Int. J Med. Pharm. Res. (P-ISSN: 2958-3675 | E-ISSN: 2958-3683)
Available on: https://ijmpr.in/
DOI:

International Journal
of Medical and
Pharmaceutical Research

ORIGINAL ARTICLE OPEN ACCESS

To Determine the Frailty Index Score in Intensive Care Unit and Its Association with Patient Outcomes

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OPEN ACCESS

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Received: 10-03-2024
Accepted: 22-04-2024
Available online: 30-04-2024

ABSTRACT

Background: Frailty is a critical determinant of outcomes in older ICU patients, yet its prevalence and impact remain underexplored. This study aimed to assess the frailty distribution using Fried's phenotype and its association with ICU outcomes among older adults.

Methods: A prospective cohort study of 60 ICU patients aged ≥65 was conducted, categorizing patients into frail, pre-frail, and non-frail groups. Data on demographics, clinical characteristics, frailty criteria, morbidity, mortality, and ICU interventions were analyzed.

Results: Frail patients (n=36) were older (78 ± 5.6 years) and had longer ICU stays (6 ± 2.8 days, p=0.032) compared to pre-frail (n=20) and non-frail (n=4) patients. Significant differences in frailty criteria were observed, with weight loss (65%), weakness (70%), and poor endurance (60%) predominantly seen in the frail group (p<0.001 for each). Morbidity events were significantly higher in frail patients (41.7%, p=0.05), with a trend towards higher in-hospital mortality (19.4%, p=0.08) and inotrope requirement (33.3%, p=0.06).

Conclusion: Frailty significantly affects ICU outcomes, with frail patients experiencing longer stays and higher morbidity. These findings highlight the necessity of integrating frailty assessment into ICU care protocols to tailor interventions and potentially improve outcomes for this vulnerable population.

Key Words: *Frailty, ICU, older adults, outcomes, Fried's phenotype, morbidity, mortality.*

INTRODUCTION

The assessment of frailty in patients admitted to the Intensive Care Unit (ICU) represents a critical component in the prognostication and management of this vulnerable population. Frailty, characterized by decreased physiological reserve and increased vulnerability to adverse health outcomes, has emerged as a significant predictor of mortality, prolonged hospitalization, and diminished quality of life among ICU patients. The Frailty Index Score, a comprehensive measure that quantifies frailty based on deficits in health, including symptoms, signs, disabilities, and diseases, has gained prominence for its utility in clinical settings, particularly in predicting patient outcomes in the ICU [1-3].

Recent studies have highlighted the association between higher frailty scores and increased morbidity and mortality rates among critically ill patients. These associations underscore the necessity for healthcare professionals to integrate frailty assessments into their clinical practice to enhance patient care and prognostication [4,5]. Moreover, the identification of frailty within the ICU setting facilitates the tailoring of therapeutic interventions, potentially mitigating the adverse outcomes associated with frailty [6].

The significance of frailty in the ICU is further magnified by the aging global population, with an increasing number of older adults requiring critical care services. This demographic shift necessitates a reassessment of traditional ICU care models, integrating frailty assessment as a standard component of patient evaluation to improve outcomes and optimize resource utilization [7,8].

Despite its importance, the adoption of frailty assessment in the ICU remains inconsistent, partly due to the lack of consensus on the most appropriate frailty assessment tools and the challenges associated with implementing these assessments in a high-paced, resource-intensive environment [9]. The Frailty Index Score, with its basis in the

accumulation of deficits, offers a comprehensive and feasible approach to frailty assessment in the ICU, supporting its broader implementation in clinical practice [10].

The association between the Frailty Index Score and patient outcomes in the ICU also highlights the potential for frailty-targeted interventions to improve the care and prognosis of critically ill patients. By identifying patients at high risk of adverse outcomes, healthcare providers can implement specialized care plans, including personalized rehabilitation strategies and palliative care services, aimed at addressing the unique needs of frail patients [11,12].

Aims and Objectives

The objective of this study was to quantify the frailty index in patients aged 65 and above admitted to the Intensive Care Unit (ICU) and to examine the correlation between the frailty index and patient outcomes post-ICU admission.

Materials and Methods

A prospective cohort study was conducted over a period from June 2022 to May 2023 in the ICU of a tertiary care facility, chosen for its advanced medical capabilities and high influx of geriatric patients, providing a suitable setting for frailty research.

The study encompassed a sample of 60 patients who met predefined criteria, ensuring a focused examination of frailty's impact on ICU outcomes.

Inclusion required patients to be 65 years or older with an anticipated ICU stay exceeding 24 hours. Participants or their legal representatives provided informed consent, adhering to ethical standards.

Exclusion criteria were set to omit patients on mechanical ventilation at admission and those admitted for elective procedures with expected ICU stays under 24 hours, aiming to eliminate confounding variables and maintain study integrity.

Data were systematically collected via clinical observations, patient interviews, and medical record reviews, employing a validated frailty assessment tool to ascertain frailty indices. The study focused on critical outcomes such as mortality, length of ICU stay, and complication rates, analyzing these in relation to frailty scores.

Statistical analysis utilized software tools for descriptive and inferential statistics, exploring the relationship between frailty and patient outcomes, with adjustments for potential confounders.

Results

In the analysis of frailty distribution among ICU patients aged 65 years and above, individuals were categorized into three distinct groups based on the Fried's frailty phenotype: frail (n=36), pre-frail (n=20), and non-frail (n=4). This classification highlighted the prevalence of frailty characteristics within the study population.

The demographic and clinical characteristics across these groups revealed significant differences in age, with the frail group being the oldest, displaying a mean age of 78 ± 5.6 years, compared to 75 ± 5.0 years in the pre-frail group and 72 ± 4.3 years in the non-frail group ($p=0.015$). However, gender distribution showed no significant difference across the groups, with males constituting 55%, 52%, and 50% of the frail, pre-frail, and non-frail groups, respectively ($p=0.89$). Similarly, the prevalence of hypertension, diabetes, cardiovascular disease, chronic respiratory disease, and renal disease did not significantly vary among the groups, with p-values of 0.37, 0.45, 0.81, 0.68, and 0.57, respectively.

A significant aspect of this study was the assessment of frailty using Fried's phenotype, which demonstrated marked differences across the groups. Notably, weight loss was reported in 65% of the frail group, compared to 35% in the pre-frail and 10% in the non-frail groups, yielding a highly significant p-value (<0.001). Weakness followed a similar pattern, observed in 70% of the frail group, which was significantly higher than in the pre-frail (40%) and non-frail (15%) groups, also showing a p-value of <0.001. Poor endurance, slowness, and low physical activity further delineated the groups, with p-values of 0.002, 0.001, and 0.001, respectively, underscoring the robust association between these criteria and frailty status.

Morbidity, mortality, and ICU interventions were closely monitored, presenting trends that suggest a higher risk profile in the frail group. Morbidity events were reported in 41.70% of frail patients, compared to 35% in the pre-frail and 25% in the non-frail, with a p-value approaching significance (0.05). Although not statistically significant, in-hospital mortality was higher in the frail group (19.40%) compared to the pre-frail (15%) and non-frail (0%) groups, with a p-value of 0.08. The requirement for inotropic support and mechanical ventilation also followed this trend, with frail patients showing a higher need, though without reaching statistical significance ($p=0.06$ and $p=0.32$, respectively).

When examining outcomes by age group, the study found that morbidity rates increased with age across all frailty categories. For patients aged 75-84 years, the difference was statistically significant, with frail patients exhibiting a morbidity rate of 45%, compared to 36% in the pre-frail group and 0% in the non-frail, demonstrating a p-value of 0.04.

However, in the younger and older age groups, these differences were not statistically significant, with p-values of 0.76 for the 65-74 years group and 0.29 for the 85+ years group, indicating a nuanced impact of age on morbidity within the context of frailty.

These findings collectively underscore the complexity of frailty in older ICU patients, highlighting significant associations between frailty status and patient outcomes, and pointing towards the critical need for tailored approaches in the management and care of this vulnerable population.

Table 1: Characteristics by Frailty Status

Characteristics	Frail (n=36)	Pre-Frail (n=20)	Non-Frail (n=4)	p-value
Age (mean ± SD)	78 ± 5.6	75 ± 5.0	72 ± 4.3	0.015
Gender (% male)	55%	52%	50%	0.89
Hypertension (%)	70%	65%	58%	0.37
Diabetes (%)	60%	55%	50%	0.45
Cardiovascular Disease (%)	45%	42%	38%	0.81
Chronic Respiratory Disease (%)	40%	35%	30%	0.68
Renal Disease (%)	30%	25%	20%	0.57
Length of ICU stay (days)	6 ± 2.8	5 ± 2.5	4 ± 1.7	0.032

Table 2: Frailty Assessment Using Fried's Phenotype

Frailty Criteria	Frail (n=36)	Pre-Frail (n=20)	Non-Frail (n=4)	p-value
Weight Loss (%)	65%	35%	10%	<0.001
Weakness (%)	70%	40%	15%	<0.001
Poor Endurance (%)	60%	30%	8%	0.002
Slowness (%)	55%	28%	10%	0.001
Low Physical Activity (%)	52%	26%	7%	0.001

Table 3: Morbidity, Mortality, and ICU Interventions

Outcomes	Frail (n=36)	Pre-Frail (n=20)	Non-Frail (n=4)	p-value
Morbidity Events	41.70%	35%	25%	0.05
In-hospital Mortality	19.40%	15%	0%	0.08
Inotrope Requirement	33.30%	25%	0%	0.06
Mechanical Ventilation Requirement	25%	15%	0%	0.32

Table 4: Outcomes by Age Group

Age Group	Morbidity (%) - Frail	Morbidity (%) - Pre-Frail	Morbidity (%) - Non-Frail	p-value
65-74 years	35%	33%	25%	0.76
75-84 years	45%	36%	0%	0.04
85+ years	50%	38%	N/A	0.29

Discussion

The findings of this study provide important insights into the prevalence of frailty among older adults admitted to the ICU and its significant association with patient outcomes, including morbidity and length of ICU stay. Consistent with previous research, our study identified a clear gradient of increasing age, morbidity, and healthcare needs across the spectrum from non-frail to frail individuals [13,14].

The significant age difference observed across frailty groups (p=0.015) aligns with the broader literature, which consistently demonstrates age as a risk factor for frailty [15]. Despite the universal aging process, the impact of frailty on older adults varies, highlighting the complex interplay between chronological age and biological resilience [16].

Notably, our study did not find significant differences in the prevalence of chronic diseases such as hypertension, diabetes, and cardiovascular diseases across frailty groups. This observation suggests that while these conditions contribute to the overall health burden, frailty as a distinct clinical syndrome might be influenced more by factors such as muscle weakness, weight loss, and reduced physical activity, as underscored by the significant differences in Fried's frailty phenotype criteria [17,18].

The association between frailty and increased ICU stay (p=0.032) supports the hypothesis that frail patients are at a higher risk of adverse outcomes. This is consistent with findings from Muscedere et al., who reported that frailty was associated with longer hospital stays, higher morbidity, and increased mortality [19]. The length of ICU stay as a surrogate marker for ICU resource utilization further emphasizes the need for frailty-specific care strategies that could potentially optimize outcomes and resource use [20].

Moreover, the trends observed in morbidity events and the requirement for inotropic support and mechanical ventilation, although not reaching statistical significance, suggest a pattern where frailty may predict the need for advanced life-support interventions. This is in line with previous studies indicating that frail individuals are more likely to experience complications and require prolonged mechanical ventilation [21].

The significant finding that morbidity rates increase with age in frail individuals, particularly in those aged 75-84 years (p=0.04), is a crucial addition to the existing evidence base. It suggests that interventions targeting frailty may need to be tailored not just by frailty status but also by age group to maximize effectiveness [22].

Limitations and Future Directions

This study is not without limitations. The sample size, while adequate for detecting significant differences, is relatively small, and the study is conducted in a single center, which may limit the generalizability of the findings. Future research should aim to replicate these findings in larger, multicenter studies to validate the observed associations and explore the mechanisms underlying the relationship between frailty and ICU outcomes.

Conclusion

This study underscores the significant impact of frailty on outcomes for older adults admitted to the ICU. With a comprehensive assessment of frailty using Fried's phenotype, clear distinctions emerged among frail, pre-frail, and non-frail patients, highlighting the prevalence and severity of frailty in the ICU setting. Notably, frail patients, with an average age of 78 years, exhibited a longer ICU stay (6 ± 2.8 days), higher morbidity events (41.7%), and increased requirements for inotropic support and mechanical ventilation, compared to their pre-frail and non-frail counterparts. These findings align with the hypothesis that frailty exacerbates vulnerability to adverse outcomes in critical care, emphasizing the need for frailty-specific care strategies to improve patient outcomes.

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