

ORIGINAL ARTICLE

Association between Frailty and All-Cause In-hospital Mortality in Elderly Patients in Internal Medicine Wards, Vajira Hospital

Chavis Singhapanupong MD¹,  Chadawan Pathonsmith, MD² 

¹ Department of Internal Medicine, Faculty of Medicine Vajira Hospital, Navamindradhiraj University, Bangkok 10300, Thailand

² Division of Geriatric Medicine, Department of Internal Medicine, Faculty of Medicine Vajira Hospital, Navamindradhiraj University, Bangkok 10300, Thailand

Corresponding author

Chadawan Pathonsmith
chadawan.pat@nmu.ac.th

Received 25 June 2025

Revised 2 February 2026

Accepted 25 February 2026

J Med Urban Health

2026;70(3):e7481

<https://doi.org/10.62691/jmuh.2026.7481>

ABSTRACT

Objectives: Geriatric syndromes such as frailty are becoming more significant in healthcare. Frailty is characterized by increased vulnerability to stressors and decreased physiological reserve in elderly people. Studies in the community and hospice care settings have shown relationships between frailty and morbidity, hospitalization, and mortality. This study aimed to investigate the association between frailty and short-term outcomes in hospitalized Thai older adults.

Materials and Methods: This prospective cohort study included 140 inpatient department patients aged ≥ 60 . The patients or their close relatives were interviewed and assessed for frailty using the Thai version of the FRAIL scale within the first 48 hours of admission, and the patients were followed up at 2 and 4 months for in-hospital mortality. The evaluated secondary outcomes comprised 30-day readmission, length of stay, and hospital costs per day. Results were expressed using risk ratios and mean differences, with $p < 0.05$ indicating statistical significance.

Results: Among the 140 patients examined, 77 (55%) were determined to be frail according to the Thai FRAIL scale, and 63 (45%) were non-frail. In-hospital mortality rates were higher in the frail group than in the non-frail group 13 (16.9%) vs. 3 (4.8%). Multivariate analysis revealed that frail patients were 3.32 times more likely to die during admission than non-frail patients (adjusted risk ratios: 3.32; 95% confidence intervals: 1.12–9.86; $p = 0.031$).

Conclusion: Frailty was associated with higher short-term mortality among older adults admitted to a Thai hospital. Larger, multicenter studies are needed to confirm these findings.

Keywords: frailty, hospital costs, in-hospital mortality, length of stay, readmission

INTRODUCTION

Thailand is facing a demographic transition, with individuals aged ≥ 60 years comprising 20.4% of the total population as of 2022.¹ As this proportion continues to increase, the healthcare system is increasingly challenged by age-related syndromes. One such condition is frailty, which is characterized by decreased physiological reserve and increased vulnerability to stressors,² placing older adults at greater risk for adverse outcomes.

Frailty prevalence in 2005–2021 was 5%–15% among the elderly population in Thailand.³ As the aging population grew, the clinical significance of frailty in predicting health outcomes in hospitalized patients has gained considerable attention. Studies in the community and hospice care settings have shown relationships between frailty and morbidity, hospitalization, and mortality^{4–8}; however, only a few studies were conducted in hospital settings.

Hao et al. evaluated the association between frailty and in-hospital mortality and readmission in elderly patients who received medical care in acute geriatric wards in West China Hospital, Sichuan University, using Frailty Index to diagnose frailty. After 3-year follow-up, it was concluded that frail older adults had higher mortality and readmission rates than robust older adults.² Frailty was significantly associated with increased mortality and poorer functional outcomes in stroke patients.⁹ Some additional evidence of frailty significantly associated with infectious diseases.¹⁰ However, data from Thailand remain limited despite the country's growing elderly population.

Existing studies confirm that the FRAIL scale has high sensitivity and specificity compared with the phenotype criteria. The FRAIL scale to assess frailty status, a scale based on self-report that does not require activities affected by the disease itself.¹¹ This study aimed to investigate the association between frailty assessed using the validated Thai version of the FRAIL scale and in-hospital mortality from all causes in elderly patients admitted to Internal Medicine wards for disease treatment in Vajira Hospital, Bangkok, Thailand.

MATERIALS AND METHODS

This study was a prospective cohort study conducted in Vajira Hospital, Bangkok, Thailand. It included patients aged ≥ 60 years who were admitted to the general Internal Medicine wards for treatment of illnesses between September 25, 2023, and November 10, 2024, and were able to provide formal consent. Patients admitted for appointed procedures were excluded. In cases of inability to consent (i.e., during intubation,

under sedation, or with decreased awareness), the patient's closest relative was asked for consent and interviewed. If both the patient and their representative were not available or did not consent, the patient was not included in the study.

This study utilized the Thai FRAIL scale to screen for frailty, which was validated for reliable and accurate identification of frailty in elderly patients in the Thai context.¹² Five domains (i.e., fatigue, resistance, ambulation, illnesses, and loss of weight) were assessed using five simple questions—one question for each domain. Each question had two predefined answers, rated as 0 or 1, depending on the presence of characteristics related to frailty in each domain. Scores ranged from 0 to 5, and the cutoff for frailty was 3 or above. This tool was used instead of the full Frailty Index questionnaire, as it was simpler and well-suited for elderly patients in our context.

On the day of inclusion (referred to as "Visit 1"), patients were interviewed, and their medical records were evaluated for baseline characteristics: age, sex, weight, height, marital status, cause of admission, severity of disease, comorbidities (especially those included in the Thai FRAIL scale and Charlson Comorbidity Index), medications in use, and diagnoses in current admission. Then, they were assessed for ability to perform activities of daily living (ADLs) using the Barthel ADL Index and nutritional status according to nutrition triage (NT) nutritional assessment form and were screened for frailty with the Thai FRAIL scale. The Barthel ADL Index classified patients into three groups: group 1, independent; group 2, partially dependent and able to do some ADLs; and group 3, unable to perform ADLs and totally dependent. NT nutritional assessment form categorized patients into four groups by severity of malnutrition, namely, no malnutrition or at risk of malnutrition (NT-1), mild malnutrition (NT-2), moderate malnutrition (NT-3), and severe malnutrition (NT-4). Patients were determined to be frail if their scores on the Thai FRAIL scale were ≥ 3 .

Two months after Visit 1 (referred to as "Visit 2"), we obtained each patient's discharge status, length of stay, total hospital cost, and consecutive admissions within 30 days after discharge from the admission wherein they were included. If the patient had not yet been discharged, they would be followed for those outcomes again at 4 months after Visit 1 (referred to as "Visit 3").

A sample size of 280 patients (140 patients in each group) was calculated using results from a study by Hao et al.,² based on prospective study design with

consideration of 5% dropout rate. This study found mortality rates among elderly patients with and without frailty of 28.6% ($p_1 = 0.286$) and 14.5% ($p_2 = 0.145$), respectively. The sample size ratio for the comparison group to the study group was set at 1.5, based on population proportion.¹³ However, this preliminary analysis includes the first 140 patients enrolled, with follow-up and analysis completed.

Categorical data were expressed as percentages and continuous data as means and standard deviations or medians and interquartile ranges. The frail and non-frail patients were compared using Chi-square test or Fisher's exact test for categorical data and independent samples t-test or the Mann-Whitney U test for continuous data. The association between frailty and outcomes were analyzed using multiple regression analysis. Results were described using risk ratios (RR) and 95% confidence

intervals (CI) for all-cause in-hospital mortality and 30-day readmission and mean/median differences and 95% CI for length of hospital stay and hospital cost per day.

Statistical analyses were performed using the IBM SPSS Statistic software for Windows, Version 28.0 (IBM Corporation, Armonk, NY, USA) and Stata Version 13.0 (StataCorp, College Station, TX, USA), with $p = 0.05$ indicating statistical significance. This study obtained ethical approval (COA 162/2566) from the Institutional Review Board of the Faculty of Medicine Vajira Hospital, Navamindradhiraj University.

RESULTS

In total, 155 older adult patients were admitted to designated wards. Among the 140 patients included (Figure 1), 77 (55%) were determined to be frail according to the Thai FRAIL scale, and 63 (45%) were

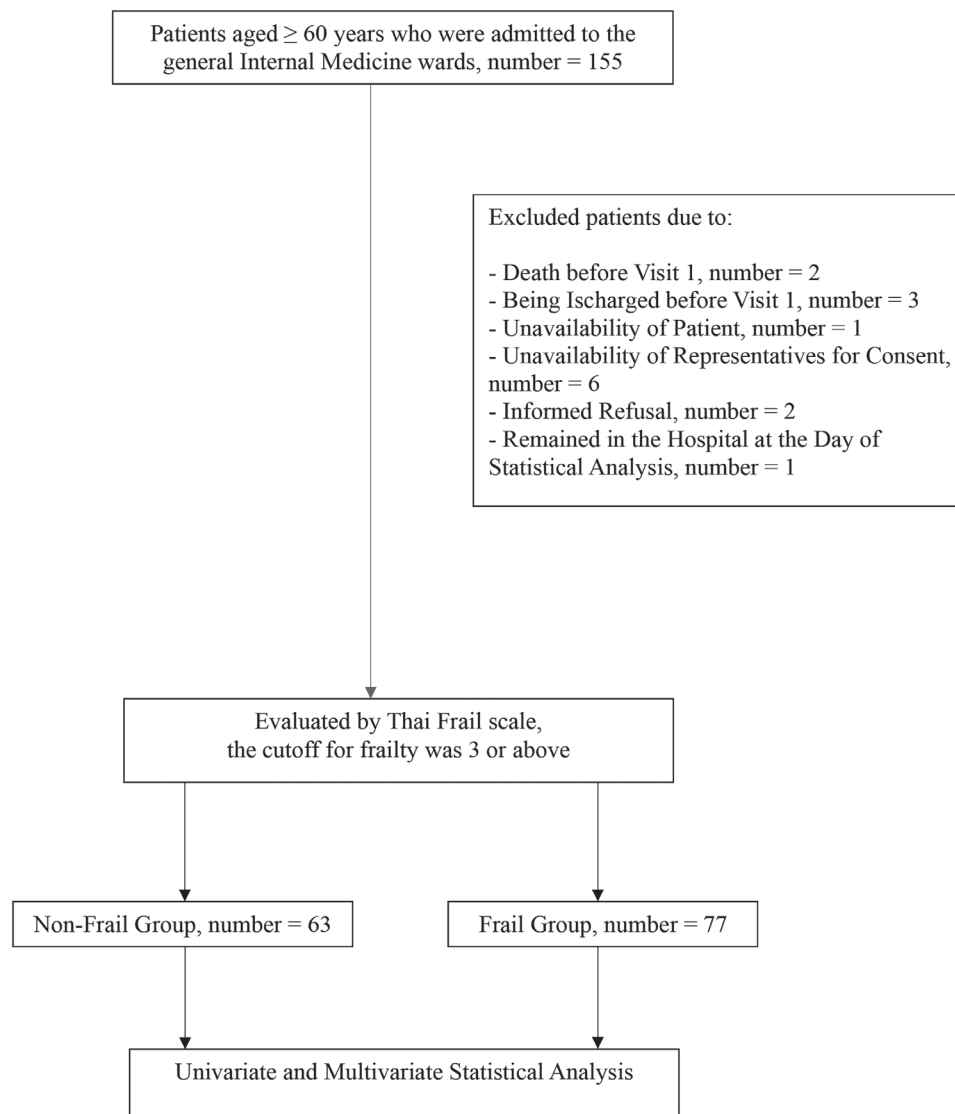


Figure 1 Flow Diagram of the Study

non-frail. Fourteen were excluded for reasons of death before Visit 1 (two patients) or being discharged before Visit 1 (three patients), unavailability of patient at Visit 1 (one patient, undergoing hemodialysis at the time), unavailability of representatives for consent (six patients), and informed refusal (two patients). One patient remained in the hospital at the day of statistical analysis and thus was not included.

Table 1 shows the baseline characteristics of the frail and non-frail groups. Moreover, 67.9% of the included population were below 80 years old, and the average age was 75.45 years. The most common cause of admission was infection related disease (58.6%). The most common underlying illnesses included hypertension (77.1%), diabetes (49.3%), chronic kidney disease (52.9%), and ischemic stroke (22.9%). Polypharmacy was reported in 85.7% of the patients, and 66.4% had high comorbidity burden (Charlson Comorbidity Index ≥ 5). Most patients (62.1%) were able to perform basic ADLs (Barthel ADL Index group 1). Furthermore, 43.6% of the patients were malnourished (NT-2 to NT-4).

Significant differences were noted in sex, comorbidity burden, functional status, and nutritional status between the frail and non-frail groups. There were 2 times more females than males in the frail group. Larger percentages of patients in the frail group were found to have more comorbidities (according to the Charlson Comorbidity Index), be dependent on caregiver (according to the Barthel ADL Index), and suffer from malnutrition than in the non-frail group. Other characteristics were not significantly different between the two groups (**Table 1**).

Compared with non-frail elderly patients, frail patients were more likely to die during admission from any cause (16.9% vs. 4.8%, $p = 0.031$) (**Table 2**). Univariate analysis on the primary outcome demonstrated that frail elderly patients had a higher risk of death from any cause during admission (unadjusted RR: 3.55; 95% CI: 1.05–11.95; $p = 0.041$). After adjustment for age, sex, body mass index (BMI), marital status, cause of admission, severity of disease, Charlson Comorbidity Index, nutritional status, polypharmacy, and the presence of anticholinergics, benzodiazepines, and pain control, it was found that frail patients were 3.32 times more likely to die during admission than non-frail patients (adjusted RR: 3.32; 95% CI: 1.12–9.86; $p = 0.031$) (**Table 2**). **Figure 2** shows the survival analysis based on primary objective outcome among non-frail group and frail group.

For secondary outcomes, no significant differences were found in 30-day readmission rate, length of stay, and hospital cost per day (**Table 2**). The 30-day readmission rates were 19.5% and 9.5% for the frail and non-frail groups, respectively. The median lengths of stay for both groups were 6 days. The median hospital costs per day were 4865.38 Thai Baht (THB) for the frail group and 4853.16 THB for the non-frail group.

DISCUSSION

This prospective cohort study demonstrated an association between frailty, as defined by the Thai FRAIL scale, and all-cause in-hospital mortality among elderly patients admitted to Internal Medicine wards. Frail patients were more likely to die during hospitalization compared to non-frail patients. Although no significant differences were observed in secondary outcomes such as 30-day readmission, length of stay, and hospital costs per day, the mortality association underscores the critical prognostic value of frailty screening upon admission.

Our findings are consistent with previous Thai studies utilizing the FRAIL scale. A prospective cohort study performed by Suraarunsumrit et al. (2025) at Siriraj Hospital. This retrospective cohort study included medical inpatients aged ≥ 60 years old. They were classified into robust, prefrail, and frail groups using the FRAIL scale. Infection was the most common reason for admission in this study. Frailty was significantly associated with higher in-hospital mortality and healthcare utilization, validating the use of the FRAIL scale in academic medical settings in Thailand.¹⁴ However, a previous study demonstrated that frail patients had significantly higher odds ratio of in-hospital acute infections and adverse events compared to non-frail patients. Various frailty tools and definitions were used, with the frailty index being the most frequently employed tool.¹⁵ In a cross-sectional study in Thailand, reported similar findings among elderly patients with medical conditions. Most of the patients had multiple risk factors for frailty such as chronic disease and polypharmacy. Using the Thai Frailty Index, they found that frail patients the risk of hospitalization, more complications, and elderly patients with frailty (both physical and cognitive frailty) had poorer quality of life.¹⁶ These studies underscore the significance of the FRAIL scale as a practical, low-resource screening tool in Thai acute care settings.

In contrast to Western studies,^{4,11,15} wherein frailty assessments are often incorporated into routine geriatric care, several Thai hospitals still lack standardized frailty

Table 1 Demographic and Clinical Characteristics of Elderly Patients in Internal Medicine Wards According to Frailty Status (n = 140)

Variables	Total (n = 140)	Non-Frail (n = 63)	Frail (n = 77)	P-value
All patients	140 (100.0)	63 (45.0)	77 (55.0)	
Age (years)	75.45 ± 9.29	73.98 ± 9.03	76.65 ± 9.39	0.091 ^a
< 80	95 (67.9)	45 (71.4)	50 (64.9)	0.413 ^b
≥ 80	45 (32.1)	18 (28.6)	27 (35.1)	
Sex				
Male	64 (45.7)	38 (60.3)	26 (33.8)	0.002 ^b
Female	76 (54.3)	25 (39.7)	51 (66.2)	
Body Mass Index (kg/m ²)	23.03 ± 4.70	23.78 ± 5.02	22.43 ± 4.35	0.091 ^a
Underweight (< 18.5)	22 (15.7)	9 (14.3)	13 (16.9)	0.567 ^b
Normal (18.5-22.9)	53 (37.9)	22 (34.9)	31 (40.3)	
Overweight (23.0-24.9)	23 (16.4)	9 (14.3)	14 (18.2)	
Obesity (25.0-29.9)	30 (21.4)	16 (25.4)	14 (18.2)	
Morbid Obesity (≥ 30)	12 (8.6)	7 (11.1)	5 (6.5)	
Marital Status				
Single	30 (21.4)	16 (25.4)	14 (18.2)	0.102 ^c
Married	62 (44.3)	32 (50.8)	30 (39.0)	
Widowed	41 (29.3)	12 (19.0)	29 (37.7)	
Divorced/Living Separately	7 (5.0)	3 (4.8)	4 (5.2)	
Cause of Admission				
Infectious Cause	82 (58.6)	38 (60.3)	44 (57.1)	0.113 ^b
Myocardial Infarction	8 (5.7)	5 (7.9)	3 (3.9)	0.082 ^c
Heart Failure	12 (8.6)	6 (9.5)	7 (9.1)	0.515 ^b
Stroke	8 (5.7)	4 (6.3)	4 (5.2)	0.438 ^c
GI Hemorrhage	9 (6.4)	5 (7.9)	4 (5.2)	0.132 ^c
Acute Kidney Injury	6 (4.3)	3 (4.8)	3 (3.9)	0.268 ^c
Electrolyte Imbalance	7 (5.0)	3 (4.8)	4 (5.2)	0.416 ^c
Other	8 (5.7)	3 (4.8)	5 (6.5)	0.548 ^c
Severity of Disease at Admission				
Infection with Septic Shock	12 (8.6)	5 (7.9)	7 (9.1)	0.102 ^c
Shock Condition on Admission (exclude septic shock)	2 (1.4)	0 (0.0)	2 (2.6)	NA

Table 1 Demographic and Clinical Characteristics of Elderly Patients in Internal Medicine Wards According to Frailty Status (n = 140) (cont.)

Variables	Total (n = 140)	Non-Frail (n = 63)	Frail (n = 77)	P-value
Underlying Disease				
Hypertension	108 (77.1)	48 (76.2)	60 (77.9)	0.808 ^b
Diabetes Mellitus	69 (49.3)	33 (52.4)	36 (46.8)	0.508 ^b
Liver Disease	12 (8.6)	7 (11.1)	5 (6.5)	0.332 ^b
Chronic Kidney Disease	74 (52.9)	28 (44.4)	46 (59.7)	0.071 ^b
KDIGO Staging				0.005 ^b
G1	23 (16.4)	8 (12.7)	15 (19.5)	
G2	44 (31.4)	28 (44.4)	16 (20.8)	
G3a	14 (10.0)	6 (9.5)	8 (10.4)	
G3b	15 (10.7)	1 (1.6)	14 (18.2)	
G4	23 (16.4)	13 (20.6)	10 (13.0)	
G5	9 (6.4)	3 (4.8)	6 (7.8)	
ESRD on RRT	12 (8.6)	4 (6.3)	8 (10.4)	
COPD	11 (7.9)	4 (6.3)	7 (9.1)	0.754 ^c
Asthma	3 (2.1)	2 (3.2)	1 (1.3)	0.588 ^c
Angina	8 (5.7)	3 (4.8)	5 (6.5)	0.730 ^c
Heart Failure	28 (20.0)	11 (17.5)	17 (22.1)	0.497 ^b
CAD/MI	29 (20.7)	8 (12.7)	21 (27.3)	0.034 ^b
PAD	2 (1.4)	1 (1.6)	1 (1.3)	1.000 ^c
Old CVA/TIA	32 (22.9)	8 (12.7)	24 (31.2)	0.010 ^b
Hemiplegia	14 (10.0)	2 (3.2)	12 (15.6)	0.015 ^b
Dementia	14 (10.0)	3 (4.8)	11 (14.3)	0.062 ^b
Arthritis	24 (17.1)	9 (14.3)	15 (19.5)	0.417 ^b
CTD	3 (2.1)	0 (0.0)	3 (3.9)	0.252 ^c
Peptic Ulcer	3 (2.1)	1 (1.6)	2 (2.6)	1.000 ^c
Solid Tumor	17 (12.1)	5 (7.9)	12 (15.6)	0.168 ^b
Local	9 (6.4)	3 (4.8)	6 (7.8)	0.428 ^c
Metastatic	8 (5.7)	2 (3.2)	6 (7.8)	
Leukemia	1 (0.7)	1 (1.6)	0 (0.0)	0.450 ^c
Lymphoma	0 (0.0)	0 (0.0)	0 (0.0)	NA
AIDS	2 (1.4)	0 (0.0)	2 (2.6)	0.501

Table 1 Demographic and Clinical Characteristics of Elderly Patients in Internal Medicine Wards According to Frailty Status (n = 140) (cont.)

Variables	Total (n = 140)	Non-Frail (n = 63)	Frail (n = 77)	P-value
Charlson Comorbidity Index	5.74 ± 2.13	5.11 ± 1.87	6.25 ± 2.21	0.001 ^a
< 5	47 (33.6)	28 (44.4)	19 (24.7)	0.014 ^b
≥ 5	93 (66.4)	35 (55.6)	58 (75.3)	
Medication				
Polypharmacy	120 (85.7)	50 (79.4)	70 (90.9)	0.052 ^b
Anticholinergics	41 (29.3)	13 (20.6)	28 (36.4)	0.042 ^b
Benzodiazepines	37 (26.4)	13 (20.6)	24 (31.2)	0.160 ^b
Pain Control (NSAIDs, opioids)	37 (26.4)	15 (23.8)	22 (28.6)	0.525 ^b
Barthel ADL Index				
Group 1	87 (62.1)	55 (87.3)	32 (41.6)	< 0.001 ^b
Group 2	18 (12.9)	3 (4.8)	15 (19.5)	
Group 3	35 (25.0)	5 (7.9)	30 (39.0)	
Nutritional Status				
NT-1	79 (56.4)	48 (76.2)	31 (40.3)	< 0.001 ^c
NT-2	33 (23.6)	9 (14.3)	24 (31.2)	
NT-3	23 (16.4)	6 (9.5)	17 (22.1)	
NT-4	5 (3.6)	0 (0.0)	5 (6.5)	
FRAIL Scale	2.48 ± 1.24	1.33 ± 0.78	3.42 ± 0.57	< 0.001 ^a

Abbreviations: ADL, activity of daily living; AIDS, acquired immunodeficiency syndrome; CAD, coronary artery disease; COPD, chronic obstructive pulmonary disease; CTD, connective tissue disease; CVA, cerebrovascular accident; ESRD, end-stage renal disease; GI, gastro-intestinal; KDIGO, kidney disease improving global outcomes; kg, kilogram; m², square meter; MI, myocardial infarction; n, number; NA, data not applicable; NSAIDs, non-steroidal anti-inflammatory drugs; NT, nutrition triage; PAD, peripheral arterial disease; RRT, renal replacement therapy; TIA, transient ischemic attack

Data are presented as number (%), mean ± standard deviation or median (interquartile range).

P-value corresponds to ^aIndependent samples t-test, ^bChi-square test or ^cFisher's exact test.

Table 2 Univariable and Multivariable Analysis for Comparison of Outcomes of Elderly Patients in Internal Medicine Wards According to Frailty Status (n = 140)

Outcomes	Non-Frail (n = 63)		Frail (n = 77)	Univariable Analysis		Multivariable Analysis		
				Adjusted RR/MD (95%CI)	P-value	Adjusted RR/MD (95%CI)	P-value	
In-Hospital Mortality	3	(4.8)	13	(16.9)	3.55 (1.05-11.95) ^a	0.041	3.32 (1.12-9.86) ^b	0.031
30-Day Readmission	6	(9.5)	15	(19.5)	2.05 (0.84-4.98) ^a	0.115	1.71 (0.74-3.48) ^b	0.356
Length of Stay (days)	6	(4-9)	6	(4-12)	3.98 (-0.11, 8.08) ^c	0.057	4.66 (-0.09, 8.62) ^d	0.084
Total Hospital Cost	35086.75 (23406.5-70658)		32029.5 (17783.75-51805.25)		22964.05 (-1851.79, 47779.89) ^c	0.070	20986.86 (-3215.46, 44751.78) ^d	0.102
Hospital Cost per Day	4853.16 (3896.81-7083.13)		4865.38 (3463.92-6691.75)		449.35 (-2583.36, 3482.06) ^c	0.772	-735.46 (-3112.32, 1329.68) ^d	0.534

Abbreviations: CI, confidence interval; MD, mean difference; n, number; NA, data not applicable; RR, risk ratio

^a Unadjusted risk ratio estimated by Poisson regression with robust standard errors.^b Adjusted risk ratio estimated by Poisson regression with robust standard errors adjusting for age, sex, body mass index, marital status, cause of admission, severity of disease, underlying disease, Charlson Comorbidity Index, polypharmacy, anticholinergics, benzodiazepines and pain control.^c Unadjusted mean difference estimated by Generalized linear model with Gaussian family, with robust standard errors.^d Adjusted mean difference estimated by Generalized linear model with Gaussian family, with robust standard errors adjusting for age, sex, body mass index, marital status, cause of admission, severity of disease, underlying disease, Charlson Comorbidity Index, polypharmacy, anticholinergics, benzodiazepines and pain control

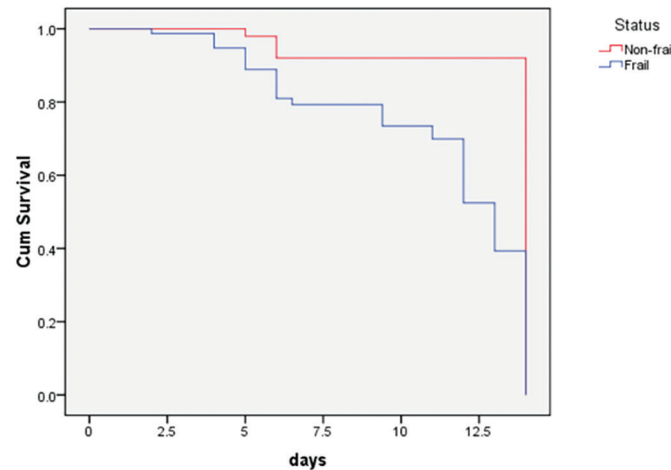


Figure 2 Survival Analysis Based on In-Hospital Mortality among Non-Frail Group and Frail Group

screening protocols. Our findings indicate the need for systematic frailty assessment in acute medical admissions in Thailand, given its rapidly aging population and limited specialized geriatric services. The FRAIL scale is a practical, culturally adapted, and time-efficient tool that can be administered by general staff without requiring extensive training.

Although the present study showed a significant difference in in-hospital mortality, no significant differences were observed in 30-day readmission rates and healthcare costs. These discrepancies may reflect differences in discharge planning, access to post-acute care, or social support systems and warrant further investigation. Moreover, this study did not find a significant difference in length of stay, in contrast to previous reports.¹⁴ A discharge planning system may reduce the length of hospital stays for patients with acute diseases. In addition, this may also be due to the differing characteristics of patients.

This study had several limitations. First, this is a preliminary analysis with a sample size smaller than originally planned, which may limit the potential to detect significant differences in secondary outcomes. Inclusion of more patients could increase accuracy of the study. Second, although some covariates were adjusted, residual confounding—particularly from delirium and functional trajectory—might have influenced outcomes. Third, the FRAIL scale remains a subjective measure and may be affected by recall bias or cognitive impairment in the respondent. Fourth, patients who died before frailty assessment were excluded. This cause leading to underestimation of frailty prevalence and biased

mortality comparisons. Last, as the study was conducted in a single urban tertiary care center, generalizability to other settings, including rural hospitals or community health centers, may be limited. The variation of patient case mix, discharge practices, and resource availability at Our hospital may not reflect other Thai hospitals or international settings.

This study contributes to the association of the FRAIL scale and in-hospital short-term mortality among elderly inpatients. Frailty screening in elderly inpatients may enhance risk stratification, guide clinical decision-making, and prompt early multidisciplinary interventions for inpatients. Future research should investigate whether targeted interventions based on frailty status—such as early mobilization, medication review, vaccination program and nutritional support—can improve clinical outcomes and reduce avoidable mortality in frail older adults.

CONCLUSION

Frailty was associated with higher short-term mortality among older adults admitted to a Thai hospital. The routine frailty screening may help risk stratification and clinical decision-making in acute in-patient settings. Larger, multicenter studies are needed to confirm these findings.

Conflict of Interest

The authors declare that they have no competing interests related to this study.

Acknowledgments

The author appreciates Associate Professor Varalak Srinonprasert

(Division of Geriatric Medicine, Department of Internal Medicine, Faculty of Medicine Siriraj Hospital, Mahidol University) for granting the use of the Thai version of FRAIL scale.

Author Contributions

Conceptualization: C.P.

Data curation: C.S.

Formal analysis: C.S., C.P.

Funding acquisition: -

Investigation: -

Methodology: C.S., C.P.

Project administration: -

Resources: -

Software: -

Supervision: C.P.

Validation: -

Visualization: -

Writing – original draft preparation: C.S., C.P.

Writing – review & editing: C.P.

Data Availability Statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

REFERENCES

- 1 Institute of Population and Social Research Mahidol University. Mahidol population gazette [internet]. 2022 [cited 2023 May 21]. Available from: <https://ipsr.mahidol.ac.th/population-gazette/>
- 2 Hao Q, Zhou L, Dong B, Yang M, Dong B, Weil Y. The role of frailty in predicting mortality and readmission in older adults in acute care wards: a prospective study. *Sci Rep* 2019;9(1):1207. doi: 10.1038/s41598-018-38072-7.
- 3 Sopraphum S, Srisuwan P, Tienthavorn T, Kengpanich S. Prevalence and risk factors associated with frailty among older patients in out-patient department Phramongkutklao Hospital: a mixed method study. *J Gerontol Geriatr Med* 2022;21:1-11.
- 4 Joosten E, Demuyneck M, Detroyer E, Milisen K. Prevalence of frailty and its ability to predict in hospital delirium, falls, and 6-month mortality in hospitalized older patients. *BMC Geriatr* 2014;14:1. doi: 10.1186/1471-2318-14-1.
- 5 Kojima G. Frailty defined by FRAIL scale as a predictor of mortality: a systematic review and meta-analysis. *J Am Med Dir Assoc* 2018;19(6):480-3. doi: 10.1016/j.jamda.2018.04.006.
- 6 Kojima G. Frailty as a predictor of future falls among community-dwelling older people: a systematic review and meta-analysis. *J Am Med Dir Assoc* 2015;16(12):1027-33. doi: 10.1016/j.jamda.2015.06.018.
- 7 Shamliyan T, Talley KM, Ramakrishnan R, Kane RL. Association of frailty with survival: a systematic literature review. *Ageing Res Rev* 2013;12(2):719-36. doi: 10.1016/j.arr.2012.03.001.
- 8 Vermeiren S, Vella-Azzopardi R, Beckwée D, Habbig A-K, Scafoglieri A, Jansen B, et al. Frailty and the prediction of negative health outcomes: a meta-analysis. *J Am Med Dir Assoc* 2016;17:1163.e1-1163.e17. doi: 10.1016/j.jamda.2016.09.010.
- 9 Li J, Wan J, Wang H. Role of frailty in predicting outcomes after stroke: a systematic review and meta-analysis. *Front Psychiatry* 2024;15:1347476. doi: 10.3389/fpsy.2024.1347476.
- 10 Yang Y, Che K, Deng J, Tang X, Jing W, He X, et al. Assessing the impact of frailty on infection risk in older adults: prospective observational cohort study. *JMIR Public Health Surveill* 2024;10:e59762. doi: 10.2196/59762.
- 11 Aprahamian I, Cezar N, Izbicki R, Lin SM, Paulo D, Fattori A, et al. Screening for frailty with the FRAIL scale: a comparison with the phenotype criteria. *J Am Med Dir Assoc* 2017;18:592–6. doi: 10.1016/j.jamda.2017.01.009.
- 12 T Sriwong W, Mahavisessin W, Srinonprasert V, Siriussawakul A, Aekplakorn W, Limpawattana P, et al. Validity and reliability of the Thai version of the simple frailty questionnaire (T-FRAIL) with modifications to improve its diagnostic properties in the preoperative setting. *BMC Geriatr* 2022;22(1):161. doi: 10.1186/s12877-022-02863-5.
- 13 Bernard R. Fundamentals of biostatistics. 5thed. Duxbury: Thomson learning; 2000.
- 14 Suraarunsumrit P, Sinthornkasem P, Petchthai P, Sainimnuan S, Preedachitkul R, Srinonprasert V. Impact of frailty on healthcare utilization in older patients admitted to medical wards: a study from a large medical school in a middle-income setting. *Siriraj Med J* 2025;77(1):83-92. doi: 10.33192/smj.
- 15 Alotaibi F, Alshibani A, Banerjee J, Manktelow B. The association between frailty and hospital-related adverse events in older hospitalised patients: a systematic literature review. *Eur Geriatr Med* 2025;16(4):1303-18. doi: 10.1007/s41999-025-01242-8.
- 16 Limpawattana P, Khammak C, Manjavong M, So-ngern A. Frailty as a predictor of hospitalization and low quality of life in geriatric patients at an internal medicine outpatient clinic: a cross-sectional study. *Geriatrics* 2022;7(5):89. doi: 10.3390/geriatrics7050089.