Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Comparison of the Clinical Frailty Scale and the FRAIL Scale for Predicting Short-Term Outcomes in Older Adults Hospitalized with Infectious Diseases: A Multicentre Prospective Study

Hilal Ekici

drhilalirci@gmail.com

Yozgat City Hospital

Zeynep Türe Yüce

Private Gürlife Hospital

Sabahat Çağan Aktaş

Dr Lütfi Kırdar Kartal Eğitim ve Araştırma Hastanesi

Sabahat Çeken

Ankara Etlik City Hospital

Müge Ayhan

Ankara Bilkent City Hospital

Feyza İzci Çetinkaya

Çankırı State Hospital

Ayşe Sağmak Tartar

Fırat Üniversitesi Hastanesi

Sevgi Baltacı

Sivas State Hospital

Şafak Kaya Kavak

Diyarbakır Gazi Yaşargil Eğitim ve Araştırma Hastanesi

Yasemin Kırık

Elazığ Fethi Sekin City Hospital

Gülşen İskender

Ankara Onkoloji Eğitim ve Araştırma Hastanesi

Melike İnan Hekimoğlu

Bartın State Hospital

Mustafa Serhat Şahinoğlu

Mersin University Faculty of Medicine

Zehra Karacaer

Gülhane Eğitim ve Araştırma Hastanesi

Emine Arman Fırat
Besni State Hospital
Zeynep Tekin Taş
Sincan Training and Research Hospital
Aleyna Erbil
Canakkale Onsekiz Mart Universitesi Tip Fakultesi Hastanesi
Sevil Alkan Varoğlu
Canakkale Onsekiz Mart Universitesi Tip Fakultesi Hastanesi
Behice Kurtaran
Acıbadem Adana Hospital
Gülden Eser Karlıdağ
Elazığ Fethi Sekin City Hospital

Research Article

Keywords: Clinical Frailty Scale, FRAIL Scale, frailty, infectious diseases, prognosis

Posted Date: September 10th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10550007/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Abstract

Background

Frailty is a major determinant of adverse health outcomes in older adults, yet evidence comparing commonly used frailty instruments in patients hospitalized with infectious diseases is limited. We aimed to compare the prognostic performance of the Clinical Frailty Scale (CFS) and the FRAIL Scale for predicting short-term outcomes in older adults admitted to infectious diseases departments.

Methods

This prospective multicentre point-prevalence study included adults aged ≥ 65 years hospitalized in infectious diseases departments across 16 hospitals in Türkiye. Frailty was assessed using the CFS (frail: ≥5) and the FRAIL Scale (frail: ≥3). The primary outcome was intensive care unit transfer, ongoing hospitalization, or death within 28 days. Multivariable logistic regression and receiver operating characteristic analyses were performed.

Results

Among 151 hospitalized older adults, 102 (67.5%) were classified as frail by the FRAIL Scale and 87 (57.6%) by the CFS. Polypharmacy was more common among frail patients identified by both instruments. FRAIL-defined frailty was associated with lower discharge rates (84.3% vs. 95.9%, p = 0.039) but not with mortality. In contrast, CFS-defined frailty was associated with lower discharge rates (81.6% vs. 96.9%, p = 0.004), higher 28-day mortality (8.0% vs. 0.0%, p = 0.021), and poorer overall 28-day outcomes (p = 0.032). CFS-defined frailty independently predicted poor 28-day outcome (adjusted OR 5.99, 95% CI 1.26–28.57; p = 0.024). The CFS showed greater discriminative ability than the FRAIL Scale (AUC 0.823 vs. 0.696; DeLong p = 0.034).

Conclusions

Both instruments identified vulnerable older adults, but the Clinical Frailty Scale provided superior prognostic performance for adverse short-term outcomes. Routine CFS assessment may facilitate early risk stratification and help identify older adults at increased risk of adverse short-term outcomes during hospitalization for infectious diseases.

Background

The rising average age of the population has significantly affected the epidemiology and clinical management of infectious diseases. Older adults account for an increasingly large proportion of hospital admissions due to acute infections. In addition, compared to younger populations, they are at higher risk

for severe illness, prolonged hospital stays, functional impairment, and mortality (1, 2). Age-related immune dysfunction, multimorbidity, reduced physiological reserve, and atypical clinical presentations further exacerbate this frailty. Consequently, both diagnostic and therapeutic clinical decision-making processes become more challenging (2, 3). For all these reasons, more accurately assessing the prognosis in older adults hospitalized for infectious diseases has become a major clinical priority. This has increased the need for assessment tools that reflect biological vulnerability rather than chronological age (3, 4).

Frailty is a fundamental concept in geriatrics because it reflects biological ageing and captures an individual's physiological reserve and resilience to acute stressors (3). Frailty reflects the loss of function that develops over time across multiple organ systems and helps explain differences in health status among older adults of similar chronological age (5). An increasing number of studies have shown that frailty is independently associated with prolonged hospital stays, the need for institutional care, increased use of health care services, and mortality (4, 9). Furthermore, frailty has been associated with an increased risk of hospital-acquired infections and poorer clinical outcomes. This suggests that biological vulnerability may be a more meaningful indicator of prognosis than chronological age (6). Accordingly, routine frailty assessment is increasingly recognized as an important component of a comprehensive geriatric assessment. It supports individualized risk stratification, shared clinical decision-making, and a person-centred care approach (4).

Several validated instruments are available for frailty assessment, although they differ considerably in their conceptual basis, complexity, and intended clinical application (3). The Clinical Frailty Scale (CFS) is a clinician-rated multidimensional instrument that integrates functional status, comorbidity, cognition, and overall clinical fitness. In contrast, the FRAIL Scale is a brief questionnaire developed primarily to identify physical frailty in routine clinical practice (7, 8). Both instruments have demonstrated prognostic value across diverse healthcare settings; however, direct comparisons of their performance in older adults hospitalized with infectious diseases remain limited. Prospective multicentre studies conducted specifically in infectious diseases departments are also scarce.

Therefore, the present multicentre prospective study was undertaken to compare the prognostic performance of the Clinical Frailty Scale and the FRAIL Scale in older adults hospitalized with infectious diseases. We also examined the associations of both frailty instruments with clinically relevant short-term outcomes, including discharge status, intensive care unit admission, length of hospital stay, and 28-day mortality.

Methods

Study design and participants

This multicentre, prospective, point-prevalence observational study was conducted in the Departments of Infectious Diseases and Clinical Microbiology of 16 participating hospitals across Türkiye.

Consecutive adult patients hospitalized on the predefined study day were screened for eligibility. Patients aged ≥ 65 years were classified as the geriatric cohort and constituted the study population for frailty analyses, whereas patients aged < 65 years were included only for comparisons of baseline clinical characteristics.

Participants were followed for 28 days after enrolment to assess clinical outcomes. The study was designed and reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement (9).

Data collection

Demographic characteristics, comorbidities, previous healthcare utilization, medication use, microbiological findings, antimicrobial therapy, and clinical outcomes were prospectively recorded using a standardized electronic case report form. Previous healthcare utilization included outpatient visits and hospitalizations during the preceding year. Polypharmacy was defined as the regular use of five or more medications, consistent with previous recommendations (10). Microbiological diagnoses were established according to routine clinical practice at each participating center. Pathogen identification and antimicrobial susceptibility testing were performed in the participating microbiology laboratories using standard laboratory procedures in accordance with institutional protocols.

Frailty assessment

Frailty was assessed at enrolment using both the Clinical Frailty Scale (CFS) and the FRAIL Scale. The Clinical Frailty Scale is a validated nine-point clinician-rated instrument that integrates functional status, comorbidity, cognition, and overall clinical fitness, with scores ranging from 1 (very fit) to 9 (terminally ill), where higher scores indicate greater frailty (7). Frailty according to the Clinical Frailty Scale was defined as a score of ≥ 5, in accordance with previous validation studies (7, 11).

The FRAIL Scale is a validated five-item screening instrument assessing fatigue, resistance, ambulation, illnesses, and weight loss, with total scores ranging from 0 to 5 (8, 13). Frailty was defined as a FRAIL Scale score of ≥ 3, consistent with previous validation studies (8).

Outcomes

The primary outcome was poor clinical outcome within 28 days after enrolment. Poor outcome was defined as a composite endpoint comprising transfer to the intensive care unit, ongoing hospitalization on day 28, or death within 28 days after enrolment.

Secondary outcomes included length of hospital stay, discharge status, intensive care unit admission, and 28-day mortality.

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, version 20.0 (IBM Corp., Armonk, NY, USA). Continuous variables were assessed for normality using the Shapiro–Wilk test and visual inspection of data distribution. Since continuous variables were not normally distributed, they are presented as median and interquartile range (IQR) and were compared using the Mann–Whitney U test. Categorical variables are presented as numbers and percentages and were compared using the Pearson chi-square test or Fisher's exact test, as appropriate. The relationship between the Clinical Frailty Scale and the FRAIL Scale was evaluated using Spearman's rank correlation coefficient.

Multivariable binary logistic regression analysis was performed to identify independent predictors of poor 28-day outcome among geriatric patients. Variables were selected a priori based on their clinical relevance and previous evidence and included age, sex, polypharmacy, and the Clinical Frailty Scale. Because the Clinical Frailty Scale and the FRAIL Scale assess overlapping constructs of frailty, only the Clinical Frailty Scale was included in the multivariable model to avoid multicollinearity. All variables were entered simultaneously using the enter method. Adjusted odds ratios (aORs) with 95% confidence intervals (CIs) were calculated. Model calibration was assessed using the Hosmer–Lemeshow goodness-of-fit test, and model performance was evaluated using the Nagelkerke R^2 statistic.

Receiver operating characteristic (ROC) curve analysis was performed to evaluate the discriminative ability of the Clinical Frailty Scale and the FRAIL Scale for predicting poor 28-day outcome. The area under the receiver operating characteristic curve (AUC) with corresponding 95% confidence intervals was calculated for each frailty instrument. All statistical tests were two-sided, and a P value < 0.05 was considered statistically significant. The areas under the ROC curves were compared using DeLong's test for paired ROC curves.

Ethics

The study was approved by the local Institutional Ethics Committee. All procedures were performed in accordance with the ethical standards of the institutional research committee and the Declaration of Helsinki. Written informed consent was obtained from all participants or their legally authorized representatives before enrolment.

Results

Study population and baseline characteristics

A total of 265 patients were enrolled, including 151 geriatric (≥ 65 years, 57.0%) and 114 non-geriatric (< 65 years, 43.0%) participants. Frailty analyses were restricted to the geriatric cohort according to the study objectives. Baseline characteristics are summarized in Table 1.

Table 1
Baseline Characteristics and Infection Profiles of Geriatric and Non-Geriatric Patients

Variable	Non-geriatric (n = 114)	Geriatric (n = 151)	p value
Baseline characteristics			
Female sex	44 (38.6)	73 (48.3)	0.114
At least one comorbidity	65 (57.0)	145 (96.0)	< 0.001
Hypertension	20 (17.5)	107 (70.9)	< 0.001
Diabetes mellitus	24 (21.1)	69 (45.7)	< 0.001
Coronary artery disease	12 (10.5)	53 (35.1)	< 0.001
Malignancy	11 (9.6)	28 (18.5)	0.043
Chronic kidney disease	10 (8.8)	26 (17.2)	0.047
Alzheimer's disease/dementia	1 (0.9)	19 (12.7)	< 0.001
Chronic obstructive pulmonary disease	6 (5.3)	19 (12.6)	0.044
Cerebrovascular disease	5 (4.4)	15 (9.9)	0.091
Asthma	5 (4.4)	10 (6.6)	0.435
Hemodialysis	7 (6.1)	9 (6.0)	0.962
Epilepsy	5 (4.4)	4 (2.6)	0.439
Infection characteristics			
Nosocomial infection	20 (17.5)	31 (20.5)	0.542
Pathogen isolation	46 (40.4)	70 (46.4)	0.329
Reason for hospitalization (overall p = 0.051)			
Urinary tract infection	15 (13.2)	46 (30.5)	
Skin and soft tissue infection	22 (19.3)	22 (14.6)	
Community-acquired pneumonia	13 (11.4)	16 (10.6)	
Catheter-related infection	5 (4.4)	9 (6.0)	
Diabetic foot infection	3 (2.6)	8 (5.3)	

Variable	Non-geriatric (n = 114)	Geriatric (n = 151)	p value
Baseline characteristics			
Central nervous system infection	9 (7.9)	4 (2.6)	
Fever of unknown origin	7 (6.1)	7 (4.6)	
Hospital-acquired pneumonia	3 (2.6)	6 (4.0)	
Intra-abdominal infection	3 (2.6)	5 (3.3)	
Gastroenteritis	6 (5.3)	4 (2.6)	
Systemic viral infection	7 (6.1)	2 (1.3)	
Osteomyelitis	4 (3.5)	4 (2.6)	
Bacteremia	2 (1.8)	4 (2.6)	
Infective endocarditis	3 (2.6)	3 (2.0)	
HIV infection	6 (5.3)	0 (0.0)	

COPD, chronic obstructive pulmonary disease; ICU, intensive care unit; IQR, interquartile range.

Compared with younger adults, geriatric patients had a substantially greater burden of comorbidity, with at least one chronic disease present in 96.0% versus 57.0% of patients ($p < 0.001$). Hypertension, diabetes mellitus, coronary artery disease, chronic kidney disease, chronic obstructive pulmonary disease, malignancy, and Alzheimer's disease/dementia were all significantly more prevalent among geriatric patients (all $p < 0.05$), whereas the prevalence of cerebrovascular disease, asthma, hemodialysis, and epilepsy was comparable between the two groups.

Healthcare-associated infections and microbiologically confirmed infections occurred at similar frequencies in geriatric and non-geriatric patients. Among microbiologically confirmed infections, bacterial pathogens predominated in both groups but were more frequently identified in geriatric patients, whereas viral infections were more common among younger adults ($p = 0.017$).

Clinical outcomes were broadly comparable between age groups. Median length of hospital stay was similar in geriatric and non-geriatric patients (7 vs. 6 days, $p = 0.767$). Although 28-day mortality (4.6% vs. 1.8%) and intensive care unit (ICU) transfer (4.0% vs. 0.0%) were numerically higher among geriatric patients, these differences did not reach statistical significance. Overall, 28-day clinical outcomes were also comparable between the two groups ($p = 0.087$).

Frailty and short-term clinical outcomes

Among the 151 geriatric patients, 102 (67.5%) were classified as frail according to the FRAIL Scale. Compared with non-frail patients, frail individuals were more likely to have polypharmacy (68.6% vs.

44.9%, p = 0.005) and healthcare utilization during the previous year (99.0% vs. 87.8%, p = 0.008). Frailty defined by the FRAIL Scale was also associated with a lower discharge rate (84.3% vs. 95.9%, p = 0.039). However, no significant differences were observed in ICU transfer, length of hospital stay, composite poor 28-day outcome, or 28-day mortality (Table 2).

Table 2
Clinical Characteristics and Outcomes According to FRAIL Status Among Geriatric Patients

Variable	Non-frail (n = 49)	Frail (n = 102)	p value
Clinical characteristics			
Polypharmacy	22 (44.9)	70 (68.6)	0.005
Healthcare utilization			
Healthcare utilization during the previous year	43 (87.8)	101 (99.0)	0.008
Hospitalization during the previous year	26 (53.1)	62 (60.8)	0.333
Bacterial infection during the previous year	26 (53.1)	55 (53.9)	0.921
Viral infection during the previous year	9 (18.4)	20 (19.6)	0.856
Clinical outcomes			
Length of hospital stay, days†	Median (IQR) 10.0 (7.0–17.5)	Median (IQR) 11.0 (6.75–18.5)	0.523
Overall 28-day outcome (overall p = 0.179)			
Discharged	47 (95.9)	86 (84.3)	0.039
ICU transfer	1 (2.0)	5 (4.9)	
Ongoing hospitalization	1 (2.0)	4 (3.9)	
Death	0 (0.0)	7 (6.9)	0.097

ICU, intensive care unit.

FRAIL

Fatigue, Resistance, Ambulation, Illnesses, and Loss of Weight scale. Patients with a FRAIL score ≥ 3 were classified as frail.

According to the Clinical Frailty Scale, 87 patients (57.6%) were classified as frail. Compared with non-frail patients, CFS-defined frailty was associated with significantly lower discharge rates (81.6% vs. 96.9%, p = 0.004), higher 28-day mortality (8.0% vs. 0.0%, p = 0.021), and worse overall 28-day clinical outcomes (p = 0.032). Polypharmacy was also more common among frail patients (69.0% vs. 50.0%, p = 0.018), whereas ICU transfer, length of hospital stay, previous healthcare utilization, previous

hospitalization, and infection history during the preceding year did not differ significantly between groups (Table 3).

Table 3
Clinical Characteristics and Outcomes According to Clinical Frailty Scale (CFS) Status Among Geriatric Patients

Variable	CFS Non-frail (n = 64)	CFS Frail (n = 87)	p value
Clinical characteristics			
Polypharmacy	32 (50.0)	60 (69.0)	0.018
Healthcare utilization			
Healthcare utilization during the previous year	60 (93.8)	84 (96.6)	0.465
Hospitalization during the previous year	36 (56.3)	52 (59.8)	0.303
Bacterial infection during the previous year	36 (56.3)	45 (51.7)	0.582
Viral infection during the previous year	13 (20.3)	16 (18.4)	0.767
Clinical outcomes			
Length of hospital stay, days†	Median (IQR) 10.5 (6.25–18.0)	Median (IQR) 11.0 (7.0–18.0)	0.497
Overall 28-day outcome (overall p = 0.032)			
Discharged	62 (96.9)	71 (81.6)	0.004
ICU transfer	1 (1.6)	5 (5.7)	
Ongoing hospitalization	1 (1.6)	4 (4.6)	
Death	0 (0.0)	7 (8.0)	0.021

CFS, Clinical Frailty Scale; ICU, intensive care unit.

Overall, polypharmacy was present in 92 of 151 geriatric patients (60.9%) and was associated with a longer hospital stay (p = 0.002) but not with ICU transfer, discharge status, 28-day mortality, or the composite poor 28-day outcome.

Correlation and prognostic performance of frailty instruments

The FRAIL Scale and the Clinical Frailty Scale demonstrated a strong positive correlation among geriatric patients (Spearman's ρ = 0.694, p < 0.001), indicating good agreement between the two frailty instruments.

Receiver operating characteristic (ROC) analysis demonstrated that the Clinical Frailty Scale showed significantly greater discriminative ability for predicting poor 28-day outcome than the FRAIL Scale (DeLong test, Z = 2.12, p = 0.034). The CFS yielded an area under the curve (AUC) of 0.823 (95% CI, 0.702–0.944; p < 0.001), whereas the FRAIL Scale yielded an AUC of 0.696 (95% CI, 0.579–0.813; p = 0.007) (Fig. 1).

Multivariable analysis

Multivariable logistic regression analysis was performed to identify independent predictors of poor 28-day outcome among geriatric patients (Table 4). The overall model was statistically significant (Omnibus χ^2=10.520, p = 0.033), demonstrated good calibration (Hosmer–Lemeshow χ^2=11.703, p = 0.165), and explained 13.0% of the variance in poor outcome (Nagelkerke R^2=0.130).

After adjustment for age, sex, and polypharmacy, frailty defined according to the Clinical Frailty Scale remained the only independent predictor of poor 28-day outcome (adjusted OR 5.99, 95% CI, 1.26–28.57; p = 0.024).

Table 4
Multivariable Logistic Regression Analysis for Poor 28-Day Outcome Among Geriatric Patients

Variable	β	SE	aOR	95% CI	p value
Age	0.026	0.035	1.026	0.958–1.099	0.460
Female sex	−0.251	0.527	0.778	0.277–2.184	0.634
Polypharmacy	−0.233	0.582	0.792	0.253–2.478	0.689
CFS-defined frailty	1.791	0.794	5.99	1.26–28.57	0.024

CFS: Clinical Frailty Scale; aOR: adjusted odds ratio; CI: confidence interval.

Discussion

In this prospective multicentre study of older adults hospitalized with acute infectious diseases, frailty proved to be a more informative predictor of poor short-term clinical outcomes than chronological age. Among the two frailty instruments evaluated, the Clinical Frailty Scale demonstrated significantly greater discriminative ability than the FRAIL Scale for predicting poor 28-day outcome. In contrast, chronological age was not independently associated with adverse outcomes, reinforcing the concept that biological vulnerability better reflects an individual's capacity to withstand and recover from acute illness than chronological age alone (2).

Recent prospective evidence further indicates that frailty is associated with an increased risk of hospital-treated infections, supporting its particular relevance in patients admitted with acute infectious diseases

(6). Our findings also agree with recent systematic evidence demonstrating that the CFS is a robust predictor of adverse outcomes across acute care settings (13).

The better discriminative performance of the Clinical Frailty Scale (CFS) is likely attributable to its multidimensional approach to frailty assessment. Unlike the FRAIL Scale, which primarily evaluates physical frailty through a brief screening questionnaire, the CFS integrates functional status, mobility, cognition, comorbidity burden, and dependence in activities of daily living into an overall clinical judgement (11). This broader assessment more accurately reflects the complex biological and functional vulnerability of older adults hospitalized with acute infections, thereby improving its ability to identify patients at risk of adverse outcomes (2). Consistent with our findings, recent systematic reviews have demonstrated that the CFS independently predicts mortality, prolonged hospitalization, institutionalization, and functional decline across diverse acute care settings (13). Similarly, a contemporary meta-analysis of unplanned hospital admissions confirmed that frailty identified using validated instruments is strongly associated with adverse clinical outcomes, supporting the routine incorporation of frailty assessment into acute hospital care (14). Overall, the available evidence supports the use of the CFS not only as a frailty screening instrument but also as a clinically useful prognostic tool.

Older adults admitted with infectious diseases commonly present with immunosenescence, multimorbidity, chronic inflammation, cognitive impairment, and functional decline, all of which contribute to diminished physiological reserve and reduced resilience to acute illness (3). Because the CFS integrates these interconnected domains into a single global clinical assessment, it may identify patients at increased risk of adverse outcomes more accurately than instruments primarily assessing physical frailty (13). This interpretation is further supported by recent evidence indicating that the FRAIL Scale performs well as a screening instrument but provides a narrower assessment of frailty than multidimensional clinical tools (15).

From a clinical perspective, our findings support the routine incorporation of frailty assessment into the evaluation of older adults hospitalized with acute infectious diseases. Contemporary geriatric care increasingly advocates individualized, person-centered decision-making based on biological rather than chronological ageing (16).

Within this framework, the Clinical Frailty Scale represents a practical bedside instrument that complements conventional assessment based on infection severity, microbiological findings, laboratory parameters, and comorbidity burden (13). Recent international consensus recommendations further emphasize that frailty should be identified early during acute hospital care to guide comprehensive geriatric assessment and individualized management pathways (17). Furthermore, routine frailty screening in acute care settings facilitates timely clinical decision-making and should become an integral component of emergency and inpatient care for older adults (18).

An important secondary finding of this study was that antimicrobial resistance profiles were comparable between geriatric and non-geriatric patients despite the greater burden of multimorbidity and bacterial

infections among older adults. This observation suggests that chronological age alone may be a less important determinant of antimicrobial resistance than cumulative healthcare exposure, previous antimicrobial use, invasive procedures, and underlying comorbidity (19). Because all participants were recruited from tertiary infectious diseases wards, younger patients in our cohort may have shared similar healthcare exposures and clinical complexity, thereby reducing age-related differences in resistance patterns. Consequently, our findings support current antimicrobial stewardship principles, emphasizing that empirical antimicrobial therapy should be guided by individualized risk assessment and local epidemiology rather than chronological age alone (20).

Our study has several strengths that deserve emphasis. Its prospective multicentre design, standardized data collection, and inclusion of patients from 16 participating hospitals enhance the robustness, external validity, and clinical applicability of the findings. Nevertheless, several limitations should be considered. First, the point-prevalence design precluded assessment of longitudinal changes in frailty and clinical status over time. Second, the relatively small number of poor outcome events may have limited the statistical power of the multivariable analyses. Finally, because all participants were recruited from tertiary infectious diseases wards, the generalizability of our findings to other healthcare settings, including community hospitals and primary care, should be interpreted with caution. Future multicentre longitudinal studies with larger sample sizes are warranted to validate these findings and to determine whether frailty-guided interventions improve clinical outcomes in older adults with acute infectious diseases.

Conclusions

Our findings suggest that routine frailty assessment may be useful for risk stratification in older adults hospitalized with infectious diseases. The Clinical Frailty Scale demonstrated better prognostic performance than the FRAIL Scale and may help identify patients at increased risk of adverse short-term outcomes. Future prospective interventional studies are warranted to determine whether frailty-guided management translates into improved patient outcomes.

Abbreviations

AUC
Area under the receiver operating characteristic curve
CFS
Clinical Frailty Scale
CI
Confidence interval
COPD
Chronic obstructive pulmonary disease
ICU
Intensive care unit

IQR
Interquartile range
OR
Odds ratio
ROC
Receiver operating characteristic

Declarations

Ethics approval and consent to participate

The study was approved by the Yozgat Bozok University Non-Interventional Clinical Research Ethics Committee (Approval No. 2026-GOKAEK-266_2026.03.25_37; Meeting No. 06; Decision No. 37; Approval Date: 25 March 2026). Written informed consent was obtained from all participants or their legally authorized representatives before enrolment. Clinical trial number: Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Funding

The authors received no specific funding for this study.

Author Contribution

HE, ZTY, BK, and GEK conceived and designed the study. HE coordinated the multicentre data collection, analysed and interpreted the data, and drafted the initial manuscript. ZTY, SÇA, SÇ, MA, FİÇ, AST, SB, ŞKK, YK, Gİ, MİH, MSS, ZK, EAF, ZTT, SAV, AE, and GEK contributed to patient recruitment and data collection at their respective centres. BK critically reviewed the manuscript for important intellectual content and contributed to the interpretation of the findings. All authors critically reviewed the manuscript, approved the final version, and agree to be accountable for all aspects of the work.

Acknowledgements

The authors thank all participating centers and investigators for their contribution to data collection.

Availability of data and materials

The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request.

References

1. Gavazzi G, Krause KH. Ageing and infection. Lancet Infect Dis. 2002;2(11):659–66. 10.1016/S1473-3099(02)00337-1.
2. Kim DH, Rockwood K. Frailty in older adults. N Engl J Med. 2024;391(6):538–48. 10.1056/NEJMra2301292.
3. Hoogendijk EO, Afilalo J, Ensrud KE, Kowal P, Onder G, Fried LP. Frailty: implications for clinical practice and public health. Lancet. 2019;394(10206):1365–75. 10.1016/S0140-6736(19)31786-6.
4. Dent E, Martin FC, Bergman H, Woo J, Romero-Ortuno R, Walston JD. Management of frailty: opportunities, challenges, and future directions. Lancet. 2019;394(10206):1376–86. 10.1016/S0140-6736(19)31785-4.
5. Clegg A, Young J, Iliffe S, Rikkert MO, Rockwood K. Frailty in elderly people. Lancet. 2013;381(9868):752–62. 10.1016/S0140-6736(12)62167-9.
6. Xu M, Gong Y, Yin X, et al. Association of frailty with risk of incident hospital-treated infections in middle-aged and older adults: a large-scale prospective cohort study. J Gerontol Biol Sci Med Sci. 2024;79(8):glae146. 10.1093/gerona/glae146.
7. Rockwood K, Song X, MacKnight C, et al. A global clinical measure of fitness and frailty in elderly people. CMAJ. 2005;173(5):489–95. 10.1503/cmaj.050051.
8. Morley JE, Malmstrom TK, Miller DK. A simple frailty questionnaire (FRAIL) predicts outcomes in middle-aged African Americans. J Nutr Health Aging. 2012;16(7):601–8. 10.1007/s12603-012-0084-2.
9. von Elm E, Altman DG, Egger M, et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies. PLoS Med. 2007;4:e296. 10.1371/journal.pmed.0040296.
10. Maher RL Jr, Hanlon J, Hajjar ER. Clinical consequences of polypharmacy in elderly. Expert Opin Drug Saf. 2014;13(1):57–65. 10.1517/14740338.2013.827660.
11. Church S, Rogers E, Rockwood K, Theou O. A scoping review of the Clinical Frailty Scale. BMC Geriatr. 2020;20:393. 10.1186/s12877-020-01801-7.
12. World Medical Association. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. JAMA. 2013;310(20):2191–4. 10.1001/jama.2013.281053.
13. Erhag HF, Guðnadóttir G, Alfredsson J, et al. The Association Between the Clinical Frailty Scale and Adverse Health Outcomes in Older Adults in Acute Clinical Settings: A Systematic Review of the

Literature. Clin Interv Aging. 2023;18:249–61. 10.2147/CIA.S388160.

14. Boucher EL, Gan JM, Rothwell PM, et al. Prevalence and outcomes of frailty in unplanned hospital admissions: a systematic review and meta-analysis of hospital-wide and general medicine cohorts. EClinicalMedicine. 2023;59:101947. 10.1016/j.eclinm.2023.101947.
15. Vo NT, Tu YK, Lin KC, Chiu HY, Huang HC. Diagnostic Accuracy of the FRAIL Scale, Groningen Frailty Indicator, Tilburg Frailty Indicator, and PRISMA-7 for Frailty Screening Among Older Adults in Community Settings: A Systematic Review and Network Meta-Analysis. Gerontologist. 2024;64(6):gnae008. 10.1093/geront/gnae008.
16. World Health Organization. Decade of Healthy Ageing: Baseline Report. Geneva: World Health Organization; 2021.
17. Moloney E, O'Donovan MR, Carpenter CR, et al. Core requirements of frailty screening in the emergency department: an international Delphi consensus study. Age Ageing. 2024;53(2):afae013. 10.1093/ageing/afae013.
18. van Oppen JD, Mason S. Frailty screening in the Emergency Department: why does it matter? Age Ageing. 2024;53(4):afae056. 10.1093/ageing/afae056.
19. Tacconelli E, Carrara E, Savoldi A, Harbarth S, Mendelson M, Monnet DL, et al. Discovery, research, and development of new antibiotics: the WHO priority list of antibiotic-resistant bacteria and tuberculosis. Lancet Infect Dis. 2018;18(3):318–27. 10.1016/S1473-3099(17)30753-3.
20. Barlam TF, Cosgrove SE, Abbo LM, MacDougall C, Schuetz AN, Septimus EJ, et al. Implementing an Antibiotic Stewardship Program: Guidelines by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America. Clin Infect Dis. 2016;62(10):e51–77. 10.1093/cid/ciw118.

Figures

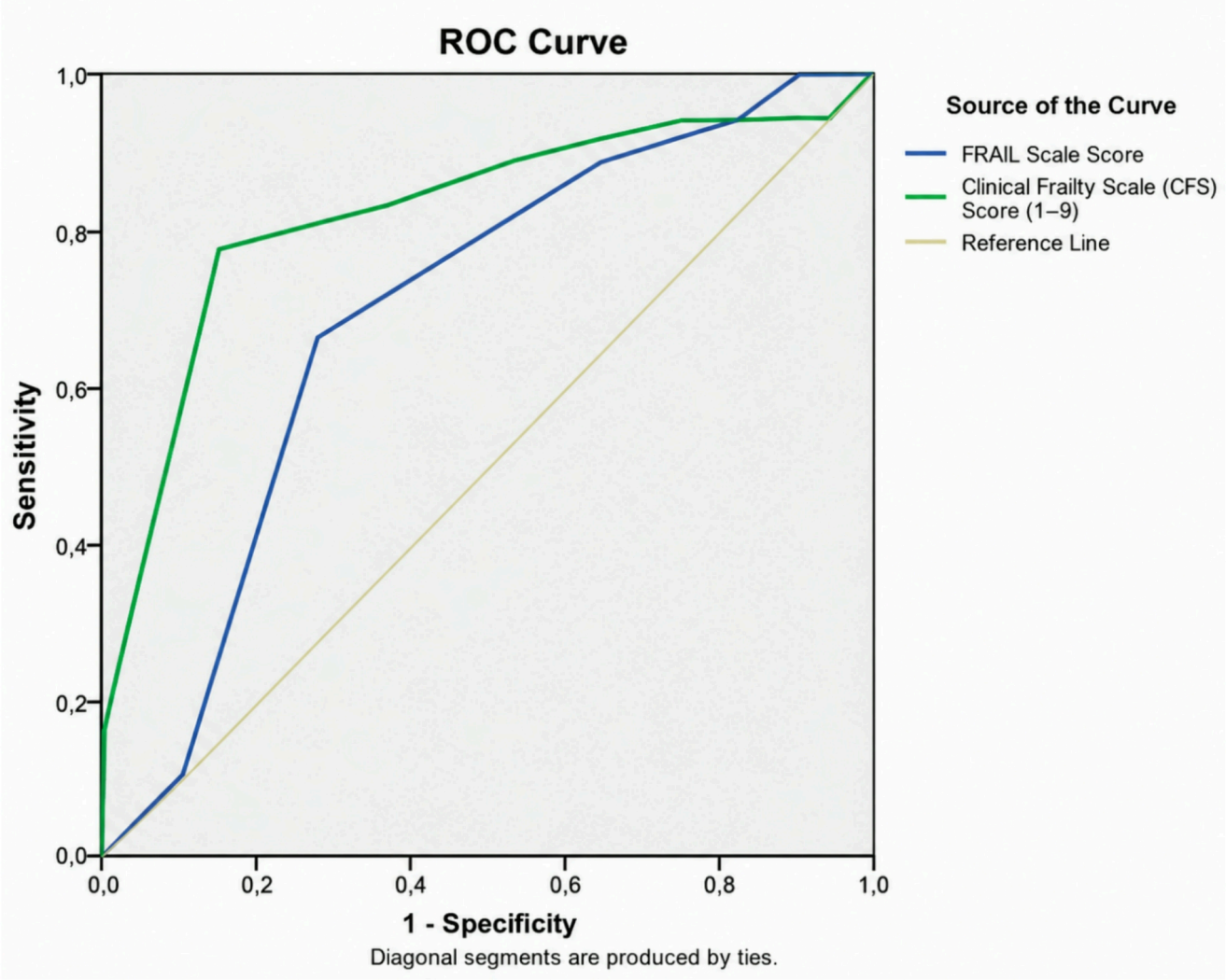


Figure 1

Receiver operating characteristic curves of the FRAIL Scale and Clinical Frailty Scale for prediction of poor 28-day outcome among geriatric patients

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SupplementaryTablekopyas.docx