this study, Taha Ismaeil et al. developed a retrospective cohort study of patients between February 2016 and February 2018 at the Medical Surgical Intensive Care Units department of King Abdulaziz Medical City & King Abdullah Children Specialist Hospital located in Riyadh, Saudi Arabia. Therefore, the primary objective of the study was to analyze the overall survival probability of the adult and pediatric population with the critical condition in the ICU area, receiving mechanical ventilation, and determine potential risk factors. The observation included 262 adult patients and 175 children who were admitted to the ICUs and required MV during the period under research. The overall mortality in the adult patients was 37% and their median survival was recorded to be 11 days. More importantly, there was next observation that age showed significance and patients of age 51-60 have higher mortality rate. The conditions that necessitate the commencement of mechanical ventilation, including diseases that involve the circulatory system and specific infections, were mentioned earlier to be associated with increased mortality (Ismaeil et al., 2019).

The retrospective cross-sectional study by Shruti K. Gadre et al aims to provide a guardrail on the Epidemiological characteristics and outcomes of patients who have severe Chronic Obstructive Pulmonary Disease (COPD) & who undergo Invasive Mechanical Ventilation. Targeting 670 patients with severe COPD served in a quaternary referral medical intensive care unit from the beginning of the year 2008 to the end of the year 2012, it established that COPD exacerbation and pneumonia are the most frequent causes of respiratory failure. The ICU mortality rate was twenty-five percent and COPD exacerbation cases were lesser than in any other cases of morbidity. One point of concern that has been raised in previous studies has to do with the fact that patients with COPD require long durations of mechanical ventilation in the ICU; therefore, the study discounts this with a shortened duration of mechanical ventilation and the statistically significant shorter duration spent in the ICU. It was statistically proved that higher APACHE II score and active malignancy adversely affect ICU survival, whereas, discharge home improves overall survival rate (Gadre et al., 2018).

This retrospective cohort study was done by Yi Chi and colleagues where the prevalence and prognosis of the respiratory pendelluft phenomenon in Mechanically ventilated ICU patients with ARF were analyzed. An inpatient study of 200 patients used to screen for pendelluft within 48 hours of admission. In conclusion, the overall prevalence of pendelluft as determined by the data is 31 percent, and is highest among subjects that were undergoing spontaneous breathing and had greater lung heterogeneity. Interestingly, pendelluft has been associated with an increased duration of mechanical ventilation if the patient has a PaO2/FiO2 ratio of ≤200. Based on the findings of this study, the importance of early identification of pendelluft is highlighted, given its possible impact on the ventilation approaches and patients' outcomes in mechanically ventilated, critically ill patients with hypoxia (Chi, Zhao, Frerichs, Long, & He, 2022).

The high randomized clinical trial, led by researchers from multiple hospitals across Franac by Elie Azoulay et al worked to investigate whether high-flow nasal oxygen therapy was superior to conventional oxygen treatment options for 28-day mortality of immunocompromised patients with ARF. Given the growing population of individuals surviving immune deficiencies due to advancements in cancer treatment, transplantation, and immunosuppressive therapies, the study focused on a critical aspect of care: the need for invasive mechanical ventilation (IMV). While some prior research suggests that high-flow oxygen therapy is effective, others fail to show comparable results; more importantly, the HIGH trial conducted on a total of 778 patients found no significant difference in 28-day mortality rates of the patients in the high-flow and that of the patients on the standard oxygen therapy. From these findings, it can be concluded that in this population, identifying the best approach to oxygenation may not have the most significant impact on survival, therefore raising consideration towards further investigation of other supportive treatments for ARF in immunocompromised patients (Azoulay et al., 2018).

Raschke et al. carried out a crucial retrospective study. (2020) investigated how patient outcomes in cases of severe ARF were affected by delayed intubation. A sizable cohort of 1314 patients from diverse ICUs helped as the basis for this study guaranteeing a representative and diverse sample of severely ill people. Delays in intubation were defined in the study as taking place more than twenty-four hours after the first signs of respiratory failure. New findings showed that the patients who had such delays were much less likely to survive compared to those who were intubated immediately. What the researchers discovered more narrowly was the high correlation between late intubation and death which accentuates the importance of airway control in this patient population. Beyond that, this analysis showed that late intubation was also related to a longer stay in the ICU. Besides the higher mortality rates as well, patients who did not receive timely intubation had to undergo mechanical ventilation for longer periods, therefore increasing the demand for more ICU resources. For critically ill patients ventilator-associated pneumonia and multi-organ dysfunction are constant problems. Patients and this delay may also worsen the sequence of respiratory failure. Le Terrier & Co. also stressed the time factor in decision making and they proposed making and turning towards practical clinical protocols that deal with early intubation only when it is necessary. In cases where fast clinical decision-making is vital for improved patient outcomes, their study underlines the challenges of airway management in critically ill patients (Le Terrier et al., 2022).

At Tikur Anbessa Specialized Hospital in Addis Ababa, Ethiopia, a retrospective cohort study revealed the kind of problems that are likely to happen in such cases. The study presented the data from 160 patients who were on mechanical ventilation in one year. The study aims to evaluate the characteristics of patients that lead to mortality. The overall mortality rate was 60.7%, consistent with results from comparable low-resource surroundings. The main factors expecting mortality included older age, raised disease severity scores, late presentation, and comorbid conditions like sepsis and acute renal injury. Resource restraints were also seeming, with a significant lack of ventilators, inadequate maintenance, and employment issues disturbing the quality of care. These results highpoint the requirement for definite actions intended at attractive ICU capacity, like as staff training, asset in infrastructure, and enhanced early patient referral systems. The research offers significant viewpoints on the different complications faced in critical care within low-resource surroundings, highlighting the need of undertaking systemic problems to improve results for patients on mechanical ventilation (Debebe et al., 2022).

In a significant study, the investigators observed the results for patients requiring prolonged ICU admissions, mainly those who were in intensive care for at least of 30 days. This retrospective study occurred at St. Michael's Hospital, a tertiary-care academic institution, and involved a group of 182 patients, representative of the ICU demographic. The results presented that patient with prolonged stays made up 8% of all admissions, yet used an incredible 48% of total bed days, importance the significant straining they impose on healthcare resources. The research designated an ICU mortality rate of 32%. Meaningfully, 44% of survivors give back to their previous homes or rehabilitation centers, whereas 14% needed long-term support. At the six-month checkup, the mortality rate rose to 50%, with 40% of those who lived going back home. These results highlight the possibility of development for patients with prolonged stays, even with their higher risk of mortality. The writers identified numerous independent factors that expect hospital mortality, such as age, immunosuppression, prolonged mechanical ventilation (above 90 days), acute renal failure requiring dialysis post day 30, and the necessity for inotropic support at least three days after day 30. These consequences coincide with present literature highlighting the importance of persistent physiological disturbances in manipulating survival results in critically ill patients. The results of the study designate that a rise in non-age-related clinical factors leads to a distinguished decrease in the probabilities of survival in the hospital (Friedrich, Wilson, & Chant, 2006).

Together these studies highlight the complex nature of managing ARF in ICU patients stressing the value of early intervention biomarker monitoring and comprehension of how preexisting comorbidities affect patient outcomes. Incorporating these findings could result in improved risk assessment and individualized strategies for ARF patient care in the intensive care unit which would ultimately improve survival and lessen the cost of extended ICU stays.

Chapter Two

Methods

2.1 Study Design

This research employed a retrospective cohort design, focusing on adult patients admitted to the ICU at a tertiary care hospital who experienced ARF and had prolonged ICU stays. Data were extracted from electronic health records.

2.2 Sample and Sampling

The study used systematic sampling, conducting a retrospective search of patient electronic health records over a set period. Data for the six preceding years (2018-2023) were collected from the electronic health records database of a tertiary care hospital. The reason for the time frame chosen was primary to make sure that the data set was ideal for the hospital. The patient population was broken down into segments by patient factors such as age gender the degree of respiratory failure and other diseases that coexisted in the sample in accordance with the chosen stratification sample. If the different categories had been missed it would have been impossible to explore the real effect of each risk factor in this way, as it would have lost the power to generalize to the population. This way, the statistical power of the quant models which stand and predict the length of a patient's stay was increased by the maximum number of possible predictive factors. The group formed is such that each combination of the potential risk factors is contained by a member of at least one group but no one is in more than one group.

The obvious benefits of the retrospective cohort design were visible in this case that it was feasible for the researchers to explore the extensive datasets for lengthy periods, hence in-depth insights into long-term outcomes and trends that could have not been perceived in smaller, more controlled studies. Besides, this means allows to identify of the risk factors and outcomes connected to prolonged ICU admissions, which in turn prompts the choice of clinical practices and policies (Andrade, 2022).

Besides, the sample profile being formed based on the divisions of age, sex, as well as clinical features, also helped in a deeper exploration of the extent to which they influenced the outcomes and therefore, created a more realistic way of looking at the troubles that the patient population went through in the ICU. (Campbell et al., 2020)**.**

2.3 Sample Size Calculation

The number of people from which the sample size was determined with a 5-percent margin of error (E - 0. 05) and a 95-percent confidence level (Z- 1. 96) was:

$n=Z2 \cdot p \cdot (1-p)/ d2$

$n = (1.96)^2 \times 0.5 \times (1 - 0.5) / (0.05)^2$

$n = 384.16$

To account for possible dropout, 20% was added, bringing the total sample size to 460.

The calculation performed was the one that made sure the study was strong enough to discover significant differences and associations, hence, this made the findings more trustworthy. In addition, using a greater number of samples made the outcome of the study more applicable to a wider context, and, therefore, it could be of help in clinical practice and policy development in the ARF cases of the intensive care units (Serdar, Cihan, Yücel, & Serdar, 2021).

2.4 Population

2.4.1 Inclusion Criteria

- Male and female patients
- Patients aged 18 years and older
- Experiencing ARF is a situation when a vertebra is diagnosed in such a case that does not recover after seven or more days (to shorten the length of the hospital stay).

2.4.2 Exclusion Criteria

- patients whose medical records are not available or are not complete.

2.5 Data Collection

Data was collected on each patient using a structured form. The structure of the data obtained was such that all the relevant information across several domains that are pertinent to the patient in the intensive care unit was detailed in the form. One of the steps taken during data collection was to ensure the precision and the completeness of the obtained data. At first, a pilot test of the data collection form was conducted with a small sample of selected records to get to know the problems or uncertainties that may exist. The data obtained from the pilot test was additionally presented to be the information used to perfect the form at the initial stages of the main data collection (Kabir, 2016).

2.5.1 Part One: Demographic Information

The first category of these demographic data involves the age and gender of the patients, as well as other basic demographic information. The demographic section provides information on the patients' age, gender, etc. The two demographic factors written are among the fields that are fundamental in the realization of patient characteristics and possible relationships between age or sex and the outcomes in intensive care units. Another associated factor is the body's response to treatment and the overall mortality, and the prevalence and outcomes of the disease in the patients in intensive care units. In addition to that, the age-gender relationship can also affect the body's reaction to treatment, the overall mortality of the patient, and the occurrence of the disease.(Vallet et al., 2023). Having these basic demographics documented allowed for further examination of patient characteristics across different clinical profiles. Additionally, recognizing demographic trends assisted healthcare providers in predicting the requirements of particular patient groups, resulting in more efficient and tailored care approaches (Baker et al., 2015).

2.5.2 Part Two: Admission Reason

This section clarifies why the patient was admitted to the intensive care unit and the main illness or diagnosis that required critical care. These conditions involved postoperative complications, gastrointestinal bleeding, cardiovascular disease, renal injury, coagulopathy, liver injury, cerebrovascular diseases, pulmonary edema, pulmonary hemorrhage ,pneumonia, septic shock, cardiac arrest, atelectasis and acute respiratory distress syndrome (ARDS). Each of these states is a unique clinical challenge that may alter a patient's prognosis and the total time spent in the intensive care unit in various ways. This section was given a better understanding of the types of conditions that are typically taken care of in the intensive care unit and helped in determining how each medical condition may be connected to patient outcomes by documenting the chief reason for admission. (Dat, Linh, & Kim, 2022). The insight into the primary causes of ICU admissions which healthcare systems have gained, helped them to distribute resources properly and implement targeted interventions to prevent these conditions, thereby leading to the reduction of the burden on ICU services (Weissman et al., 2020).

2.5.3 Part Three: Respiratory Failure Type

Authors emphasis on patients' classification based on RF (respiratory failure) dominated the whole section. Respiratory failure is an important predictor of a highly intensive care unit (ICU) stay that allows the doctor to choose the most appropriate treatment when it is correctly diagnosed. It is worth mentioning that the severeness of respiratory failure is very broad and might require different interventions from mechanical ventilation to additional pressure support in the form of oxygen for the action of the lungs.(Villgran et al., 2022). Moreover, accurate classification of the respiratory failure types supported the study of the effectiveness of the various treatment methods which in turn leveraged the continuous improvement of the treatment methods and protocols (Battaglini et al., 2023).

2.5.4 Part Four: Length of Stay Affecting Factors

The factors recorded in this section that may have contributed to the length of the patient's stay in the intensive care unit were also required. Additional surgeries that were life-threatening, severe breathing problems by increasing the positive end-expiratory pressure (PEEP $\geq$10 cm H_2O) and using high oxygen supplies (FiO_2 >50 percent) the use of vasopressors (blood pressure medications) the presence of situations such as renal disease liver injury massive gastrointestinal bleeding, develop new sepsis events cardiovascular disease myopathy ventilator-associated pneumonia (VAP) and cerebrovascular diseases. Each component was singled out as it could determine the time period and the necessary treatment in the intensive care unit. This data collection unearthed the complexity of each patient's care needs and the differences (Toptas et al., 2018). Realizing which shortcomings were important for thinking of ways to abbreviate the time spent in ICU, this act of rethinking could lead to improved expected health results in patients, and could decrease thus generate savings in healthcare costs (Alharbi et al., 2023).

2.5.5 Part Five: Previous Medical History (PMH)

In this part, the previous medical history of each patient was established and the focus was placed on any pre-existing conditions that could worsen the outcome of the intensive care unit. These included gastrointestinal disorders and aforementioned diseases i.e. cancer, autoimmune diseases, mental health issues, metabolic disorders, neurological disorders, immunocompromised states, arrhythmias, cardiovascular disease, renal, and liver failure. These maladies often cause the disease to be more severe, complicating treatment and can be also associated with higher mortality rates in critical care units. In critical care circumstances, understanding the patient's medical history brings about more extensive and custom-tailored treatment.(Charlson, Pompei, Ales, & MacKenzie, 1987). Furthermore, the clinician's vision of patients' previous medical records was of great help in forecasting the potential complications and in services' optimization that resulted in better patient care in the ICU (Bhati et al., 2023).

2.5.6 Part Six: Values in the Laboratory

The measurement of blood pressure (systolic and diastolic) means arterial pressure (MAP) heart rate, temperature, respiratory rate, Glasgow Coma Scale (GCS) score, partial pressure of oxygen (PaO_2), hematocrit (Hct), white blood cell count (WBC), creatinine (CREA), sodium (Na), potassium (K), pH, fractional inspired oxygen (FiO_2) and carbon dioxide (CO_2) were among the vital laboratory values that were recorded upon admission. These numbers offer a moment in time of the patient's clinical state and are frequently utilized for treatment monitoring and modification. Because abnormal values can indicate complications or the need for more intensive interventions it is imperative to regularly assess these parameters when managing patients in the intensive care unit(Tyler et al., 2018). Consistent monitoring of these laboratory values was crucial for prompt intervention and could greatly influence patient outcomes, especially regarding ARF and other severe conditions (Makris, 2018).

2.5.7 Part seven: The ICU Severity Score (APACHE II Score)

This score aids in predicting the risk of death and quantifying the severity of illness. Incorporating the APACHE II score offered a consistent way to assess and contrast patient risk profiles which aided in comprehending the connections between patient severity at admission interventions and results(Knaus, Draper, Wagner, & Zimmerman, 1985). Employing the APACHE II score aided not just in risk stratification but also supported the benchmarking of ICU performance among various institutions, thus promoting a culture of ongoing quality improvement in critical care (Dossett, Redhage, Sawyer, & May, 2009).

2.5.8 Part eight: Vasopressor Use

To control low blood pressure and maintain cardiac function in critically ill patient's vasopressor agents such as norepinephrine vasopressin dobutamine and dopamine are used. Vasopressor use records gave information about the degree of cardiovascular instability in each patient and assisted in determining the amount of hemodynamic support required(Sunnaa et al., 2023). Additionally, the meticulous oversight of vasopressor treatment was essential for enhancing hemodynamic stability and reducing the potential for adverse effects, which might complicate the clinical progression of critically ill patients (Shi, Hamzaoui, De Vita, Monnet, & Teboul, 2020).

2.5.9 Part Nine: Sedation Use

This post showed in detail the most common sedatives that were applied including those that propofol dexmedetomidine midazolam fentanyl and remifentanil. People who are on mechanical ventilation will feel comfortless and may only get better through proper sedation and pain management. The best way to find out how these drugs affect patients is to keep records on patients' recovery time and time purposes after using them. (Barr et al., 2013). Hence, understanding the patterns of sedation usage which were guided by best practices and protocols for sedation management in the ICU, thus enhancing safety and satisfaction of the patient, became possible (Whittle, 2021).

2.5.10 Part Ten: Mechanical Ventilation

Part of the requirements for mechanical ventilation was being informed in this part along with the working principles whether it is an invasive or a non-invasive ventilation and for what duration. The PaO_2/FiO_2 ratio which was the index of how well the lungs were functioning was also included. The item of providing the respiratory support evaluation tool in order to estimate the most effective ventilation approaches as well as the impact of the length of stay of the patient in the intensive care unit by registering the kind and duration of ventilation was feasible. (Papazian et al., 2019). In addition, having unceasing studies about the improvement of mechanical ventilation strategies was extremely important for the betterment of the situation for the Acute Respiratory Patients as the technological and technique advancements were always evolving (Zhang & Wittenstein, 2024).

2.5.11 Part Eleven: Patient Results

The last part consisted of patient outcomes such as survival, the requirement for post-discharge rehabilitation, and death. The direct evaluation of clinical event medical actions, admission factors on the overall survival and healing of patients was made probable by the establishment of this section, which formed a termination evaluation of patient outcomes. The data form helped in the structured gathering of information which allowed for a comprehensive examination of the ICU outcome concerning all the issues. (Kristinsdottir et al., 2020). A study of patient outcomes revealed that the established treatment ways not only work well but also show the lack of effective resource management and patient care in the ICU (Xu, Zhang, Ding, Liu, & Zhang, 2021).

2.7 Definition of Variables

- **ARF:** An inability of the respiratory system to correctly exchange gases which often leads to a low partial pressure of oxygen PaO2 equal to or less than 60 mmHg and PaO2/FIO2 ratio equal to or less than 300. .(Kavanagh & Hedenstierna, 2015).

- **Shock:** For at least an hour, despite fluid resuscitation, shock is defined as the need for vasopressors to reserve systolic blood pressure (SBP) equal to or less than 90 mmHg or mean arterial pressure (MAP) equal to or less than 65 mmHg (Annane, Bellissant, & Cavaillon, 2005).

- **Kidney Injury**: Serum creatinine levels more than or equal to 2 mg/dL or urine production of 0–5 mL/kg/hr for four hours are indicative of kidney injury. (Bellomo, Kellum, & Ronco, 2012).

- **Liver Injury:** an elevated liver enzyme in which serum bilirubin level become equal to or more 4 mg/dL (Malhi & Gores, 2008).

- **Non-invasive Ventilation (NIV):** ventilation using positive pressure that is delivered through external interfaces like as nasal cannulas, face masks, non-rebreather masks, high-flow nasal cannulas, and CPAP masks (Masip, 2007).

- **Invasive Mechanical Ventilation:** ventilation requires access through the tracheal (Walter, Corbridge, & Singer, 2018)**.**

- **APACHE II score:** scale used to determine illness severity, APACHE II considers the patient's age chronic medical conditions, and also 12 physiological dimensions taken during the first 24 hours of ICU admission. The sum of the scores for each variable yields the overall APACHE II score. Higher scores indicate a higher risk of death. This scoring system is useful for comparing ICU performance across patient populations forecasting patient outcomes and directing clinical judgments.(Knaus et al., 1985).

- **Coagulopathy**: a condition of an abnormal clotting profile. PT 15 seconds or INR 1. 5 PTT 40 seconds platelet count 150000/µL fibrinogen 1. 5 g/L and clinical signs such as spontaneous bleeding or bruising are signs (Levi & Scully, 2018)

- **Neurological disorder:** Medical conditions affecting the structure and operation of the nervous system which consists of the brain spinal cord and peripheral nerves. comprise clinical manifestations like (general weakness, seizures) neurological examination results electrophysiological tests (EEG EMG) diagnostic imaging (abnormal CT or MRI findings), and historical neurological events(Chandra et al., 2006).

2.8 Statistical Analysis Methods

Data were analyzed by the SPSS version 21. Continuous variables were reported as the mean ± standard deviation (SD) and categorical variables were shown as frequencies and percentages. Comparisons of baseline characteristics and clinical variables by the survival and mortality groups involved the student's t-test for continuous variables and Pearson's χ^2 test for categorical variables. Using logistic regression analysis, the researchers carried out to study the relationship between variables such as predictive and mortality, where the odds ratios (ORs) were also displayed together with the 95% confidence intervals (CIs). The last prognosis model was built by using the baseline characteristics and clinical variables, with P-values not smaller than 0.05. The several logistic regression studies conducted have been identified as the risk factors contributing to mortality. The statistical analysis of the data was not only to enhance the reliability but also to give multiples of the study for the predictive area in the ICU environment (Xian, de Souza, & Rodrigues, 2023).

Chapter Three

Results

3.1 Descriptive Statistics of Clinical and Laboratory Parameters in ICU Patients

The descriptive statistics for several clinical variables in a sample of 460 intensive care unit patients. The patients were between the ages of 16 and 94 with an average age of 55 and 2 years (SD = 16 and 7). With skewness = -0. 460 the age distribution was somewhat negatively skewed. The systolic blood pressure (SBP) had a mild positive skew (skewness = 0. 141) and ranged from 57 to 170 mmHg with a mean of 109. 97 mmHg (SD = 18. 8). With a mean of 60. 89 mmHg (SD = 12. 8) and a slightly positive skewness (skewness = 0. 239) the diastolic blood pressure (DBP) ranged from 30 to 96 mmHg. There was minimal skewness (0. 174) and a mean arterial pressure (MAP) of 76. 69 mmHg (SD = 13. 4). A slight negative skew (skewness = -0. 261) was present in the HR values which ranged from 15 to 160 beats per minute and had an average of 101. 28 (SD = 22. 9). The average temperature was 37°C to 19°C (SD = 1. 06) with skewness close to zero (-0. 157). The temperature ranged from 30 to 40°C. The high kurtosis (4. 257) suggested that the distribution was peaked. Respiratory Rate (RR): had a mild positive skew (skewness = 0. 243) and varied from 7 to 39 breaths per minute with a mean of 23. 03 (SD = 5. 39). Glasgow Coma Scale (GCS): The distribution was right-skewed with a mean score of 10. 51 (SD = 7. 82) and extreme skewness (skewness = 5. 273). Kurtosis was likewise high with heavy tails (57point 364).

Here are the laboratory parameters. The average pressure of PaO2 was 103. 09 mmHg (SD = 34. 1) with a positive skew (1. 743) ranging from 34 to 280 mmHg. Hematocrit (Hct) values ranged from 13 to 57 with a moderate skewness (1. 222) and a mean of 27. 72 (SD = 6. 82). White Blood Cell Count (WBC) showed strong skewness (6. 8) and kurtosis (73. 044) indicating extreme values and the range was broad. With a strong positive skew (1. 877) the average for creatinine (CREA)was 2. 24 (SD = 2. 45). In contrast to potassium which exhibited extreme kurtosis (374. 757) sodium (Na) and potassium (K) displayed negligible skew (0. 154 and 18. 429 respectively). With a mean of 7. 337 (SD = 0. 279) .pH showed significant negative skew (-12. 46) and high kurtosis (175. 087) ranging from 3. 38 to 7. 68. This includes ventilation and oxygenation. The range of FIO2 was 21 to 100 percent with a positive skew (1. 375) and an average of 46. 11 percent (SD = 17. 47). Positive skew (2. 019) and high kurtosis

(10. 806) were evident in the PaO2/FIO2 Ratio which had a mean of 265. 63 (SD = 135. 27) and varied from 15 to 1375.

Clinical Results and Scores: A slight positive skew (0. 116) was present with an average APACHE point of 21. 31 (S D = 8. 46). A mildly positive skewness (0. 428) was evident in the Mortality score which averaged 39. 42 (SD = 23. 11). The ICUs Length of Stay (LOS) was significantly skewed (3. 335) with high kurtosis (15. 764) ranging from 2 to 163 days on average (17. 34 days SD = 17. 43). These findings highlight the differences in patients' vital signs lab results and clinical scores while offering a thorough summary of the clinical parameters and laboratory values within this intensive care unit cohort. ICU patients' complexity and variability which could affect their outcomes and care requirements are highlighted in this statistical summary.

Table 1

Descriptive Statistics of Clinical and Laboratory Parameters in ICU Patients

Variables	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Age	460	16	94	55.200	16.701	-.460-	0.114	-.626-	0.227
SBP	460	57	170	109.970	18.801	0.141	0.114	0.307	0.227
DBP	460	30	96	60.890	12.763	0.239	0.114	-.207-	0.227
MAP	460	39	116	76.690	13.375	0.174	0.114	0.101	0.227
HR	460	15	160	101.280	22.881	-.261-	0.114	0.202	0.227
Temp	460	30	40	37.193	1.063	-.157-	0.114	4.257	0.227
RR	460	7	39	23.030	5.388	0.243	0.114	-.271-	0.227
GCS	460	3	95	10.510	7.824	5.273	0.114	57.364	0.227
Pao2	460	34	280	103.090	34.137	1.743	0.114	5.054	0.227
Hct	460	13	57	27.720	6.821	1.222	0.114	1.924	0.227
Wbc	460	0	280	14.880	20.027	6.800	0.114	73.044	0.227
CREA	460	0.1	13	2.241	2.448	1.877	0.114	3.275	0.227
Na	460	120	159	139.090	6.348	0.154	0.114	0.533	0.227
K	460	2.6	53	4.321	2.393	18.429	0.114	374.757	0.227
PH	460	3.38	7.68	7.337	0.279	12.460-	0.114	175.087	0.227
FIO2	460	21	100	46.110	17.474	1.375	0.114	1.755	0.227
CO2	460	18	100	43.770	13.771	1.128	0.114	1.673	0.227
Pointes	460	3	44	21.310	8.462	0.116	0.114	-.658-	0.227
Mortality	460	1	85	39.420	23.108	0.428	0.114	-.899-	0.227
Period on IMV	460	0	100	10.330	16.874	2.657	0.114	8.409	0.227
Period on NIV	460	0	100	6.350	7.538	5.201	0.114	54.002	0.227
Pao2Fio2ratio	460	15	1375	265.630	135.268	2.019	0.114	10.806	0.227
LOS	460	2	163	17.340	17.434	3.335	0.114	15.764	0.227

3.2 Participant's characteristics

The current study had a total sample of 460 patients, of which 283 accounted for 61. 52% were male, and 177 accounted for 38. 47% were female. In further detail, based on age distribution, as many as 229 (49. 78%) interns were below 59 years of age whereas 231 (50. 21%) interns were 59 years of age or above. An observation made regarding the demographic characteristics of the mortality rates of the participants is quite informative. When it comes to age groups with participants under the age of 59, the mortality rate attained 117 which is 51. 1%. For the second age group with participants over the age of 59, 120 of them died which is 51. 9%. Likewise, among males – 283 deaths were noted with 147 (51. 9%) of the participants having the highest mortality rate among females, deaths were noted with 90 (50. 8%) of females having the highest mortality rate.

On Statistical analysis, mortality rates did not differ significantly across age groups; (p = 0. 926, χ^2 = 0. 034) or gender; (p = 0. 848, χ^2 = 0. 052).

Table 2

Distribution of patients according to socio-demographic characteristics

Demographic characteristics	Total	Survived	Died	P-value	Chi-square
	(N=460) N (%)	(N=223)	(N=237)		
Age (Years)					
<59	229 (49.78)	112 (48.9)	117(51.1)	0.926	0.034
≥59	231 (50.21)	111 (48.1)	120 (51.9)		
Sex					
Male	283 (61.52)	136 (48.1)	147 (51.9)	0.848	0.052
Female	177 (38.47)	87 (49.2)	90 (50.8)		

3.3 Distribution of patients according to the clinical data

The examination of clinical characteristics, including of 460 patients showed several correlations with fatal outcomes. There was further stratification for mortality in patients with systolic blood pressure (SBP)<110mmHg, which appeared higher compared with those with SBP > or =110 mmHg (60. 1% vs. 44. 4%, p = 0. 01). About the mortality rate, patients with a heart rate (HR) equal to or higher than 100 had higher mortality rates than patients with HR less than 100.

Other findings that remained statistically associated with mortality were hypothermia with temperatures below 37°C, altered level of consciousness with Glasco coma scale (GCS) below 14, hematocrit (Hct) below 26%, low sodium (Na) levels below 139 meq/L, and low pH below 7. 36. it is relevant to consider these clinical parameters and the mortality risk level to improve patients' outcomes with subsequent interventions, as provided in table B.1

3.4 Distribution of the patients based on APACHE scores with mortality

The distribution based on APACHE scores was analyzed about their survival status. Participants with an APACHE score of less than 21 comprised 48.7% (224 individuals) of the total. Among these, 72.7% (163 individuals) survived, while 27.3% (61 individuals) died. Conversely, participants with an APACHE score of 21 or greater represented 51.3% (236 individuals) of the total, with a survival rate of 25.4% (60 individuals) and a mortality rate of 74.6% (176 individuals). The statistical analysis revealed a highly significant difference between these groups, with a p-value of 0.000 and a chi-square value of 103.133.

Similarly, when analyzing the distribution based on APACHE mortality scores, 216 participants had a score of less than 40. Of these, 75% (162 individuals) survived, and 25% (54 individuals) died. In contrast, 244 participants had an APACHE mortality score of 40 or greater, with a survival rate of 25% (61 individuals) and a mortality rate of 75% (183 individuals). This difference was also highly significant, with a p-value of 0.000 and a chi-square value of 114.68.

Table 2

Distribution of patients based on APACHE score

Distribution of patients based on APACHE scores	Total	Survival status		P-value	Chi-square
	(N=460) N (%)	Survived (N=223)	Died (N=237)		
APACHE (points)					
<21	224(48.7)	163(72.7)	61(27.3)	0.000	103.133
≥21	224(48.7)	163(72.7)	176(74.6)		
APACHE (mortality)					
<40	216(47)	162(75)	54(25)	0.000	114.680
≥40	244(53)	61(25)	183(75)		

3.5 The distribution of the patients based on ventilation status and survival outcomes

Analysis showed that there was a correlation between several factors, especially the effect of ventilation on the patient's outcomes. For instance, patients who were mechanically ventilated for less than 4 days or were on noninvasive (NIV) for less than 6 days had a significant and higher survival rate compared to patients who spent more hours on the ventilators (χ^2 = 65. 791, p < 0. 001 & χ^2 = 38. 194, p < 0. 001). Also, patients who received a fraction of inspired oxygen (Fio2) less than 40 % indicated better survival as compared with those who received forty percent or more Fio2 (χ^2 = 29. 347 p < 0. 001) patients who had a partial pressure of arterial oxygen divided on fraction of inspired oxygen (Pao2/Fio2) ratio of less than 248 showed poor survival as compared to the one with Pao2/Fio2 ratio of 248 or more (χ^2 = 23. 563 These observations also support utilization, duration, and type of ventilation that should ideally be used in the initial periods of the illness as a potential predictor of long-term survival.

Table 3

Distribution of the patients based on ventilation status and survival outcomes

Distribution of patients according to ventilation status	Total	Survival status	Statistical test	P-value	Chi-square
	(N=460) N (%)	Survived (N=223)	Died (N=237)		
period of IMV					
<4	228(49.6)	154(67.5)	74(32.5)	0.000	65.791
≥4	232(50.4)	69(29.7)	163(70.3)		
period of NIV					
<6	223(48.5)	75(33.6)	148(66.4)	0.000	38.194
≥6	237(51.5)	148(62.4)	89(37.5)		
Pao2					
<97	224(48.7)	112(50)	112(50)	0.576	0.405
≥97	236(51.3)	111(47)	125(53)		
Fio2					
<40	152(33)	101(66.4)	51(33.6)	0.000	29.347
≥40	308(67)	122(39.6)	186(60.4)		
Pao2\Fio2 ratio					
<248	229(49.8)	85(37.1)	144(62.9)	0.000	23.563
≥248	231(50.2)	138(59.7)	93(40.3)		

3.6 Distribution of the patients based on their reason for admission with death

The dispersion of patients based on their reason for confirmation uncovered a few noteworthy discoveries in connection to their survival status. Among the 460 patients, those conceded with pneumonia had a critical distinction in survival rates. Particularly, 62.8% (289) of the patients had pneumonia, with a survival rate of 41.2% (119) and a mortality rate of 58.8% (170), compared to those without pneumonia, who had a survival rate of 60.8% (104) and a mortality rate of 39.2% (67) (p = 0.000, chi-square = 16.59).

Patients with intense respiratory trouble disorders like acute respiratory distress disorder (ARDS) too appeared a noteworthy contrast. Among the 53 patients with ARDS, 28.3% (15) survived, whereas 71.7% (38) passed on. In differentiate, among the 407 patients without ARDS, 51.1% (208) survived, and 48.9% (199) passed on (p = 0.002, chi-square = 9.763).

Postoperative complications were another critical complication. Of the 23 patients with postoperative complications, 87% (20) survived, and 13% (3) passed on. Of the 437 patients without postoperative complications, 46.5% (203) survived, and 53.5% (234) kicked the bucket (p = 0.000, chi-square = 14.352).

Septic displayed the most striking contrast. Among the 223 patients with septic, 36.3% (81) survived, whereas 63.7% (142) passed on. In comparison, of the 237 patients without septic, 59.9% (142) survived, and 40.1% (95) passed on (p = 0.000, chi-square = 25.604).

These noteworthy contrasts highlight the effect of particular conditions on persistent survival rates, emphasizing the requirement for focused on mediation for these high-risk groups, as show in table B.2

3.7 Distribution of the patients based on the type of RF with death

Therefore, based on the statistical analysis, control variable and data assessment, there was evidence of a connection between Type 1 respiratory failure (RF) and mortality (p = 0. 047, chi-square = 4. 05). Specifically, overall, within the study 72.8 % had a type 1 RF, however for type 2 RF which was moderate risk, there was a slight tendency towards the result as the p-value was 0. 06 and the chi-square value was 3. 610 but this did not have a Stationary effect on mortality rate.

Table 5

Distribution of the patients based on the type of RF with death

Distribution of the patients based on the type of RF	Total	Survival status		P-value	Chi-square
	(N=460)	Survived	Died		
	N (%)	(N=223)	(N=237)		
Type 1					
No	125(27.2)	51(40.8)	74(59.2)	0.047	4.050
Yes	335(72.8)	172(51.3)	163(48.7)		
Type 2					
No	334(72.6)	171(51.2)	163(48.8)	0.060	3.610
Yes	126(27.4)	52(41.3)	74(58.7)		

3.8 Distribution of the patients based on complications with death

Several complications were tested for correlation and relationship to the survival status of the patients in the study. Interestingly, vasopressors were utilized ($p < 0.001$), renal disease ($p < 0.001$), and hepatic injuries as well were considerably related to higher mortality rates. Furthermore, developed new shock was also an independent predictor of mortality with a $p < 0.001$ as well as ventilator-associated pneumonia (VAP) $p < 0.001$ and the need for Fio2 50% $p < 0.001$. Interestingly, no correlation between gastrointestinal bleeding (GIB) and survival status was noted ($p = 1.000$) though there is a similar trend observed for cerebrovascular disease ($p = 0.053$) In addition, the use of positive end-expiratory pressure (PEEP) 10 or more was found to have a significant association with mortality ($p < 0.001$). These data highlight the significance of these complications to growth and determine what measures need to be considered to optimize the survival of critically ill patients.as provided in table B .3

3.9 Distribution of the patients based on co-morbidities

Analyzing the distribution of the patients depending on the presence of certain accompanying conditions, some correlations with the survival rates were established to be statistically significant. Interestingly, comorbid conditions like cancer, immunocompromised state, and smoking were observed to have a relation with the survival rate at a magnitude of $p <0.001$. Those with a cancer diagnosis had a higher risk of mortality compared to the rest of the sample, but those who did not have any compromised immune system or have any smoking history had better survival outcomes. Furthermore, metabolic disorders were seen to have a statistically significant relation to survival status p = 0. 012 while arrhythmia also has an almost significant relation with the survival status p = 0. 027. The other co-morbidities even though not significant rose to some level of trends towards significance such as the cerebrovascular diseases p = 0. 084; hepatic failure p = 0. 077 which means that there may be relationships with survival that are worth exploring. As show in table B.4

3.10 Clinical Data and Modified Early Warning Score with length of stay

Some of the existing correlations concerning the length of stay together with the other variables, SBP of less than 110 mmHg was statistically related to the duration of hospitalization thus; it could be a predictor of longer hospital stay (p = 0. 001). Furthermore, a heart rate (HR) of 100 bpm or more had a significant correlation with the increased length of stay (p = 0. 029), the how useful it is as a predictor of outcome. Patients with GCS scores of less than 14 required longer hospitalization with moderate significance (p = 0. 003), underlining the role of neurologic checks in determining the patient's prognosis. Moreover, there were increased white blood cells (WBC) above 11 x 10^9/L (p = 0. 011) and decreased sodium (Na) below 139 mmol/L (p = 0. 004) that related to the longer hospital stay. These studies should be useful in highlighting the possibility of using some clinical parameters and components of the Modified Early Warning Score to predict the LOS. As provided in table B.5

3.11 Distribution of patients based on APACHE scores and death with LOS

Patient characterization based on their distribution using APACHE scores suggested that these metrics were related to extended hospital stays and mortality. According to the analysis, participants with APACHE below 21 points were likely to have a shorter hospital stay – p = 0. 015, concerning participants with 21 points or more who had a longer stay. Likewise, the low mortality risk APACHE score of less than 40 was a sign of less hospital stay (p = 0. 011), and high mortality risk scores of 40 and above were indicative of long hospital stay. In addition, death during the study period was more common among participants with a higher value in the APACHE score (p = 0. 004) and an increased mortality rate. Such perceptions point towards the feasibility of scores gotten from APACHE more as potential indicators of the duration taken in the hospital as well as mortality rates.

Table 4

Distribution of patients based on APACHE scores and death with LOS

Distribution of patients based on APACHE scores	Total	Survival status		P-value	Chi-square
	(N=460) N (%)	Survived (N=223)	Died (N=237)		
APACHE (points)					
<21	224(48.7)	163(72.7)	61(27.3)	0.000	103.133
≥21	236(51.3)	60(25.4)	176(74.6)		
APACHE (mortality)					
<40	216(47)	162(75)	54(25)	0.000	114.680
≥40	244(53)	61(25)	183(75)		

3.12 Distribution of participants according to ventilation status with length of stay

Distribution analysis of participants showed significant relationships between ventilation status with both days in the hospital and respiratory parameters. Those who were placed in invasive mechanical ventilation (IMV) for at least 4 days were over four times as likely to need more time in the hospital ($p < 0.001$), reflecting the fact that they had a more severe respiratory disease. Predictably, patients on non-invasive ventilation (NIV) for six hours or more stayed slightly longer; however, this was not statistically significant ($p = 0.925$). Participants also needed a FiO2 40% or greater and longer stayed in the hospital, reflecting a more serious respiratory insufficiency and pathology outcome in the form of a respiratory parameter ($p = 0.046$). The remaining parameters including PaO2, PaO2/FiO2 ratio, and duration of NIV did not show significant correlations with the LOS.

Table 7

Distribution of patients according to ventilation status with LOS

Distribution of patients according to ventilation status	Total	Survival status		P-value	Chi-square
	(N=460) N (%)	Survived (N=223)	Died (N=237)		
period of IMV					
<4	228(49.6)	142(62.3)	86(37.7)	0	57.42
≥4	232(50.4)	63(27.2)	169(72.8)		
period of NIV					
<6	223(48.5)	100(44.8)	123(55.2)	0.925	0.014
≥6	237(51.5)	105(44.3)	132(55.7)		
Pao2					
<97	224(48.7)	99(44.2)	125(55.8)	0.925	0.024
≥97	236(51.3)	106(44.9)	130(55.1)		
Fio2					
<40	152(33)	78(51.3)	74(48.7)	0.046	4.187
≥40	308(67)	127(41.2)	181(58.8)		
Pao2\Fio2 ratio					
<248	229(49.8)	94(41)	135(59)	0.135	2.283
≥248	231(50.2)	111(48)	120(52)		

3.13 Distribution of the patients based on their reason for admission with LOS

The dispersion of members based on their reason for admission and LOS. Among the 460 members, those with ARDS appeared a critical distinction in LOS. Of the 53 members with ARDS, 30.2% (16) had a LOS of less than 10 days, whereas 69.8% (37) had a LOS of 10 days or more. In comparison, among the 407 members without ARDS, 46.4% (189) had a LOS of less than 10 days, and 53.6% (218) had a LOS of 10 days or more ($p = 0.028$, chi-square = 5.012).

Cardiac arrest was too essentially related to LOS. Among the 17 members with cardiac arrest, as it were 11.8% (2) had a LOS of less than 10 days, while 88.2% (15) had a LOS of 10 days or more. In differentiate, among the 443 members without cardiac arrest, 45.8% (203) had a LOS of less than 10 days, and 54.2% (240) had a LOS of 10 days or more (p = 0.005, chi-square = 7.688) As provided in table B.6

These critical contrasts show that members with ARDS and cardiac arrest are more likely to have a delayed clinic remain, underscoring the seriousness and effect of these conditions on understanding results.

3.14 The distribution of patients based on the type of RF with LOS

Overall, on analysis, there is no statistically significant difference between Type 1 (Sign Test = 0. 752, Sig = 0. 129) and Type 2 (Sign Test = 0. 834, Sig = 0. 059) RFs between patients with low LOS of less than 10 days and High LOS of 10 days or more, presented on table 13. Based on these findings, the results proved that the null hypothesis posited that there is no significant correlation between the type of RF and the length of stay among the participants is true.

Table 8

Distribution of the participants based on type of RF with LOS

Distribution of the participants based on type of RF with LOS	Total	LOS period		P-value	Chi-square
	(N=460) N (%)	Less than 10 days (N=205)	10 days ≥ (N=255)		
Type 1					
No	125(27.2)	54(43.2)	71(56.8)	0.752	0.129
Yes	335(72.8)	151(45.1)	184(54.9)		
Type 2					
No	334(72.6)	150(44.9)	184(55.1)	0.834	0.059
Yes	126(27.4)	55(43.7)	71(56.3)		

3.15 The distribution of participants based on complications with LOS

The result also reveals several important relationships. These findings showed the participants who had received vasopressors or those with new shock had a significantly higher proportion where LOS was of 10 days or more than LOS less than 10 days (χ^2 = 8. 740, p = 0. 004 for vasopressors and χ^2 = 41. 557, p < 0. 001 for new shock). Further, Myopathy cases were observed only in the participants with an LOS of 10 days or more (χ^2 = 47. Again, there was a variation in the distribution of VAP and coagulopathy, the data showed more subjects who developed VAP (χ^2 = 67. 67, p < 0. 001) and coagulopathy (χ^2 = 5. 9, p = 0. 017) had their LOS equal to or greater than 10 days, more details on table 14 Therefore, these complications are useful to consider clinically for their relationship between extended LOS and patients. As provided in table B .7

3.16 The distribution of patients based on comorbidities with LOS

These found values reveal moderate association and underlines the influence on the number of days the patient stayed in the hospital. Patients with immunosuppression had a highly significant variation between the group with LOS < 10 days and that with LOS ≥ 10 days (χ^2 = 48. 681, p < 0. 001) as table 15. The same was found in participants with metabolic disorders where the proportion was higher among those who had LOS of 10 days or more without such disorders (χ^2 = 6. 646, p = 0. 012). Cancer diagnosis was also strongly associated with longer hospital stays as documented by the fact that majority of patients with cancer stayed for 10 days and above (χ^2 = 36. 352, p < 0. 001). Likewise, the distribution of smoking status (χ^2 = 26. 595, p < 0. 001), autoimmune diseases (χ^2 = 8. 451, p = 0. 004), and arrhythmia (χ^2 = 5. 375, p = 0. 014) significantly differed are dependent on LOS; therefore, comorbidities should be taken into consideration when assessing the outcomes. As mentioned in table B .8

3.17 Regression according to P-value result

3.17.1 Predictors for Death in Logistic Regression Analysis

Logistic regression analysis found significant correlations between clinical, and demographic characteristics, and mortality in the study cohort (N=460). The survival odds were higher for patients with a heart rate below 100 beats per minute and a hematocrit level below 26 percent (p-values of 0. 005 (OR=2. 555) and p=0. 033 (OR=1. 974) respectively. Additionally, longer non-invasive ventilation and higher APACHE mortality scores (above 40) were associated with higher mortality (p=0. 014 OR=0. 181 and p=0. 003 OR=2. 57). Additionally, patients who needed vasopressors (p=0. 009 OR=0. 3) and those with ARDS (p=0. 012 OR=4. 049) had a noticeably higher chance of dying. Increased mortality was linked to immunocompromised status hepatic injury and the requirement for PEEP ≥10 cm H_2O (p=0. 001 OR=0. 238) respectively (p0. 001 OR=0. 285 and p=0. 028 OR=0. 376). Additionally smoking significantly increased the risk of death (p0. 001 OR=0. 31). Nevertheless, there was no significant correlation found between survival outcomes and other variables like pH, septic shock, cardiovascular disease, metabolic disorders, cancer, arrhythmias, and sodium levels. High APACHE scores low hematocrit ARDS vasopressor use and liver damage were all found to be important predictors of mortality risk in this patient group according to the analysis. As provided in table B.9

3.17.2 Predictors for Length of Stay in Logistic Regression Analysis

For the 460 patients in this study, the logistic regression analysis found correlations between clinical, and demographic factors and LOS. An elevated LOS was observed in patients with SBP less than 110 mmHg however this association was close to significance (p=0. 051 OR=0. 616). LOS was lower in patients with WBCs less than 11x10^3/µL (p=0. 004 OR=0. 497). An important factor was the length of IMV patients who were on IMV for fewer than four days had a noticeably lower length of stay (LOS) (p=0. 002 OR=0. 385). The highest odds ratio was found for ventilator-associated pneumonia (VAP) (p0. 001 OR=0. 255 for VAP and p=0. 014 OR=2. 404 for coagulopathy) while both coagulopathy and VAP were significantly linked to extended length of stay. Additionally, LOS was higher in arrhythmia-afflicted patients (p=0. 028 OR=2. 298). In contrast, LOS was not substantially impacted by variables like autoimmune disease, metabolic diseases, immunocompromised status, cardiac comorbidities, and sodium levels. The results show that LOS is significantly predicted by WBC count IMV duration VAP and coagulopathy indicating that these factors are important in influencing patient outcomes and resource use. As show in table B.10

Chapter Four

Discussions and Conclusions

4.1 Discussion

In a cohort of patients needing intensive care, this study offers vital information about the demographic clinical and comorbid factors affecting mortality and length of stay (LOS). Specific clinical parameters including low systolic blood pressure (SBP) high heart rate (HR) and altered Glasgow Coma Scale (GCS) were found to be significantly linked to worse survival outcomes. These results demonstrate the significance of these vital signs as prognostic markers in critically ill populations which is in line with previous research. (Reisner, Chen, Kumar, & Reifman, 2014). Hypotension for instance has consistently been associated with a higher risk of death since it impacts oxygen delivery and perfusion both of which are vital in critically ill patients (SBP 110 mmHg). (Meng, 2021). The importance of treating anemia and controlling temperature as part of patient care in intensive settings is further highlighted by the fact that hypothermia and low hematocrit (Hct 26 percent) in this cohort are linked to higher mortality (Mutio, 2008).

The descriptive statistics show that the ICU patients in this cohort are diverse and have a range of clinical parameters. A considerable percentage of the population is probably going to have comorbidities which can make managing acute respiratory failure (ARF) more difficult given the mean age of 55 and 2 years. According to earlier studies older patients frequently have several chronic conditions which can make their respiratory problems worse and result in worse outcomes (Alhaid et al., 2024). One study for example found that among critically ill patients especially those with respiratory failure age is a significant predictor of mortality (Killien et al., 2019). Significant physiological stress is evident in many patients as evidenced by the skewness in vital signs like heart rate and blood pressure. The evidence to support the need for hemodynamic stability management for the patient is in the study. (Knaus et al., 1985). To ascertain the association between these features and predicting the success of a patient in the intensive care unit plays an important role in implementing personalized interventions and results in a positive patient outcome.

The demographic survey showed that a large proportion of the cohort's patients comprised males which was correlated with a previously conducted study that implied the existence of gender differences in the prevalence and consequences of ARF. As per the studies conducted, males outperform females in the rate of occurrence of severe respiratory diseases owing to let us say, for instance, the fact that more males smoke or are more exposed to working environments. (Heffernan et al., 2011). Additional results confirmed that more male patients with acute renal failure development had a mortality rate higher compared to female patients (Kollef, 1998) . In addition, the distribution of age states that old people and vulnerable groups who suffer from debilitating chronic diseases such as Diabetes and Cardiovascular Diseases by-stand interventions must be put in place (C. C. Lai et al., 2019). For the demographic information, the specific formula includes gender and age as inputs and the intensive care unit is one of the numerous dots that receive this field data.

Furthermore, it was found in this study that there were only 25% of patients who belonged to the APACHE score group (mortality score of 40 or higher) that are alive which shows that for some certain acute physiology and chronic health evaluation (APACHE II) scores (≥21) higher mortality rates were confirmed as APACHE is a trustable predictor for intensive care units. The finding that higher APACHE scores indicate more severe clinical deterioration is consistent with this result.(Mumtaz et al., 2023). Such a great connection point! The Clinical data and an APACHE score of 12 or more are allied to different departments in the intensive care unit, thereby furnishing the patients' welfare by warning about the consequences. Carol Rivers concluded from previous research that the APACHE II scoring system is an effective way to evaluate the severity of the patient's illness and the higher the scores are the higher is the mortality rate of the patient (Knaus et al., 1985). The research indicates a massive raise in the death rate of the patients whose APACHE II scores exceeded 20.(Mumtaz et al., 2023). The findings of the study showed that the patients though have high heart rates and low SBP are the most susceptible, thus the group of those patients needs to be carefully monitored and quickly treated. (Tian et al., 2021). The above gives the example of the important role of incorporating APACHE II severity scores in standard clinical evaluation to guide treatment decision making.

How to allocate resources and adjust interventions for the patients who are most vulnerable is a question that physicians should especially touch on in cases of this observation. Besides that, it was uncovered that the ventilation status had an influential role in both the length of stay (LOS) and the risk of death. The rate of LOS and mortality was much higher among the patients on the ventilator for a longer period. The longer time of mechanical ventilation is closely related to the length of patient life as determined by the ventilation status. A longer period of mechanical ventilation was associated with more deaths among patients which is in line with the findings from earlier research stressing out that long mechanical ventilation is causatively associated with more complications and mortality in critically ill patients. (Esteban et al., 2008). For instance, this investigation (Muscedere, Martin, & Heyland, 2008) Research unveiled that the patients who went through mechanical ventilation for over 7 days were at much higher risk of getting ventilator-associated pneumonia (VAP) and other complications leading to a higher death rate. In addition, it is a proven fact that the patients who will have the worse consequences if fraction of inspired oxygen (FiO2) is set higher because their respiratory conditions are generally more severe. (Helms et al., 2024). This research underlined the prevention of ARF through adequate ventilation strategies, which will likely result in the best possible outcome.

Patients who were ventilated for more than four days were much more likely to die as a result of complications. (Sakr et al., 2021). Higher levels of FiO2 (≥40 percent) were associated with lower survival rates. The study by Hopkins et al. (2005) pointed out that the acute respiratory distress syndrome (ARDS) is further worsened by the need for high oxygen demand (Keyt & Peters, 2018). The survey takes full regard for breathing support and in addition it decreases the odds that are linked to the continued use of ventilation. This observation would suggest a sensible option to the management of oxygen therapy settings and ventilation parameters. (Banavasi, Nguyen, Osman, & Soubani, 2021).

The distribution of patients according to the aim for admission reveals notable variations in the survival rates of diverse circumstances. In particular the mortality rate for patients admitted with pneumonia was significantly higher than that of patients without pneumonia which is in line with earlier studies that highlight the seriousness of pneumonia as a major cause of (Bauer, Ewig, Rodloff, & Müller, 2006). Researchers

(Cillóniz, Torres, & Niederman, 2021) discovered that pneumonia was linked to an increased risk of death in intensive care unit patients especially those who had underlying medical conditions. Acute respiratory distress syndrome (ARDS) is a critical condition with poor outcomes as demonstrated by other studies. The high mortality rate among ARDS patients additional supports these discoveries (Ranieri et al., 2012). These results highpoint the need for patients with these high-risk conditions to obtain tailored interventions and administration plans.

Moreover, difficulties like vasopressor (Gershengorn, Stelfox, Niven, & Wunsch, 2020) dependency ventilator-associated pneumonia (VAP) (Spalding, Cripps, & Minshall, 2017) and new-onset shock (Zhou et al., 2014) were strongly linked with lengthier LOS and higher mortality. The investigation of difficulties shows a clear association between higher death rates and the emergence of specific difficulties. Respiratory illnesses, VAP, and vasopressor dependency were all significantly connected with increased death which is in line with previous research that found these complications to be significant causes of ICU patient consequences (Bor, Demirag, Okcu, Cankayali, & Uyar, 2015). for example, this study presented that the risk of death was significantly higher for patients who developed VAP than for those who did not understand the consequences of infection control procedures in the intensive care unit (Muscedere et al., 2008). Also, findings from other studies showing that acute kidney injury is a recurrent complication in critically ill patients and is linked to worse results are consistent with the association between renal disease and death (Gameiro, Marques, & Lopes, 2021). These results highpoint the need of proactive problem solving in order to increase ARF patients' survival rates.

Since VAP raises the risk of sepsis multi-organ dysfunction and an extended ICU stay these complications are well-established indicators of unfavorable outcomes(Kalil et al., 2016). Comparably vasopressors are frequently required for hemodynamic support however extended use of these medications is linked to increased mortality possibly as a result of refractory shock states or the severity of the underlying illness (Alhashemi, Cecconi, & Hofer, 2011).

The length of stay in the in the ICU is significantly correlated with the analysis of comorbidities. Longer hospital stays were seen by patients with illnesses like cancer, immunocompromised states, and metabolic disorders. This is in line with previous studies showing that comorbidities can make it more hard to manage critically ill patients and their clinical sequence (Esper & Martin, 2011). For example, one research that was done by a (Esper & Martin, 2011) It was found out that cancer patients had a prolonged hospital stay and an increased incidence of complications due to unsolved problems in treating both acute illness and the underlying cancer. He further noted that extended hospitalization and augmented use of resources are connected with metabolic disorders. (Alhaid et al., 2024). It was found out that cancer patients had a prolonged hospital stay and an increased incidence of complications due to unsolved problems in treating both acute illness and the underlying cancer. He further noted that extended hospitalization and augmented use of resources are connected with metabolic disorders.

The mean occurrence of type 1 respiratory failure (RF) and the mortality rates are of great significance depending on the patient distribution by RF type. As the study demonstrated the patients who had Type 1 RF featuring not enough oxygen in their blood and not the increase of carbon dioxide had a higher chance of dying than those with Type 2 RF. In the preceding study it was mentioned that the Type 1 RF is usually related to pneumonia and ARDS which have a higher death risk (Ranieri et al., 2012). A research paper that was done (Vincent et al., 2002) Additionally, it was found that those patients diagnosed with Type 1 RF showed alarming outcomes mostly if they had a lung problem prior. This work stresses on the objectives for the re-invention of medical management procedures that able to respond and treat the communities of patients who are victims of Type 1 RF.

The association between the time spent in a hospital (LOS) and clinical data on the Modified Early Warning Score (MEWS) is indicative of the fact that if the patient is in the hospital for a longer period, the score of the MEWS is higher. This result is consistent with other studies that revealed the capability of the early warning scores for foreseeing sick patients' deterioration and application in the patients' case whose condition is critically severe and who need to use medical inputs. (Subbe, Kruger, Rutherford, & Gemmel, 2001). Such as the most basic one (Alam et al., 2014) It was found that patients who having higher MEWS scores have been noticed to have a really extended length of stay which has necessitated more tracking and control. The other factor linking the importance of quick recognition and the treatment of patients at risk is the connection between certain clinical parameters such as low blood pressure and higher heart rate and longer LOS (Davwar et al., 2023). These results can be understood as the patients' visits aim to fulfill medical care and, at the same time, achieve the most out of the resources for intensive care.

One can analyze the effects of mortality and duration of hospital stay in ICU with the help of a regression analysis. Comorbidities along with non-invasive ventilation, and high APACHE scores are some of the important predictors detected that are similar to the previous findings which also determined these elements as crucial outcome determinants in critically ill populations. (Knaus et al., 1985). This scoring system is highly useful in clinical practice as shown by (Esteban et al., 2008) It was found that patients who had higher APACHE scores died much more often. The fact that patients on longer non-invasive ventilation have higher mortality rates in agreement with other studies that depict the fact that a long ventilation might arise in problem and worse outcomes (Helms et al., 2024). These findings show the importance of early identification and treatment of patients at higher risk in order to improve survival rates and reduce hospitalization.

The outcomes from this research have suggested that implementing a multidisciplinary approach to patient care in the ICU can elevate the outcomes. Care for the most critical patients could be enhanced by using different healthcare experts such as nurses, respiratory therapists, and pharmacists. This joint effort leads to a comprehensive examination together with pharmacogenomics to assess the lung toxicity risk of each individual, which is mostly significant in the cases of ARF and the polymorbidity (Kim, Barnato, Angus, Fleisher, & Kahn, 2010).

Furthermore, the use of technology, such as telemedicine and remote monitoring, for patient management in the ICU could increase the efficiency of the process. With these tools, observation of the patient's vital signs and checking up upon other possible clinical symptoms in real-time is possible, which allows us to be more responsive to making appropriate interventions. Research has confirmed that the usage of telemedicine within the critical care units does help outcomes to the patients and there is also a reduction of hospital days (Arun, Sykes, & Tanbeer, 2024).

If the failure of an organ in the ICU takes place, it will cause poor results, and this is a worry. Yet one more new finding of this examination is the fact that the severity of multi-organ failure is a big factor in the outcomes of patients. Failures of organs, especially those of the liver, kidneys, and the heart, are the major handicaps stopping recovering patients from having a good sleep. Before this one, the evidence showed that multi-organ failure could lead to death with the chain reaction mechanism and in such a way that the failure of one organ would worsen the dysfunction of others, thereby increasing the severity of the patient’s condition. A cohort study conducted by (Holder et al., 2017) The study illustrated that patients who scored below a certain threshold in the sequential organ failure assessment tool were at a significantly increased risk of needing long stays in the ICU or dying. Precise recognition of the multi-organ failure and its timely management plan is the mainstay of patient survival and minimization of the ICU stays. The results of the study revealed that people with an acute decline in the kidney function usually spend prolonged periods at the hospital because they need dialysis machines and strict fluid balance, which underscores the need for the timely identification and treatment of the issues.

Furthermore, the nutritional disorder is vital for the consequences of ICU patients, particularly for those requiring prolonged mechanical ventilation. Adequate nutrition is vital for immune purposes and wound healing, while insufficient nutritional status has been linked with advanced mortality rates, as it hinders the body’s capacity to improve from serious illness. Study shows that early enteral feeding reductions infection rates and improves results in ICU patients. In this group, individuals who faced significant weight loss or malnutrition had markedly prolonged ICU durations and decrease survival rates. It is important to accept a multidisciplinary strategy to assess and address the nutritional requirements of critically ill patients. This technique should involve dieticians, nurses, and doctors to create tailored feeding plans to improve patient recovery (Kalaiselvan, Arunkumar, Renuka, & Sivakumar, 2021).

The influence of sedation approaches also seemed as a significant section affecting both LOS and mortality. Prolonged use of sedatives, particularly in patients with mechanical ventilation, has been found to delay recovery by limiting the patient's capacity to participate in rehabilitation activities like immediate mobilization. Research directs that light sedation strategies and reducing sedation depth can improve recovery and diminish problems linked to ventilators. In the present cohort, persons who were deeply sedated for lengthy durations faced notably prolonged ICU admissions, an advanced likelihood of delirium, and reduced long-term cognitive capabilities. Reducing sedation depth, while continuing patient comfort, ought to be an essential feature of ICU management approaches to improve outcomes (Quickfall, Sklar, Tomlinson, Orchanian-Cheff, & Goligher, 2024).

Another significant factor is the influence of family engagement in the ICU. Recent research has highlighted the important of emotional support from families and their participation in decision-making for critically ill patients' care. In this group, patients with families that joined actively in care choices experienced better consequences, likely because of improved communication between healthcare workers and families about treatment objectives, possible difficulties, and recovery expectations. Endorsing family contribution in curative planning, while making certain emotional support is accessible for relatives during challenging times, can improve patient consequences and improve the emotional health of family memberships. This method can improve some of the stress related to extended ICU stays and may lead to better patient participation and compliance with treatment plans (Hetland, Hickman, McAndrew, & Daly, 2017).

Combined with clinical administration, the accessibility of healthcare organization and resources significantly impacts patient consequences in the ICU. According to the study, the provision of ICU beds, nurses, & the availability of specific equipment like continuous patient monitoring systems & dialysis machines, is linked to both patient bifurcation & length of their stay. It has been concluded that crammed ICUs, which are equipped with not enough resources, are the leading causes of the greater fatality rate of patients and the extended vital hospitalization time. One of the most significant considerations in the ICU unit's capability to provide rapid patient care and the access to the necessary supplies and services. The resource management and also the risk management on the patient side are the core determinants of not only the quality of care but the overall efficiency of the ICU treatment plans (Sakr et al., 2015).

Furthermore, the psychosocial aspects of recovery considerably affect how the results will be in a short and long view for survivors of the ICU. Studies confirm that post-ICU syndrome, in a wider sense of the meaning, can include physical, cognitive, and psychological challenges that have a significant impact on the quality of life for patients following their discharge from the ICU. The scientific research has provided evidence that individuals who have undergone a long stay in the ICU, especially those who were on mechanical ventilation for an extended period, are at a great risk of developing PICS, which could cause the recovery to drag on and therefore be the reason for a lower overall survival rate (Needham et al., 2012). For ICU survivors, the main goal after staying in the ICU is to offer support to their physical health, emotional health, and cognition; by doing so, they would be able to recover fully and reduce the chance of illnesses subsequent to the ICU care.

Eventually, the research highlights the need for continuous education and training for ICU workers related to the treatment of ARF and its connected complications. Continuing professional training can help healthcare providers stay present with the newest evidence-based methods, subsequent in enhanced patient care and better results (Aziz, 2023).

this study highpoints the consequences of several clinical fundamentals including multi-organ failure, nutritional conditions, sedation administration, family participation, healthcare facilities, and post-ICU recovery plans affecting both LOS and mortality rates between ICU patients. By focusing on these elements and joining thorough management approaches, such as timely identification and involvement, tailored care plans, and effective use of healthcare resources, healthcare providers can improve the survival rates and life quality of critically ill patients. These results also lay the basis for generating risk stratification models that may be used in ICU settings to inform clinical choices, rank care for at-risk patients, and progress overall patient results.

In the end, this study affords important information on comorbidities ventilation requirements APACHE scores, and clinical parameters as critical elements in patient prognosis providing a basis for additional examination and possible risk stratification models in intensive care units. Incorporating these conclusions into clinical practice could improve patient outcomes by guiding interventions adapting resource allocation and simplifying early identification of high-risk patients.

4.2 Strengths and Limitations

4.2.1 Strengths

1. Comprehensive Information Gathering: The study was directed through a retrospective cohort with sample N = 460 and timeframe 2018-2023.

2. Varied Patient Population: The diverse patients carefully chosen for the study reflect diverse age groups and gender, and the distribution of severity of respiratory failure, and comorbidities rises the external validity of the study.

3. Comprehensive Clinical Assessment: This method of targeting specific clinical parameters such as the APACHE scores, vital signs, lab results gives the study real visions into the determining factor of mortality and LOS in the patients with ARF.

4.2.2 Limitations

Single Center Study: Some sources of possible bias that may have affected the conducted study are related to the fact that the study was carried out in only one healthcare facility (NNUH), which may limit the degree to which the got conclusions can be widespread to other locations or other people with diverse patterns of healthcare consumption and utilization.

4.3 Conclusion

This study is vital in shedding light on the demographic clinical and comorbid factors that impact mortality and length of stay (LOS) in critical care patients. According to the results, certain clinical parameters such as raised heart rate, decrease in systolic blood pressure (SBP), and modified Glasgow Coma Scale (GCS) scores are important predictors of adverse conclusions. The success of ICU follow-up care is dependent on some key interventions such as training in rehabilitation, psychological support, and cognitive to boost patients from physical and mental impairments and to prevent long-term consequence of their stay in the ICU

In addition to this, the close association of these vital signs with death indicates that doctors should carefully examine, diagnose and immediately provide treatments for the critically ill patient.

The age of the population and the sex distribution, which is mostly male, are two of the key results in the demographic evaluation that lead to the importance of the specifics of the problems faced by the different age groups and of including gender-related risks in management strategies. The study also confirms that the APACHE II system of scores is a reliable tool for predicting patients' outcomes with advanced mortality being associated with higher scores. Thus, it underlines the importance of using APACHE scores in standard clinical assessments for the purpose of identifying patient choices and resource among departments. Specifically, for patients who need continuous care, the close relationship between ventilation condition and patient outcome shows the importance of well execution of the mechanical ventilation methods.

Comorbidities have a considerable influence on LOS and overall results and the analysis of comorbidities demonstrates that patients with situations such as cancer and metabolic disorders need specific care to address the difficulties of their clinical performances.

The findings about the diverse types of respiratory failure and its side effects such as vasopressor dependency and ventilator-associated pneumonia highlight the significance of early intervention and infection control measures in the intensive care unit.

This study lays the groundwork for future investigations into risk stratification models in intensive care units. By incorporating these results into clinical practice healthcare providers can improve patient outcomes through targeted interventions effective resource allocation and early identification of high-risk patients.

The information acquired from this study will be vital in lowering the intensive care unit's death rates and increasing the standard of care provided to patients in serious condition.

Significant clinical demographic and comorbid factors that affect LOS and mortality in ICU patients are highlighted in this study. GCS scores heart rate APACHE II scores and systolic SBP are a few of the important clinical parameters that are significant predictors of patient outcomes. In particular, lower SBP (110 mmHg) a higher heart rate and lower GCS scores were associated to a lower chance of survival while APACHE II scores more than 40 markedly elevated the risk of death. According to earlier studies, vital sign stability and APACHE II scoring are precise indicators of ICU patient outcomes and these conclusions support those findings.

Associations between complications such as vasopressor dependency, ventilator-associated pneumonia (VAP), developing new onset of shock increased mortality and prolonged length of stay (LOS), established the serious consequences of these conditions in the intensive care unit. VAP patients and those needing prolonged mechanical ventilation had longer lengths of stay which is consistent with earlier research viewing the impact of VAP on ICU resources and patient prognosis. Thus, patient survival depends on the intensity and period of ICU interventions.

Furthermore, linked to increased mortality was prolonged vasopressor dependency which is required for hemodynamic stability. These problems show how important it is to closely monitor the use of vasopressors and ventilation to minimize any possible side effects. High APACHE scores, .prolonged NIV lower heart rates and decreased hematocrit levels are all important predictors of death in patients in intensive care units according to regression analysis. VAP, coagulopathy, low WBC, and shorter IMV period were all significantly connected with longer hospital stays for LOS representing that patient with complex respiratory requirements and compromised immune systems generally require longer hospital stays. These associations support to targeted interventions that purpose to decrease the length of stay and improve survival by managing complications particularly respiratory support and hematologic marker monitoring. Comorbidities like immunosuppression cancer smoking history and metabolic disorders were found to be strongly correlated with worse outcomes highlighting the increased risk for ICU patients with pre-existing medical conditions.

Death rates were significantly higher for cancer patients and immunocompromised individuals which was consistent with their increased susceptibility to infections and reduced resistance to harsh treatments. According to the study conclusions, clinicians should consider comorbidities when planning care for patients in intensive care units and adapt interventions to the unique risks associated to each patient's medical history. The study ultimately shows that there are complex associations among clinical parameters, the need for intervention, and patient comorbidities that could be influenced by the result of the ICU stay.

Pre-existing medical conditions, including heart rate, SBP, VAP, APACHE scores, and the need for vasopressor use, and these associations are useful to create a risk-based framework and to optimize treatment delivery. The interpretation of the data to the ICU (intensive care unit) staff is made by concentrating the nurses' attention to the first suspected cases and using the existing resources as efficiently as possible.

Besides this, the effects of the study are also seen in developing clinical directives and standards for the treatment of critical care patients. Healthcare facilities can produce high-quality care that fits the individual specifications by implementing evidence-based practices which account for the normal demographic, clinical, and comorbid factors. However, this may also involve creating patient-specific screening instruments as well as mobile data sharing, which can be used to identify patients at risk of the infection.

In addition, the results are indicative that collaborative care is crucial for patients with critical illness. A combination of several healthcare professionals like intensivists, nurses, respiratory therapists, and pharmacists can be an effective way to increase the level of care with a focus on the patients' special needs. Using this approach; nurses and other staff members can foster an environment where there is both better control and management of the patient's comorbidities and vital signs, as well as the development of a culture in the organization that contributes individually and collectively to the patient's welfare.

The research also emphasizes that one of the key issues is the training of health care workers in the field of acute respiratory failure and their connected complications is an ongoing thing, continuous education must be an integration into the current care settings as a result. It is obvious that if a new method is used to educate the healthcare professionals it will be more efficient and thus it will be beneficial not only for the patient but also for the healthcare workers. The success of the staff in the future depends on the dedication of teachers, which are a pillar of clinical abilities, patient management, and eventually patient outcomes, who are the students' healthcare providers.

Additionally, the study text identifies overcoming the challenges of acute respiratory failure and its related problems through non-stop education and training of healthcare professionals as very important. The continuous professional training in turn, is given contemporary evidence-based methods and techniques that might help them to deal with the unpredictable, unstable circumstances caused by the severely ill people. This commitment to teach maybe leads to better clinical abilities and handling of patient management. Hence, it can result in improvements in patient health.

Besides majorly, it has a chance to become the driving force of the revolution that will take the viewing of the patient data using breakthrough methods. By doing this, healthcare providers may even calculate predictions, which will, in fact, will result in the recognition of such patients at high risk of encountering real-time problems. This particular approach can, therefore, be a means to rapid intervention as well as better the allocations of resources, thus, it may result in the better quality of care delivered in the ICU.

Another very important fact is the necessity of early detection and fast response to help patients who might encounter any untoward effects. One of the earliest indicators of clinical deterioration is unbalanced vital signs such as abnormal heart rate or low oxygenation levels as well as worsening results on lab tests which makes it very important for improving the chances of survival. This plan is designed in a way that it is the similar to the findings of the study which is shown by the fact that the intervention defined as early can work out the situation by taking problems in advance. In the former case, if the problem changes are noticed, a proactive plan will be undertaken to try to prevent long-term adverse effects.

Moreover, the results of the study advocate for a broader combination of technological innovations in the ICU, particularly about prognostic analytics and real-time monitoring technologies. Using AI systems to investigate patient information and anticipate probable undesirable consequences may provide decision-making, equipping healthcare teams with the knowledge required to perform before a patient's situation deteriorations. These technologies have the possible to significantly decrease mortality rates and improve the overall efficiency of ICU management.

The study supports the combination of long-term care strategies for survivors of the ICU. Due to the complexity and continuing effects of severe illness, an emphasis on post-ICU treatment is vital. Continuing monitoring, rehabilitation, and psychological support post-discharge are important factors for attractive long-term consequences.

A complete strategy that participates in direct and longstanding care might result in enhanced recovery consequences and a better quality of life for ICU patients.

In summary, this research suggests an important understanding of the complicated relationship between demographic, clinical, and comorbid elements that affect mortality and period of hospitalization in intensive care unit patients. By acknowledging the importance of these elements and participating them in clinical practice, healthcare professionals can generate tailored strategies that improve patient outcomes. The results deliver a basis for future studies focused on enhancing risk stratification models and elevating the overall standard of care in intensive care environments. In the end, the purpose is to establish a healthcare setting in which very ill patients find the best level of care, subsequent in improved survival rates and a better quality of life.

4.4 Recommendation

4.4.1 Implement Early Assessment Protocols

- Establish and bring into function uniform protocols to classify and check the patients who are in the early stages of ARF. Consequently, this entails checking the comorbidity, lab test results, and clinical appearances of the patients at the time of ICU admission.

- Intensivists, nurses, respiratory therapists, and pharmacists should be working together to make the best treatment plan for each patient and follow the procedure correctly. On the other hand, the outcome of the patient can be good and the treatment and the physicians' discussion about the patient are effective

4.4.2 Preventive Strategies

- Emphasize the significance of avoiding conditions that cause ARF by implementing treatment protocols of sepsis pneumonia and chronic obstructive pulmonary disease (COPD) in the population group at the highest risk

4.4.3 Utilize evidence-based strategies

- managing mechanical ventilation such as reducing the use of sedatives and encouraging spontaneous breathing trials to minimize the length of ventilation and intensive care unit stays.

4.4.4 Educate Patients and Families

- Inform patients and their families about the prospects for long-term intensive care unit support and the prognosis of ARF. Families support and satisfaction during a patient's critical illness can be enhanced by their involvement in care decisions.

4.4.5 Monitor and Adjust Resource Allocation

- To pinpoint areas that require improvement assess ICU resource usage and patient outcomes regularly. Reevaluating bed capacity equipment availability and staffing levels may be necessary to guarantee the best possible care delivery.

4.4.6 Conduct Additional Research

- Promote continued studies on the long-term consequences of ARF patients the efficacy of early intervention techniques and the discovery of other risk factors that might be involved in extended intensive care unit stays.

4.4.7 Right follow-up and support services are available

- To facilitate recovery and reduce readmission rates it is important to establish clear transition pathways for patients moving from the intensive care unit to step-down units or home care.

List of Abbreviations

Abbreviation	Meaning
ARF	Acute Respiratory Failure
ICU	Intensive Care Unit
MV	Mechanical Ventilation
LOS	Length of Stay
FiO2	Fraction of Inspired Oxygen
APACHE	Acute Physiology and Chronic Health Evaluation
SBP	Systolic Blood Pressure
HR	Heart Rate
GCS	Glasgow Coma Scale
Hct	Hematocrit
Na	Sodium
Temp	Temperature
PaO2	Partial Pressure of Arterial Oxygen
PaO2/FiO2	Ratio of Partial Pressure of Arterial Oxygen to Fraction of Inspired Oxygen
RF	Respiratory Failure
VAP	Ventilator-Associated Pneumonia
GIB	Gastrointestinal Bleeding
PEEP	Positive End-Expiratory Pressure
MICU	Medical Intensive Care Unit
NNUH	Norfolk and Norwich University Hospital
NIV	Non-Invasive Ventilation
ARDS	Acute Respiratory Distress Syndrome
SPSS	Statistical Package for the Social Sciences
SD	Standard Deviation
OR	Odds Ratio
CI	Confidence Interval
WBC	White Blood Cell
IMV	Invasive Mechanical Ventilation
COPD	Chronic Obstructive Pulmonary Disease

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Appendices

Appendix A

Tables of Study

Table A.1

Distribution of patients according to Clinical data

Clinical Data and Modified Early Warning Score.	Total	Survival status	Statistical test	P-value	Chi-square
	(N=460) N (%)	Survived (N=223)	Died (N=237)		
SBP					
<110	208(45.2)	83(39.9)	125(60.1)	0.010	11.180
≥110	252(54.7)	140(55.5)	112(44.4)		
DBP					
<60	190(41.3)	92(48.4)	98(51.6)	1.000	0.000
≥60	270(58.7)	131(48.5)	139(51.5)		
MAP					
<76	219(47.6)	99(45.2)	120(54.8)	0.192	1.179
≥76	241(52.4)	124(51.5)	117(48.5)		
HR					
<100	190(41.3)	118(62.1)	72(37.9)	0.000	24.066
≥100	270(58.7)	105(38.9)	165(61.1)		
Temp					
<37	207(45)	113(54.6)	94(45.4)	0.019	5.627
≥37	253(55)	110(43.5)	143(56.5)		
RR					
<23	225(48.9)	118(52.4)	107(47.6)	0.113	2.774
≥23	235(51.1)	105(44.7)	130(55.3)		
GCS					
<14	212(46.1)	56(26.4)	156(73.6)	0.000	76.637
≥14	248(53.9)	167(67.3)	81(32.7)		
Hct					
<26	198(43)	83(41.9)	115(0.8)	0.018	5.988
≥26	262(57)	140(53.4)	122(46.6)		
WBCs					
<11	227(49.3)	109(48)	118(52)	0.853	0.038
≥11	233(50.7)	114(49)	119(51)		
Cr					
<1.175	230(50)	115(50)	115(50)	0.576	0.426
≥1.175	230(50)	108(47)	122(53)		
Na					
<139	225(48.9)	126(56)	99(44)	0.002	9.976
≥139	235(51)	97(41.)	138(59)		
K					
<4.1	223(48.5)	110(49.3)	113(50.7)	0.780	0.125
≥4.1	237(51.5)	113(47.7)	124(52.3)		

Ph					
<7.36	212(46.1)	79(37.3)	133(62.7)	0.000	19.799
≥7.36	248(53.9)	144(0.58)	104(41.9)		
CO2					
<40	206(44.8)	107(51.9)	99(48.1)	0.190	1.792
≥40	254(55.2)	116(45.7)	138(54.3)		

Table A.2

Distribution of the patients based on their reason for admission with death

Distribution of the patients based on their reason for admission	Total	Survival status		P-value	Chi-square
	(N=460) N (%)	Survived (N=223)	Died (N=237)		
RF					
No	178(38.7)	93(52.2)	85(47.8)	0.214	1.650
Yes	282(61.3)	130(46.1)	152(53.9)		
Pneumonia					
No	171(37.2)	104(60.8)	67(39.2)	0.000	16.590
Yes	289(62.8)	119(41.2)	170(58.8)		
COPD					
No	398(86.5)	190(47.7)	208(52.3)	0.214	0.647
Yes	62(13.5)	33(53.2)	29(46.8)		
P-edema					
No	387(84.1)	189(48.8)	198(51.2)	0.799	0.126
Yes	73(15.9)	34(46.6)	39(53.4)		
P-embolism					
No	447(97.2)	216(48.3)	231(51.7)	0.782	0.154
Yes	13(2.8)	7(53.8)	6(46.2)		
p-hemorrhage					
No	390(84.8)	194(49.7)	195(50)	0.242	1.643
Yes	70(15.2)	29(41.4)	41(58.6)		
ARDS					
No	407(88.5)	208(51.1)	199(48.9)	0.002	9.763
Yes	53(11.5)	15(28.3)	38(71.7)		
Atelectasis					
No	376(81.7)	176(46.8)	200(53.2)	0.148	2.298
Yes	84(18.3)	47(56)	37(44)		
Post OP					
No	437(95)	203(46.5)	234(53.5)	0.000	14.352
Yes	23(5)	20(87)	3(13)		
GI bleeding					
No	428(93)	203(47.4)	225(52.6)	0.141	2.707
Yes	32(7)	20(62.5)	12(37.5)		
Pancreatitis					
No	454(98.7)	219(48.2)	235(51.8)	0.437	0.805
Yes	6(1.3)	4(66.7)	2(33.3)		
Septic shock					
No	237(51.5)	142(60)	95(40)	0.000	25.604

Yes	223(48.4)	81(36.3)	142(63.7)		
Cardiac arrest					
No	443(96.3)	217(49)	226(51)	0.327	1.228
Yes	17(3.7)	6(35.3)	11(64.7)		
Cardiovascular					
No	429(93.2)	209(48.7)	220(51.3)	0.715	0.146
Yes	31(6.8)	14(45.2)	17(54.8)		
Renal					
No	429(93.3)	211(49.2)	218(50.8)	0.272	1.270
Yes	31(6.7)	12(38.7)	19(61.3)		
Hepatic injury					
No	429(93.3)	211(49.2)	218(50.8)	0.272	1.270
Yes	31(6.7)	12(38.7)	19(61.3)		
Cerebrovascular					
No	437(95)	208(47.6)	229(52.4)	0.133	2.716
Yes	23(5)	15(65.2)	8(34.8)		

Table A.3

Distribution of the patients based on complications with death

Distribution of the patients based on complication	Total	Survival status	Statistical test	P-value	Chi-square
	(N=460) N (%)	Survived (N=223)	Died (N=237)		
Required fio2					
No	206(44.8)	130(63.1)	76(36.9)	0.000	31.960
Yes	254(55.2)	93(36.6)	161(63.4)		
RF					
No	281(61.1)	129(45.9)	152(54.1)	0.181	1.911
Yes	179(38.9)	94(52.5)	85(47.5)		
Vasopressors					
No	107(23.3)	87(81.3)	20(18.7)	0.000	60.169
Yes	353(76.7)	136(38.5)	217(61.5)		
Renal disease					
No	228(49.6)	133(58.3)	95(41.7)	0.000	17.579
Yes	232(50.4)	90(38.8)	142(61.2)		
Hepatic injury					
No	289(62.8)	174(60.2)	115(39.8)	0.000	42.822
Yes	171(37.2)	49(28.7)	122(71.3)		
GIB					
No	409(89)	198(48.4)	211(51.6)	1.000	0.007
Yes	51(11)	25(49)	26(51)		
New shock					
No	272(59)	157(57.7)	115(42.3)	0.000	22.760
Yes	188(41)	66(35.1)	122(64.9)		
Cerebrovascular					
No	367(79.8)	181(49.3)	186(50.7)	0.488	0.513
Yes	93(20.2)	42(45.2)	51(54.8)		
Myopathy					
No	408(88.7)	197(48.3)	211(51.7)	0.883	0.054
Yes	52(11.3)	26(50)	26(50)		
Coagulopathy					
No	393(85.4)	200(50.9)	193(49.1)	0.017	6.287
Yes	67(14.6)	23(34.3)	44(65.7)		
VAP					
No	337(73.3)	186(55.2)	151(44.8)	0.000	22.750
Yes	123(26.7)	37(30)	86(70)		
Cerebrovascular					

No	408(88.7)	205(50.2)	203(49.8)	0.053	4.057
Yes	51(11.3)	18(35.3)	33(64.7)		
Need OP					
No	402(87.4)	195(48.5)	207(51.5)	1.000	0.001
Yes	58(12.6)	28(48.3)	30(51.7)		
Fio2 50%					
No	206(44.8)	130(63.1)	76(36.9)	0.000	31.964
Yes	254(55.2)	93(36.6)	161(63.4)		
Using peep 10					
No	322(70)	197(61.2)	125(38.8)	0.000	70.933
Yes	137(30)	25(10.9)	112(89.1)		

Table A.4

Distribution of the patients based on co-morbidities

Distribution of the patients based on co-morbidities	Total (N=460) N (%)	Survival status		P-value	Chi-square
		Survived (N=223)	Died (N=237)		
Immunocompromised					
No	196(42.6)	132(67.3)	64(32.7)	0.000	48.680
Yes	264(57.4)	91(34.5)	173965.5)		
Metabolic disorder					
No	212(46.1)	89(41.9)	123(58.1)	0.012	6.646
Yes	248(53.9)	134(54)	114(46)		
Cerebrovascular					
No	405(88)	190(46.9)	215(53.1)	0.084	3.320
Yes	55(12)	33(60)	22(40)		
Cancer					
No	208(45.2)	133(63.9)	75(36.1)	0.000	36.350
Yes	252(54.8)	90(35.7)	162(64.3)		
COPD					
No	394(85.7)	187(47.5)	207(52.5)	0.291	1.136
Yes	66(14.3)	36(54.5)	30(45.5)		
Smoking					
No	285(62)	165(57.9)	120(42.1)	0.000	26.595
Yes	175(38)	58(33.1)	117(66.9)		
COVID					
No	373(81.1)	177(47.5)	196(52.5)	0.405	0.830
Yes	87(18.9)	46(52.9)	41(47.1)		
Autoimmune diseases					
No	422(91.7)	196(46.4)	226(53.6)	0.004	8.451
Yes	38(8.3)	27(71.1)	11(28.9)		
Psychiatric disorder					
No	406(88.3)	196(48.3)	210(51.7)	0.677	0.272
Yes	5(11.7)	3(60)	2(40)		
Arrythmia					
No	399(86.7)	185(46.4)	214(53.6)	0.027	5.375
Yes	61(13.3)	38(62.3)	23(37.7)		

Renal disease					
No	311(67.6)	144(46.3)	167(53.7)	0.195	1.820
Yes	149(32.4)	79(53)	70(47)		
Hepatic failure					
No	417(90.7)	208(49.9)	209(50.1)	0.077	3.510
Yes	43(9.3)	15(34.9)	28(65.1)		
Cerebrovascular					
No	297(64.6)	141(47.5)	165(55.6)	0.626	0.338
Yes	163(35.4)	82(50.3)	81(49.7)		
GIB					
No	382(83)	184(48.2)	198(51.8)	0.576	0.511
Yes	78(17)	43(55.1)	35(44.9)		

Table A.5

Clinical Data and Modified Early Warning Score with length of stay

Clinical Data and Modified Early Warning Score.	Total	Survival status		P-value	Chi-square
	(N=460) N (%)	Survived (N=223)	Died (N=237)		
SBP					
<110	208(45.2)	111(53.4)	97(46.6)	0.001	11.900
≥110	252(54.8)	94(37.3)	158(62.7)		
DBP					
<60	190(41.3)	91(47.9)	99(52.1)	0.134	1.453
≥60	270(58.7)	114(42.2)	156(57.8)		
MAP					
<76	219(47.6)	104(47.5)	115(52.5)	0.260	1.446
≥76	241(52.4)	101(41.9)	140(58.1)		
HR					
<100	190(41.3)	73(38.4)	117(61.6)	0.029	4.946
≥100	270(58.7)	132(48.9)	138(51.1)		
Temp					
<37	207(45)	90(43.5)	117(56.5)	0.706	0.180
≥37	253(55)	115(45.5)	138(54.5)		
RR					
<23	225(48.9)	92(40.9)	133(59.1)	0.134	2.409
≥23	235(51.1)	113(48.1)	122(51.9)		
GCS					
<14	212(46.1)	78(36.8)	134(63.2)	0.003	9.616
≥14	248(53.9)	127(51.2)	121(48.8)		
Hct					
<26	198(43)	88(44.4)	110(55.6)	1.000	0.002
≥26	262(57)	117(44.7)	145(55.3)		
WBCs					
<11	227(49.3)	115(50.7)	112(49.3)	0.011	6.740
≥11	233(50.7)	90(38.6)	143(61.4)		
Cr					
<1.175	230(50)	102(44.3)	128(55.7)	1.000	0.009
≥1.175	230(50)	103(44.8)	127(55.2)		
Na					
<139	225(48.9)	116(51.6)	109(48.4)	0.004	8.711
≥139	235(51.1)	89(37.9)	146(62.1)		
K					
<4.1	223(48.5)	97(43.5)	126(56.5)	0.707	0.200
≥4.1	237(51.5)	108(45.6)	129(54.4)		
pH					
<7.36	212(46.1)	93(43.9)	119(56.1)	0.851	0.077
≥7.36	248(53.9)	112(45.2)	136(54.8)		
Co2					
<40	206(44.8)	99(48.1)	107(51.9)	0.187	1.843
≥40	254(55.2)	106(41.7)	148(58.3)		

Table A.6

Distribution of the patients based on their reason for admission with LOS

Distribution of the patients based on their reason for admission with LOS	Total	LOS period		P-value	Chi-square
	(N=460) N (%)	Less than 10 days (N=205)	10 days ≥ (N=255)		
RF					
No	178(38.7)	83(46.6)	95(53.4)	0.501	0.501
Yes	282(61.3)	122(43.2)	160(56.7)		
Pneumonia					
No	171(37.2)	76(44.4)	95(55.6)	1	0.002
Yes	289(62.8)	129(44.6)	160(55.4)		
COPD					
No	398(86.5)	183(45.9)	215(54.1)	0.132	2.392
Yes	62(13.5)	22(35.5)	40(64.5)		
P-edema					
No	387(84.1)	172(44.4)	215(55.6)	0.899	0.014
Yes	73(15.9)	33(45.2)	40(54.8)		
P-embolism					
No	447(97.2)	198(44.3)	249(55.7)	0.577	0.466
Yes	13(2.8)	7(53.8)	6(46.1)		
p-hemorrhage					
no	390(84.8)	175(44.9)	215(55.1)	0.795	0.098
yes	70(15.2)	30(42.8)	40(57.1)		
ARDS					
No	407(88.5)	189(46.4)	218(53.6)	0.028	5.012
Yes	53(11.5)	16(30.2)	37(69.8)		
Atelectasis					
No	376(81.7)	173(46.1)	203(53.9)	0.225	1.7411
Yes	84(18.2)	32(38.1)	52(61.9)		
Post OP					
No	437(95)	195(44.6)	242(55.4)	1	0.012
Yes	23(5)	10(43.5)	13(56.5)		
GI bleeding					
No	428(93.1)	194(45.3)	234(54.7)	0.271	1.446
Yes	32(6.9)	11(34.4)	21(65.6)		
Pancreatitis					
No	454(98.7)	202(44.5)	252(55.5)	1	0.073
Yes	6(1.3)	3(50)	3(50)		
Septic shock					
No	237(51.5)	107(45.1)	130(54.9)	0.851	0.067
Yes	223(48.5)	98(43.9)	125(56.1)		

Cardiac arrest					
No	443(96.3)	203(45.8)	240(54.2)	0.005	7.688
Yes	17(3.7)	2(11.8)	15(88.2)		
Cardiovascular					
No	429(93.3)	190(44.3)	239(55.7)	0.71	0.197
Yes	31(6.7)	15(48.4)	16(51.6)		
Renal					
No	429(93.6)	191(44.5)	238(55.5)	1	0.005
Yes	31(6.7)	14(45.2)	17(54.8)		
Hepatic injury					
No	429(93.3)	192(44.8)	237(55.2)	0.852	0.093
Yes	31(6.7)	13(41.9)	18(58.1)		
Cerebrovascular					
No	437(95)	197(45.1)	240(54.9)	0.393	0.938
Yes	23(5)	8(34.8)	15(65.2)		

Table A.7

Distribution of the participants based on complications with LOS

Distribution of the participants based on complications with LOS	Total	LOS period			
	(N=460)	Less than 10 days	10 days ≥	P-value	Chi-square
	N (%)	(N=205)	(N=255)		
RF					
No	281(61.1)	121(43.1)	160(56.9)	0.442	0.236
Yes	179(38.9)	84(46.9)	95(53.1)		
Vasopressors					
No	107(23.3)	61(57.1)	46(42.9)	0.004	8.74
Yes	353(76.7)	144(40.7)	209(59.2)		
Renal disease					
No	228(49.6)	103(45.2)	125(54.8)	0.851	0.068
Yes	232(50.4)	102(43.9)	130(56.1)		
Hepatic injury					
No	289(62.8)	133(46.1)	156(53.9)	0.438	0.667
Yes	171(37.2)	72(42.1)	99(57.9)		
GIB					
No	409(88.9)	189(41.2)	220(53.8)	0.052	4.041
Yes	51(11.1)	16(31.4)	35(68.6)		
New shock					
No	272(59.1)	155(56.9)	117(43.1)	0.000	41.557
Yes	188(40.9)	50(26.6)	138(73.4)		
Cardio vascular					
No	367(97.8)	166(45.2)	201(54.8)	0.641	0.326
Yes	93(20.2)	39(41.9)	54(58.1)		
Myopathy					
No	408(88.7)	205(50.2)	203(49.8)	0.000	47.132
Yes	52(11.3)	0(0)	52(100)		
Coagulopathy					
No	393(85.4)	166(42.2)	227(57.8)	0.017	5.900
Yes	67(14.6)	39(58.2)	28(41.8)		
VAP					
No	337(73.3)	189(56.1)	148(43.9)	0.000	67.670
Yes	123(26.7)	16(13.1)	107(86.9)		
C.V.D					
No	408(88.7)	189(46.3)	219(53.7)	0.052	4.100
Yes	52(11.3)	16(30.7)	35(67.3)		
Need OP					

No	402(87.4)	186(46.3)	216(53.7)	0.066	3.745
Yes	58(12.6)	19(32.8)	39(67.2)		
Fio2 50%					
No	206(44.8)	95(46.1)	111(53.9)	0.572	0.363
Yes	254(55.2)	110(43.3)	144(56.7)		
Using peep 10					
No	322(70.3)	152(47.2)	170(52.8)	0.081	3.330
Yes	137(29.7)	52(37.9)	85(62.1)		

Table A.8

Distribution of the patients based on co-morbidities with LOS

Distribution of the patients based on co morbidities	Total (N=460) N (%)	LOS period: Less than 10 days (N=205)	LOS period: 10 days ≥ (N=255)	P-value	Chi-square
Immunocompromised					
No	196(42.6)	132(67.3)	64(32.7)	0.000	48.681
Yes	264(57.4)	91(34.5)	173(65.5)		
Metabolic disorder					
No	212(46.1)	89(41.9)	123(58.1)	0.012	6.646
Yes	248(53.9)	134(54.1)	114(45.9)		
C.V.D					
No	405(88.1)	190(46.9)	215(53.1)	0.084	3.320
Yes	55(11.9)	33(60)	22(40)		
Cancer					
No	208(45.2)	133(63.9)	75(36.1)	0.000	36.352
Yes	252(54.8)	90(35.7)	162(64.3)		
COPD					
No	394(85.7)	187(47.5)	207(52.5)	0.291	1.136
Yes	66(14.3)	36(54.5)	30(45.5)		
Smoking					
No	285(61.9)	165(57.9)	120(42.1)	0.000	26.595
Yes	175(38.1)	58(33.1)	117(66.9)		
COVID					
No	373(81.1)	177(47.4)	196(52.5)	0.405	0.830
Yes	87(18.9)	46(52.9)	41(47.1)		
Autoimmune diseases					
No	422(91.7)	196(46.4)	226(53.6)	0.004	8.451
Yes	38(8.3)	27(71)	11(29)		
Psychiatric disorder					
No	406(88.3)	184(48.3)	222(51.7)	0.677	0.272
Yes	54(11.7)	50(92.6)	4(7.4)		
Arrythmia					
No	399(86.7)	176(44.1)	223(55.9)	0.014	5.375
Yes	61(13.3)	29(47.5)	32(52.5)		
Renal disease					
No	311(67.6)	144(46.3)	167(53.7)	0.195	1.820
Yes	149(32.4)	79(53.1)	70(46.9)		

Hepatic failure					
No	417(90.7)	208(49.9)	209(50.1)	0.077	3.510
Yes	43(9.3)	15(34.8)	28(65.2)		
Cardio vascular disorder					
No	297(64.6)	141(47.5)	156(52.5)	0.626	0.338
Yes	163(35.4)	82(50.3)	81(49.7)		
GIB					
No	382(83.1)	184(48.2)	198(51.8)	0.576	0.511
Yes	78(16.9)	42(53.8)	36(46.2)		

Table A.9

Relationship between multiple clinical and demographic variables and the likelihood of death based on logistic regression

Variables	Total	Survival status		p-value	OR	95% C.I.	
	(N=460) N (%)	Survived (N=223)	Died (N=237)			Lower	Upper
HR							
<100	190(41.3)	118(62.1)	72(37.9)	0.005	2.6	1.333	4.898
≥100	270(58.7)	105(38.9)	165(61.1)				
Temp							
<37	207(45)	113(54.6)	94(45.4)	0.430	1.3	0.695	2.350
≥37	253(55)	110(43.5)	143(56.5)				
GCS							
<14	212(46.1)	56(26.4)	156(73.6)	0.410	1.4	0.629	3.111
≥14	248(53.9)	167(67.3)	81(32.7)				
Hct							
<26	198(43)	83(41.9)	115(0.8)	0.033	2.0	1.058	3.682
≥26	262(57)	140(53.4)	122(46.6)				
Na							
<139	225(48.9)	126(56)	99(44)	0.825	0.9	0.502	1.733
≥139	235(51)	97(41.)	138(59)				
pH							
<7.36	212(46.1)	79(37.3)	133(62.7)	0.147	1.6	0.849	2.987
≥7.36	248(53.9)	144(0.58)	104(41.9)				
APACHE (points)							
<21	224(48.7)	163(72.7)	61(27.3)	0.503	1.6	0.397	6.573
≥21	224(48.7)	163(72.7)	176(74.6)				
APACHE (mortality)							
<40	216(47)	162(75)	54(25)	0.014	0.2	0.046	0.711
≥40	244(53)	61(25)	183(75)				
period of NIV							
<6	223(48.5)	75(33.6)	148(66.4)	0.003	2.6	1.387	4.762
≥6	237(51.5)	148(62.4)	89(37.5)				
Pao2\Fio2 ratio							
<248	229(49.8)	85(37.1)	144(62.9)	0.085	1.8	0.926	3.313
≥248	231(50.2)	138(59.7)	93(40.3)				
Pneumonia							
No	171(37.2)	104(60.8)	67(39.2)	0.809	1.1	0.571	2.051
Yes	289(62.8)	119(41.2)	170(58.8)				
ARDS							
No	407(88.5)	208(51.1)	199(48.9)	0.012	4.0	1.352	12.127
Yes	53(11.5)	15(28.3)	38(71.7)				

Post OP							
No	437(95)	203(46.5)	234(53.5)	0.465	1.8	0.367	8.942
Yes	23(5)	20(87)	3(13)				
Septic shock							
No	237(51.5)	142(60)	95(40)	0.143	0.6	0.332	1.172
Yes	223(48.5)	81(36.3)	142(63.7)				
Type 1							
No	125(27.2)	51(40.8)	74(59.2)	0.673	1.2	0.575	2.355
Yes	335(72.8)	172(51.3)	163(48.7)				
Vasopressors							
No	107(23.3)	87(81.3)	20(18.7)	0.009	0.3	0.121	0.743
Yes	353(76.7)	136(38.5)	217(61.5)				
Renal disease							
No	228(49.6)	133(58.3)	95(41.7)	0.521	0.8	0.437	1.522
Yes	232(50.4)	90(38.8)	142(61.2)				
Hepatic injury							
No	289(62.8)	174(60.2)	115(39.8)	0.000	0.3	0.144	0.563
Yes	171(37.2)	49(28.7)	122(71.3)				
New shock							
No	272(59)	157(57.7)	115(42.3)	0.519	0.8	0.386	1.616
Yes	188(41)	66(35.1)	122(64.9)				
Coagulopathy							
No	393(85.4)	200(50.9)	193(49.1)	0.282	0.6	0.272	1.461
Yes	67(14.6)	23(34.3)	44(65.7)				
VAP							
No	337(73.3)	186(55.2)	151(44.8)	0.629	1.2	0.545	2.728
Yes	123(26.7)	37(30)	86(70)				
Fio2 50%							
No	206(44.8)	130(63.1)	76(36.9)	0.219	0.7	0.344	1.278
Yes	254(55.2)	93(36.6)	161(63.4)				
Using peep 10							
No	322(70)	197(61.2)	125(38.8)	0.001	0.2	0.106	0.536
Yes	137(30)	25(10.9)	112(89.1)				
Cerebrovascular							
No	297(64.6)	141(47.5)	165(55.6)	0.373	0.7	0.274	1.625
Yes	163(35.4)	82(50.3)	81(49.7)				
Immunocompromised							
No	196(42.6)	132(67.3)	64(32.7)	0.028	0.4	0.157	0.900
Yes	264(57.4)	91(34.5)	173965.5)				
Metabolic disorder							

No	212(46.1)	89(41.9)	123(58.1)	0.514	0.8	0.417	1.550
Yes	248(53.9)	134(54)	114(46)				
Cancer							
No	208(45.2)	133(63.9)	75(36.1)	0.985	1.0	0.404	2.432
Yes	252(54.8)	90(35.7)	162(64.3)				
Smoking							
No	285(62)	165(57.9)	120(42.1)	0.000	0.3	0.165	0.581
Yes	175(38)	58(33.1)	117(66.9)				
Autoimmune diseases							
No	422(91.7)	196(46.4)	226(53.6)	0.960	1.0	0.301	3.129
Yes	38(8.3)	27(71.1)	11(28.9)				
Arrhythmia							
No	399(86.7)	185(46.4)	214(53.6)	0.382	1.5	0.619	3.502
Yes	61(13.3)	38(62.3)	23(37.7)				

Table A.10

Relationship between multiple clinical and demographic variables and the likelihood of LOS based on logistic regression

variables	Total	Survival status		p-value	OR	95% C.I.for EXP(B)	
	(N=460) N (%)	Survived (N=223)	Died (N=237)			Lower	Upper
SBP							
<110	208(45.2)	111(53.4)	97(46.6)	0.051	0.6	0.379	1.001
≥110	252(54.8)	94(37.3)	158(62.7)				
HR							
<100	190(41.3)	73(38.4)	117(61.6)	0.558	1.2	0.696	1.957
≥100	270(58.7)	132(48.9)	138(51.1)				
GCS							
<14	212(46.1)	78(36.8)	134(63.2)	0.241	0.7	0.325	1.327
≥14	248(53.9)	127(51.2)	121(48.8)				
WBCs							
<11	227(49.3)	115(50.7)	112(49.3)	0.004	0.5	0.309	0.799
≥11	233(50.7)	90(38.6)	143(61.4)				
Na							
<139	225(48.9)	116(51.6)	109(48.4)	0.412	0.8	0.504	1.325
≥139	235(51.1)	89(37.9)	146(62.1)				
APACHE (points)							
<21	224(48.7)	163(72.7)	61(27.3)	0.905	1.1	0.331	3.488
≥21	236(51.3)	60(25.4)	176(74.6)				
APACHE (mortality)							
<40	216(47)	162(75)	54(25)	0.587	0.7	0.228	2.309
≥40	244(53)	61(25)	183(75)				
period of IMV							
<4	228	142	86	0.002	0.4	0.209	0.711
≥4	232	63	169				
Fio2							
<40	152	78	74	0.444	0.8	.488	1.369
≥40	308	127	181				
ARDS							
No	407(88.5)	189(46.4)	218(53.6)	0.273	0.7	0.303	1.401
Yes	53(11.5)	16(30.2)	37(69.8)				
Cardiac arrest							
No	443(96.3)	203(45.8)	240(54.2)	0.387	0.4	0.067	2.860
Yes	17(3.7)	2(11.8)	15(88.2)				
Vasopressors							
No	107(23.3)	61(57.1)	46(42.9)	0.509	0.8	0.457	1.475

Yes	353(76.7)	144(40.7)	209(59.2)				
GIB							
No	409(88.9)	189(41.2)	220(53.8)	0.317	0.7	0.300	1.476
Yes	51(11.1)	16(31.4)	35(68.6)				
New shock							
No	272(59.1)	155(56.9)	117(43.1)	0.127	0.6	0.372	1.132
Yes	188(40.9)	50(26.6)	138(73.4)				
Myopathy							
No	408(88.7)	205(50.2)	203(49.8)	0.997	0.0	0.000	0.000
Yes	52(11.3)	0(0)	52(100)				
Coagulopathy							
No	393(85.4)	166(42.2)	227(57.8)	0.014	2.4	1.196	4.833
Yes	67(14.6)	39(58.2)	28(41.8)				
VAP							
No	337(73.3)	189(56.1)	148(43.9)	0.000	0.3	0.120	0.544
Yes	123(26.7)	16(13.1)	107(86.9)				
cerebrovascular							
No	297(64.6)	141(47.5)	156(52.5)	0.549	0.8	0.331	1.800
Yes	163(35.4)	82(50.3)	81(49.7)				
Immunocompromised							
No	196(42.6)	132(67.3)	64(32.7)	0.801	0.9	0.372	2.147
Yes	264(57.4)	91(34.5)	173(65.5)				
Metabolic disorder							
No	212(46.1)	89(41.9)	123(58.1)	0.460	1.2	0.736	1.969
Yes	248(53.9)	134(54.1)	114(45.9)				
Cancer							
No	208(45.2)	133(63.9)	75(36.1)	0.294	1.6	0.657	3.998
Yes	252(54.8)	90(35.7)	162(64.3)				
Smoking							
No	285(61.9)	165(57.9)	120(42.1)	0.168	1.5	0.842	2.687
Yes	175(38.1)	58(33.1)	117(66.9)				
Autoimmune diseases							
No	422(91.7)	196(46.4)	226(53.6)	0.252	1.6	0.711	3.684
Yes	38(8.3)	27(71)	11(29)				
Arrhythmia							
No	399(86.7)	176(44.1)	223(55.9)	0.028	2.3	1.093	4.835
Yes	61(13.3)	29(47.5)	32(52.5)				

Appendix B

Data sheet form

Code

Part one: Demographic data.

Age:

Gender: male ☐female☐

Part Two: Reason for Admission

pneumonia	☐ yes	☐ no
COPD	☐ yes	☐ no
Pulmonary edema	☐ yes	☐ no
Pulmonary hemorrhage	☐ yes	☐ no
ARDS	☐ yes	☐ no
atelactasis	☐ yes	☐ no
postoperative	☐ yes	☐ no
gastrointestinal bleeding	☐ yes	☐ no
septic shock	☐ yes	☐ no
cardiac arrest	☐ yes	☐ no
cardiovascular disease	☐ yes	☐ no
renal disease	☐ yes	☐ no
coagulopathy	☐ yes	☐ no
hepatic injury	☐ yes	☐ no
cerebrovascular diseases	☐ yes	☐ no

Part Three: Type of RF: ☐ 1 ☐11

Part Four: factor effect on LOS

Using vasopressor	☐ yes	☐ no
renal disease	☐ yes	☐ no
Hepatic injury	☐ yes	☐ no
Massive gastrointestinal tract bleeding	☐ yes	☐ no
new Sepsis	☐ yes	☐ no
cardiovascular diseases	☐ yes	☐ no
myopathy	☐ yes	☐ no
VAP	☐ yes	☐ no
cerebrovascular diseases	☐ yes	☐ no
Need further operation	☐ yes	☐ no
require Fio2 ≥50%	☐ yes	☐ no
Using PEEP ≥10 cm H2O	☐ yes	☐ no

Part Five: PMH

Immunocompromised States	☐ yes	☐ no
Metabolic Disorders	☐ yes	☐ no
Neurological Disorders	☐ yes	☐ no
Cancer Autoimmune Diseases	☐ yes	☐ no
Psychiatric Disorders	☐ yes	☐ no
arrhythmia	☐ yes	☐ no
Renal failure	☐ yes	☐ no

Hepatic failure ☐ yes ☐ no

Cardiovascular disease ☐ yes ☐ no

gastrointestinal tract disorders ☐ yes ☐ no

Part Six: Laboratory Values

SBP …. DBP….. MAP …. HR …. Temperature …. RR …..

GCS…. Pao2…. Hct…. Wbc…. CREA….. Na…..

k…. PH…… FIO2 ……. CO2 …..

Part seven: ICU Scales (APACHE II Score): …..

Part eight: Using Vasopressor

Norepinephrine ☐ yes ☐ no

Vasopressin ☐ yes ☐ no

Dobutamine ☐ yes ☐ no

Dopamine ☐ yes ☐ no

Part nine: Sedation

Fentanyl ☐ yes ☐ no

Remifentanil ☐ yes ☐ no

Midazolam ☐ yes ☐ no

Propofol ☐ yes ☐ no

Dexmedetomidine ☐ yes ☐ no

Part Ten: Mechanical Ventilation:

- Invasive Ventilation ☐ yes ☐ no

Period on IV…..

- Non-Invasive Ventilation ☐ yes ☐ no

Period on NIV…..

Pao2/Fio2 Ratio…..

LOS :..

Part Eleven: Outcomes:

- Survival ☐ yes ☐ no

- Require Rehabilitation ☐ yes ☐ no

- Death ☐ yes ☐ no

جــامعـــــة النجاح الوطنية

كليـــة الدراســـــات العليـــا

تنبؤات المرضى الذين يعانون من فشل التنفس الحاد ويتطلبون إقامة طويلة في وحدة العناية المركزة في مستشفى الرعاية الثالثية: دراسة استعادية

إعداد

منار ملوح

إشراف

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قدمت هذه الرسالة استكمالا لمتطلبات الحصول على درجة الماجستير في البحث السريري، من كلية الدراسات العليا، في جامعة النجاح الوطنية، نابلس– فلسطين.

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الملخص

الخلفية: يُعد الفشل التنفسي الحاد من أكثر الحالات خطورة، ويرتبط بفترات إقامة مطولة في وحدة العناية المركزة. تهدف هذه الدراسة إلى تحديد عوامل الخطر المرتبطة بطول الإقامة والوفيات لدى هؤلاء المرضى.

الهدف: تقييم التنبؤ بالنتائج ومعدلات البقاء على قيد الحياة لدى مرضى الفشل التنفسي الحاد في وحدة العناية المركزة بمستشفى رعاية ثالثية.

الطرق: دراسة استرجاعية شملت البالغين المصابين بالفشل التنفسي الحاد المقبولين بين عامي 2018 و2023. تم جمع البيانات الديموغرافية والسريرية والتداخلات العلاجية. استخدمت اختبارات الانحدار اللوجستي، (t-test)، ومربع كاي (Chi-square) عبر برنامج SPSS (الإصدار 21) لتحليل المتغيرات المرتبطة بالوفيات وطول الإقامة.

النتائج: بلغ عدد المشاركين 460 مريضًا (52–61% ذكور)، بمتوسط عمر 59 عامًا. لم يكن للعمر أو الجنس تأثير معنوي على الوفيات. ارتبط انخفاض الضغط الانقباضي (<110 ملم زئبق)، وزيادة معدل ضربات القلب (≥100 نبضة/دقيقة)، وانخفاض الحرارة(<37°C)، ومقياس غلاسكو <14، وقيم منخفضة للهيماتوكريت، الصوديوم، وpH، بزيادة خطر الوفاة.

كانت معدلات البقاء أعلى بين المرضى ذوي درجات APACHE المنخفضة، ومرتبطة بفترات تهوية صناعية أقصر وعدد تدخلات أقل. ارتفعت معدلات الوفاة وطول الإقامة مع الحالات التالية للجراحة، الالتهاب الرئوي، متلازمة الضائقة التنفسية الحادة، والمضاعفات كاستخدام مضادات انقباض الأوعية، أمراض الكلى، وإصابات الكبد.

الخلاصة: تؤكد الدراسة أهمية التقييم المبكر واستخدام أدوات مثل APACHE II لتحسين التنبؤ بالنتائج السريرية وتقليل مدة الإقامة. كما تدعو إلى منهجيات علاجية متعددة التخصصات لمعالجة المضاعفات المصاحبة.

الكلمات المفتاحية: فشل التنفس الحاد، وحدة العناية المركزة، APACHE II، التنبؤ بالنتائج، مدة الإقامة، مستشفى النجاح الوطني الجامعي.