Journal of Chemical Health Risks

www.jchr.org

JCHR (2026) 16(1), 2137-2142 | ISSN:2251-6727

Pre Operative Frailty Indices as Predictor of Postoperative Outcomes in Elderly Patients

Dr Rana Pratap*[1], Dr Manish Tripathi[2], Dr Pradeep Kumar Rao[3], Dr Sushila yadav[4]

[1,2,3]Assistant Professor Department of Anaesthesiology Mahamaya Rajkiya Allopathic Medical College Ambedkar Nagar

[4]Department of Anaesthesiology Assistant professor Heritage institute of medical sciences

Corresponding Author: Dr Rana Pratap

(Received: 05 December 2025 Revised: 15 January 2026 Accepted: 10 February 2026)

KEYWORDS

Frailty index; Elderly patients; Postoperative outcomes; Preoperative assessment; Anesthesiology

ABSTRACT:

Background: The growing elderly population has led to an increasing number of surgical procedures in older patients, who are at a higher risk of adverse postoperative outcomes. Chronological age alone is an unreliable predictor of surgical risk, necessitating the use of comprehensive preoperative assessment tools. Frailty, a multidimensional syndrome characterized by reduced physiological reserve, has emerged as an important predictor of postoperative morbidity and mortality.

Objectives: This study aimed to evaluate the role of preoperative frailty indices as predictors of postoperative outcomes in elderly patients undergoing surgery.

Materials and Methods: A hospital-based prospective observational study was conducted in the Department of Anesthesiology at a tertiary care hospital. A total of 95 elderly patients aged ≥60 years undergoing elective surgery were included. Preoperative frailty assessment was performed using a validated frailty index during pre-anesthetic evaluation. Postoperative outcomes assessed included complications, length of hospital stay, requirement for intensive care unit (ICU) admission, and postoperative mortality. Data were analyzed using appropriate statistical methods, with a p-value <0.05 considered statistically significant.

Results: Frail patients demonstrated a significantly higher incidence of postoperative complications, prolonged hospital stay, increased ICU admissions, and higher postoperative mortality compared to non-frail and pre-frail patients. A progressive increase in adverse outcomes was observed with worsening frailty status, indicating a strong association between preoperative frailty and postoperative outcomes.

Conclusion: Preoperative frailty assessment is a valuable tool for predicting postoperative outcomes in elderly surgical patients. Incorporation of frailty indices into routine pre-anesthetic evaluation may improve perioperative risk stratification and facilitate targeted interventions to optimize surgical outcomes in this vulnerable population.

INTRODUCTION

The global demographic shift toward an aging population has led to a substantial increase in the number of elderly patients undergoing surgical procedures. Advancements in surgical techniques, anesthesia, and perioperative care have made surgery feasible even in advanced age groups. However, elderly patients remain particularly vulnerable to postoperative complications due to age-related physiological decline, multiple comorbidities, and reduced functional reserve. Chronological age alone has proven to be an inadequate predictor of surgical risk, prompting the need for more

Journal of Chemical Health Risks
www.jchr.org
JCHR (2026) 16(1), 2137-2142 | ISSN:2251-6727

comprehensive preoperative assessment tools that can accurately stratify risk and guide clinical decision-making [1].

Frailty has emerged as a critical geriatric syndrome that reflects a state of decreased physiological reserve and increased vulnerability to stressors such as surgery. Unlike isolated comorbidities, frailty represents a multidimensional construct encompassing physical, cognitive, nutritional, and psychosocial domains. Frail individuals have impaired homeostatic mechanisms, making them less capable of withstanding surgical stress and more prone to adverse postoperative outcomes, including complications, prolonged hospital stay, functional decline, readmission, and mortality [2,3].

In recent years, preoperative frailty indices have gained increasing attention as robust predictors of postoperative outcomes in elderly patients. These indices aim to quantify frailty objectively using standardized parameters and offer a more individualized risk assessment compared to traditional scoring systems. Commonly used frailty assessment tools include the Fried Frailty Phenotype, the Frailty Index based on deficit accumulation, the Clinical Frailty Scale, and the modified Frailty Index (mFI). Among these, the mFI, derived from the Canadian Study of Health and Aging, has been widely adopted in surgical practice due to its simplicity and ease of integration into routine preoperative evaluation [4].

Several studies have demonstrated a strong association between preoperative frailty and adverse postoperative outcomes across a wide range of surgical specialties, including general surgery, orthopedics, urology, and cardiothoracic surgery. Frail patients have been shown to experience significantly higher rates of postoperative complications such as surgical site infections, pneumonia, delirium, cardiac events, and renal dysfunction. Additionally, frailty has been linked to increased intensive care unit admissions, longer hospital stays, higher healthcare costs, and greater postoperative mortality compared to non-frail counterparts [5,6].

Importantly, frailty has also been identified as an independent predictor of outcomes, even after adjusting for age, comorbidities, and operative complexity. This underscores the concept that frailty captures dimensions of vulnerability not adequately reflected by conventional risk assessment tools such as the American Society of Anesthesiologists (ASA) physical status classification or disease-specific scoring systems. Incorporating frailty assessment into preoperative evaluation allows clinicians to better anticipate postoperative risks, optimize patients preoperatively, and tailor perioperative management strategies [7].

Beyond risk prediction, frailty assessment has significant implications for shared decision-making and patient counseling. Identifying frail patients preoperatively enables realistic discussions regarding surgical benefits, potential risks, expected recovery trajectories, and quality-of-life outcomes. Furthermore, early recognition of frailty provides an opportunity for targeted interventions such as prehabilitation, nutritional optimization, physiotherapy, and multidisciplinary geriatric involvement, which may improve postoperative outcomes and functional recovery [8,9].

Despite growing evidence supporting the utility of frailty indices, their routine incorporation into surgical practice remains inconsistent, particularly in resource-limited settings. Variability in frailty assessment tools, lack of standardized cut-offs, and time constraints in busy clinical environments pose challenges to widespread adoption. Moreover, there is a need for further region-specific and population-based studies to validate the predictive value of frailty indices in diverse surgical populations and healthcare systems [10].

Given the increasing surgical burden among the elderly and the limitations of traditional risk stratification methods, evaluating preoperative frailty indices as predictors of postoperative outcomes is of paramount importance. A better understanding of the role of frailty in surgical prognosis can contribute to improved perioperative care, enhanced patient selection, and ultimately better surgical outcomes in the elderly population. The aim of this study is to evaluate preoperative frailty indices as predictors of postoperative outcomes in elderly surgical patients. The objectives include assessing the association between frailty status and postoperative complications, length of hospital stay, morbidity, and short-term mortality.

MATERIALS AND METHODS

Study Design: Hospital-based prospective observational study.

Journal of Chemical Health Risks

www.jchr.org

JCHR (2026) 16(1), 2137-2142 | ISSN:2251-6727

Study Setting: Department of Anesthesiology at a tertiary care teaching hospital.

Study Duration: Conducted over a defined study period of one year.

Study Population: Elderly patients aged ≥60 years undergoing elective surgery under anesthesia.

Sample Size: A total of **95 patients** were included in the study.

Inclusion Criteria: Patients aged ≥60 years of either sex, planned for elective surgical procedures, and providing informed written consent.

Exclusion Criteria: Emergency surgeries, patients with severe cognitive impairment, terminal illness, or refusal to participate.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using SPSS software version 27.0 (SPSS Inc., Chicago, IL, USA) and GraphPad Prism version 5. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. The unpaired t-test was used to compare continuous variables between independent groups, and the paired t-test was applied for within-group comparisons. Categorical variables were analyzed using the Chi-square test or Fisher's exact test as appropriate. A p-value of <0.05 was considered statistically significant.

RESULT

Table 1. Baseline Demographic Characteristics

Variable	Total (n = 95)
Age (years), mean ± SD	68.4 ± 6.9
Male, n (%)	58 (61.1)
Female, n (%)	37 (38.9)
BMI (kg/m²), mean ± SD	23.6 ± 3.4
ASA Grade III–IV, n (%)	42 (44.2)

Table 2. Distribution of Preoperative Frailty Status

Frailty Category	Number (%)
Non-frail	34 (35.8)
Pre-frail	36 (37.9)
Frail	25 (26.3)

Table 3. Association Between Frailty and Postoperative Complications

Frailty Status	Complications Present n (%)	Complications Absent n (%)	p value
Non-frail (n=34)	5 (14.7)	29 (85.3)	**<0.001**
Pre-frail (n=36)	12 (33.3)	24 (66.7)	
Frail (n=25)	16 (64.0)	9 (36.0)	

Table 4. Frailty Status and Length of Hospital Stay

Frailty Status	Hospital Stay (days), mean ± SD	p value
Non-frail	6.2 ± 1.8	**<0.001**
Pre-frail	8.4 ± 2.6	
Frail	12.1 ± 3.9	

Table 5. ICU Admission According to Frailty Status

Frailty Status	ICU Admission n (%)	No ICU n (%)	p value
Non-frail	3 (8.8)	31 (91.2)	**0.002**
Pre-frail	7 (19.4)	29 (80.6)	
Frail	11 (44.0)	14 (56.0)	

Journal of Chemical Health Risks
www.jchr.org
JCHR (2026) 16(1), 2137-2142 | ISSN:2251-6727

Table 6. Frailty Status and Postoperative Mortality

Frailty Status	Mortality n (%)	Survived n (%)	p value
Non-frail	0 (0)	34 (100)	**0.004**
Pre-frail	2 (5.6)	34 (94.4)	
Frail	5 (20.0)	20 (80.0)	

Figure: 1. Distribution of Postoperative Complications According to Frailty Status (Non-frail, Pre-frail, and Frail Patients)

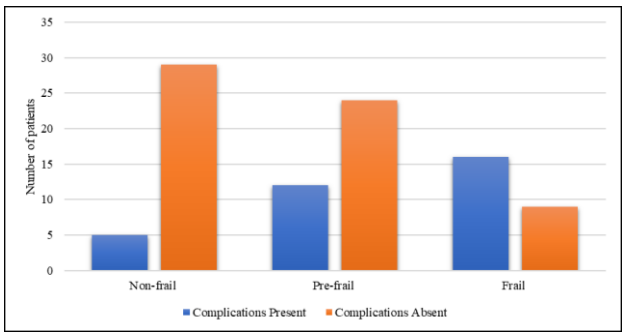

Figure: 2. ICU Admission Status Across Frailty Categories (Non-frail, Pre-frail, and Frail Patients)

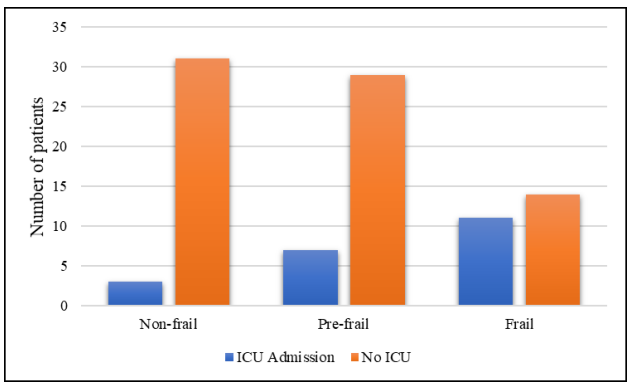

Table 1 shows the baseline demographic and clinical characteristics of the study population. A total of 95 elderly patients were included, with a mean age of 68.4 ± 6.9 years. Males constituted the majority (61.1%), while females accounted for 38.9%. The mean body mass index was 23.6 ± 3.4 kg/m². Nearly half of the patients (44.2%) belonged to ASA physical status grades III–IV, indicating a relatively high perioperative risk profile.

Table 2 depicts the distribution of preoperative frailty status among the study participants. Based on the frailty assessment, 34 patients (35.8%) were classified as non-frail, 36 patients (37.9%) as pre-frail, and 25 patients (26.3%) as frail. This demonstrates that more than two-thirds of the elderly patients exhibited some degree of frailty.

Table 3 illustrates the association between frailty status and postoperative complications. Postoperative complications were observed in 14.7% of non-frail patients, 33.3% of pre-frail patients, and 64.0% of frail patients. The incidence of complications increased significantly with worsening frailty status, and this association was found to be statistically significant ($p < 0.001$).

Table 4 shows the relationship between frailty status and length of hospital stay. The mean duration of hospital stay was shortest in non-frail patients (6.2 ± 1.8 days), followed by pre-frail patients (8.4 ± 2.6 days), and longest in frail patients (12.1 ± 3.9 days). The difference in hospital stay across the three frailty groups was statistically significant ($p < 0.001$).

Table 5 demonstrates the association between frailty status and the requirement for postoperative ICU admission. ICU admission was required in 8.8% of non-frail patients, 19.4% of pre-frail patients, and 44.0% of frail patients. A significant increase in ICU admission was noted with increasing frailty, and this association was statistically significant ($p = 0.002$).

Table 6 presents postoperative mortality across different frailty categories. No mortality was observed in the non-frail group. Mortality occurred in 5.6% of pre-frail patients and 20.0% of frail patients. The association between higher frailty status and increased postoperative mortality was statistically significant ($p = 0.004$).

DISCUSSION

The present study demonstrates that preoperative frailty is a significant predictor of adverse postoperative outcomes in elderly surgical patients. Increasing frailty status was associated with a higher incidence of postoperative complications, prolonged hospital stay, greater need for intensive care admission, and increased postoperative mortality. These findings reinforce the concept that frailty reflects reduced physiological

Journal of Chemical Health Risks
www.jchr.org
JCHR (2026) 16(1), 2137-2142 | ISSN:2251-6727

reserve and vulnerability to surgical stress, beyond what is captured by chronological age or conventional risk assessment tools.

The observed complication rate of 64% among frail patients in this study is comparable to findings reported by Makary et al., who showed that frail elderly patients had significantly higher postoperative complication rates and poorer functional recovery following major surgery [11]. Similarly, Robinson et al. reported that frailty independently predicted postoperative morbidity and mortality across various surgical specialties, even after adjusting for comorbidities and operative risk, highlighting the robustness of frailty as a prognostic marker [12].

In the present study, frail patients experienced a significantly longer hospital stay compared to non-frail and pre-frail groups. This finding is consistent with the results of Partridge et al., who demonstrated that frailty was associated with delayed postoperative recovery and prolonged hospitalization due to increased susceptibility to complications such as infections, delirium, and functional decline [13]. Prolonged hospital stay in frail patients also translates into increased healthcare costs and resource utilization, as emphasized by studies conducted in high-volume tertiary centers [14].

The requirement for postoperative ICU admission was significantly higher in frail patients in the current study. This aligns with the work of McIsaac et al., who found that frailty was strongly associated with increased ICU utilization and one-year mortality following non-cardiac surgery [15]. The increased need for ICU care among frail patients may be attributed to limited cardiopulmonary reserve, impaired immune response, and reduced ability to compensate for perioperative physiological stress.

Postoperative mortality was significantly higher in frail patients compared to non-frail patients in this study. Similar findings were reported by Revenig et al., who demonstrated that even a simplified frailty score was predictive of short-term postoperative mortality [16]. Furthermore, studies by Kristjansson et al. emphasized that frailty is a better determinant of postoperative survival than age alone, reinforcing the importance of incorporating frailty assessment into routine preoperative evaluation [17].

Unlike traditional risk stratification tools such as ASA physical status, frailty indices capture multidimensional aspects of patient vulnerability, including functional status and comorbidity burden. This multidimensional approach has been shown to improve perioperative risk prediction, as supported by Hall et al., who reported superior predictive accuracy of frailty-based models compared to conventional scoring systems [18].

The findings of this study highlight the potential role of preoperative frailty assessment in guiding perioperative decision-making and optimizing outcomes. Early identification of frail patients allows implementation of targeted interventions such as prehabilitation, nutritional support, and multidisciplinary perioperative care, which have been shown to reduce postoperative complications and improve functional recovery [19,20].

Despite its strengths, this study has limitations, including a single-center design and relatively small sample size. However, the results add to the growing body of evidence supporting the clinical utility of frailty indices in predicting postoperative outcomes among elderly patients. Further multicentric studies with larger sample sizes are warranted to validate these findings and establish standardized frailty assessment protocols in routine anesthetic practice.

CONCLUSION

This study demonstrates that preoperative frailty is a strong and independent predictor of postoperative outcomes in elderly surgical patients. Increasing frailty status was significantly associated with a higher incidence of postoperative complications, prolonged hospital stay, increased requirement for intensive care admission, and higher postoperative mortality. These findings highlight that frailty assessment provides a more comprehensive evaluation of surgical risk than chronological age or conventional scoring systems alone. Incorporating frailty indices into routine pre-anesthetic evaluation can facilitate early identification of high-risk patients and enable individualized perioperative planning. Timely interventions such as prehabilitation, nutritional optimization, and multidisciplinary perioperative care may improve postoperative recovery and overall outcomes in frail elderly patients. Despite limitations such as a single-center design and modest sample size, the results reinforce the clinical utility of frailty assessment in

Journal of Chemical Health Risks

www.jchr.org

JCHR (2026) 16(1), 2137-2142 | ISSN:2251-6727

perioperative risk stratification. Future multicentric studies with larger sample sizes are recommended to validate these findings and to establish standardized frailty-based protocols for perioperative management in elderly surgical populations.

REFERENCES

1. United Nations. World population ageing 2019 highlights. New York: United Nations; 2019.
2. Clegg A, Young J, Iliffe S, Rikkert MO, Rockwood K. Frailty in elderly people. *Lancet*. 2013;381(9868):752–62.
3. Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J, et al. Frailty in older adults: evidence for a phenotype. *J Gerontol A Biol Sci Med Sci*. 2001;56(3):M146–56.
4. Rockwood K, Song X, MacKnight C, Bergman H, Hogan DB, McDowell I, et al. A global clinical measure of fitness and frailty in elderly people. *CMAJ*. 2005;173(5):489–95.
5. Makary MA, Segev DL, Pronovost PJ, Syin D, Bandeen-Roche K, Patel P, et al. Frailty as a predictor of surgical outcomes in older patients. *J Am Coll Surg*. 2010;210(6):901–8.
6. Robinson TN, Eiseman B. Postoperative delirium in the elderly: diagnosis and management. *Clin Interv Aging*. 2008;3(2):351–5.
7. Revenig LM, Canter DJ, Kim S, Liu Y, Sweeney JF, Sarmiento JM, et al. Report of a simplified frailty score predictive of short-term postoperative morbidity and mortality. *J Am Coll Surg*. 2015;220(5):904–11.
8. Partridge JS, Harari D, Dhesi JK. Frailty in the older surgical patient: a review. *Age Ageing*. 2012;41(2):142–7.
9. Gillis C, Carli F. Promoting perioperative metabolic and nutritional care. *Anesthesiology*. 2015;123(6):1455–72.
10. McIsaac DI, Bryson GL, van Walraven C. Association of frailty and 1-year postoperative mortality following major elective noncardiac surgery. *JAMA Surg*. 2016;151(6):538–45.
11. Makary MA, Segev DL, Pronovost PJ, Syin D, Bandeen-Roche K, Patel P, et al. Frailty as a predictor of surgical outcomes in older patients. *J Am Coll Surg*. 2010;210(6):901–8.
12. Robinson TN, Wu DS, Pointer LF, Dunn CL, Moss M. Simple frailty score predicts postoperative complications across surgical specialties. *Am J Surg*. 2013;206(4):544–50.
13. Partridge JS, Harari D, Dhesi JK. Frailty in the older surgical patient: a review. *Age Ageing*. 2012;41(2):142–7.
14. Kim S, Brooks AK, Groban L. Preoperative assessment of the older surgical patient: honing in on geriatric syndromes. *Clin Interv Aging*. 2015;10:13–27.
15. McIsaac DI, Bryson GL, van Walraven C. Association of frailty and 1-year postoperative mortality following major elective noncardiac surgery. *JAMA Surg*. 2016;151(6):538–45.
16. Revenig LM, Canter DJ, Kim S, Liu Y, Sweeney JF, Sarmiento JM, et al. Report of a simplified frailty score predictive of short-term postoperative morbidity and mortality. *J Am Coll Surg*. 2015;220(5):904–11.
17. Kristjansson SR, Nesbakken A, Jordhøy MS, Skovlund E, Audisio RA, Johannessen HO, et al. Comprehensive geriatric assessment can predict complications in elderly patients after elective surgery. *J Surg Oncol*. 2010;102(8):975–81.
18. Hall DE, Arya S, Schmid KK, Carlson MA, Lavedan P, Bailey TL, et al. Association of frailty and postoperative complications in older adults. *Ann Surg*. 2017;266(2):274–81.
19. Gillis C, Carli F. Promoting perioperative metabolic and nutritional care. *Anesthesiology*. 2015;123(6):1455–72.
20. Dhesi JK, Swart M, Ukoumunne OC, Rogerson M, Partridge JS, Tarrant C, et al. Preoperative frailty intervention and postoperative outcomes in older patients undergoing surgery. *Br J Anaesth*. 2019;123(4):479–89.