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The Final thesis

Frailty Assessment in Different Clinical Settings: Literature Review

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ABSTRACT

Objective: Several frailty assessment tools have been developed in recent years, but there is no gold standard that tells which are most suitable in different clinical settings based on their sensitivity, specificity, applicability, and feasibility.

Aim: This literature review aims to determine which frailty assessment tools are most appropriate for different clinical settings—namely, primary care, hospital/emergency departments (ED), and nursing homes—by evaluating their sensitivity, specificity, applicability, and feasibility.

Design: Literature review

Methods: Searches were conducted in PubMed, Scopus, and Elsevier using database-specific search terms such as “elderly,” “older adult,” “frailty,” “frail tool,” “frailty screening,” and related keywords; manual searches of guideline websites were also performed. Using the PICOS framework, studies published in English over the past 11 years (2014–2025) that focused on patients aged ≥65 years (excluding terminally ill individuals) were included.

Results: The findings reveal marked heterogeneity among frailty instruments, likely because different scales capture distinct components of frailty. In primary care, where time constraints and the need for self-administered tools prevail, the PRISMA-7 and EASY-Care TOS are recommended. In hospital settings, the FRAIL scale and the Frailty Index (FI) effectively predict mortality and hospitalization risks, aiding clinical decision-making. In EDs, rapid frailty detection is critical; thus, the PRISMA-7 is preferred due to its optimal balance of specificity and sensitivity. The FRAIL-NH scale is suited for broad screening in long-term care settings, while the FI is better for in-depth, individualized assessments.

Conclusion: Overall, 15 studies from America, Europe, Asia, and Australia were analyzed. Although direct comparisons are challenging because many studies focus on a single tool, the evidence supports a two-step approach involving an initial brief screening questionnaire to detect frailty, followed by a more detailed assessment to determine

care needs at the individual level. Additional investigation is warranted to enhance the clinical relevance of guidelines for frailty identification and to standardize the use of these instruments in both clinical and research settings.

Keywords: comprehensive geriatric assessment, frailty, assessment tools, feasibility, older adults, FRAILTOOLS Project, different clinical settings, Primary care setting, Hospital setting, Emergency Department setting, Long-Term Care setting

ABBREVIATIONS

Table 1. Abbreviations [source: Luisa Brix]

GFST	Gérontopôle Frailty Screening Tool
FTS-5	5-item Frailty Trait Scale
LTC	Long Term Care
CFS	Rockwood Clinical Frailty Scale
CGA	Comprehensive Geriatric Assessment
ED	Emergency Department
eFI	Electronic Frailty Index
EFS	Edmonton Frail Scale
EFT	Essential Frailty Toolset
FI	Frailty Index
FRAIL	Fatigue, Resistance, Ambulation, Illnesses & Loss of Weight
HFRS	Hospital Frailty Risk Score
ICD-10	International Statistical Classification of Diseases and Related Health Problems, Tenth Revision
ICU	Intensive Care Unit
ISAR (PC)	Identification of Seniors At Risk Primary Care
mFI	Modified Frailty Index
PFP	Fried Physical Frailty Phenotype
SAVR	Surgical Aortic Valve Replacement
TAVI	Transcatheter Aortic Valve Implantation
TFI	Tilburg Frailty Indicator
TRST	Triage Risk Screening Tool
CPGs	Clinical practice guidelines
FRAIL-NH scale	Fatigue, Resistance, Ambulation, Illnesses & Loss of Weight for Nursing Homes
Fried's Frailty Phenotype	Fried frailty phenotype
PICOS	Population Implementation Comparator Outcome Study
PHC	Primary health care
GP	General practitioner
AFI	Adelaide Frailty Index
AUC	Area Under the Curve
FQ	FRAIL Scale Questionnaire
GST	Gait Speed Test
GFI	Groningen Frailty Indicator
KC	Kihon Checklist
POLY	Polypharmacy
PRISMA-7	Program on Research for Integrating Services for the Maintenance of Autonomy
REFS	Reported Edmonton Frail Scale

Table 2. Abbreviations [source: Luisa Brix]

SRH	Self-Rated Health
TUG	Timed Up and Go
EASY-Care TOS	EASY-Care Two step Older people Screening
EMR	Electronic Medical Records
eFI-CGA	Software tool
ICECAP-O	ICEpop CAPability measure for Older people
SHARE-FI	Frailty Index developed from the Survey of Health, Ageing and Retirement in Europe
EUGMS	European Union Geriatric Medicine Society
FTS3	3-item Frailty Trait Scale
FI-Lab	FIs that focus on common clinical and laboratory tests
BGS	British Geriatrics Society
FRESH criteria	general fatigue, tiredness from a short walk, dependence in shopping, frequent falls/anticipation of falls, and three or more visits to the emergency ward during the last 12 months.
PADL	personal ADL items
IADL	instrumental ADL items
CI	Confidence Interval
FRADEA	Frailty and Dependency Study Cohort
HGS	Hand Grip Strenght
ACS	Acute Care Setting
Brief MPI	Multidimensional Prognostic Index
RISC score	Risk Instrument for Screening in the Community
LOS	Length of Stay
GDP	gross domestic product
MDS	Medical Review Board of the National Association of Statutory Health Insurance Funds
HR	Hazard Ratio
FI-35	35-item Frailty Index
NHS	National Health Service
HCPs	Healthcare Professionals
eFS	Electronic frailty scores
ML	Machine Learning
eFI	Electronic Frailty Index
e-SIF	Electronic Screening Index of Frailty
EHRs	Electronic Health Records

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1. INTRODUCTION

1.1 BACKGROUND/SIGNIFICANCE OF FRAILTY ASSESSMENT

Frailty is a growing concern in aging populations, particularly among older adults in acute and long-term care, along with individuals facing social vulnerabilities (1). As life expectancy continues to rise, so does the incidence of frailty, making early identification and management crucial for improving independence and overall welfare. Many tools were developed to measure frailty, primarily to predict adverse health outcomes. However, simple tools often lack the depth to inform

personalized care plans. Multidomain assessments based on comprehensive geriatric evaluation can uncover reversible conditions and highlight target domains for intervention (1). It is essential to understand an individual's frailty course because if frailty worsens, mortality risk becomes higher, and the quality of life becomes worse. One has to be careful when comparing results from different frailty tools because methodological differences can make interpretation difficult (1). As current frailty assessments and interventions are rather different in their features, there is, for now, only limited evidence (1). Reliable clinical practice guidelines (CPGs) are vital when it comes to diagnosing and treating frailty. These guidelines, informed by evidence, provide healthcare practitioners with recommendations on the most effective treatment strategies. However, although existing CPGs primarily focus on identifying frailty and its causes, definitive standards for frailty management remain lacking (3). Frailty prevalence varies across different populations and settings. A survey in which 7,510 elderly people across 10 European countries revealed higher frailty rates in southern Europe compared to northern regions. For instance, frailty prevalence among institutionalized and community-dwelling older adults in Spain is 8.4%, whereas in Italy, it reaches 13.9%. In France, approximately 25% of individuals over 55 years old are frail or multimorbid. In nursing home settings, frailty prevalence is significantly higher, reaching 68.8% in American studies. Frailty incidence is projected to rise alongside Europe’s aging population, with estimates ranging from 4% new cases in Germany to 8% in Spain over three years of follow-up (4). The implications of frailty on survival are significant. Survival analyses based on primary care data from England show that people with severe frailty have a mortality risk that is five times higher. (5). Despite the widespread recognition of frailty screening as a crucial tool in clinical practice, there is no universally accepted gold standard for frailty assessment. Each country employs its own frailty scale for national use, contributing to the ongoing debate surrounding the optimal method for frailty screening (6). Given the global burden of frailty and its impact on healthcare

systems, continued efforts are needed to standardize assessment tools, develop evidence-based interventions, and integrate frailty management into routine clinical practice. Advancing research in this field will help refine screening methods and enhance care strategies to support aging populations effectively.

1.2 DEFINITION OF FRAILTY

Although frailty has been defined in multiple ways, two main conceptual models have gained prominence: frailty as a clinical syndrome and frailty as the result of accumulated health deficits. Frailty becomes increasingly prevalent with advancing age and serves as a strong predictor of negative health outcomes. These two models classify different groups of individuals as frail. The Fried frailty phenotype specifically describes a clinical syndrome arising from disruptions in metabolism and abnormal responses to physiological stress. Its hallmark signs include exhaustion (often the earliest symptom), muscle weakness, slowed performance, reduced physical activity, and unintentional weight loss (typically occurring later). The extent of frailty is assessed by the number of criteria met. Individuals without any signs are classified as "robust," those with one or two signs are considered "prefrail," and those meeting three to five criteria are labeled "frail." The presence of all five indicators marks a critical point where mortality risk sharply increases and recovery becomes unlikely. Importantly, the Fried frailty phenotype is distinct from having multiple chronic conditions or disabilities. (1) The deficit accumulation approach conceptualizes frailty as a progressive decline in health status, resulting from the accumulation of multiple age-related deficits. The specific deficits incorporated into assessments vary based on the setting and available data sources, which may include survey responses, comprehensive geriatric assessments, electronic health records, administrative databases, or biological measures. This model typically captures a range of factors, including medical conditions, cognitive impairments, physical limitations, disabilities, nutritional deficiencies, and abnormal clinical or laboratory findings. Despite ongoing efforts to establish a standardized

definition of frailty, both the Fried frailty phenotype and the deficit accumulation framework remain predominant in clinical and research settings (1). Frailty assessments are generally classified according to their methodological framework into phenotypic, multidimensional, or deficit accumulation models. The so-called phenotypic models use observable physical characteristics to describe frailty, for instance, unintended weight loss, reduced physical activity, and diminished muscular strength. These approaches are sometimes critizised because their scope is narrow, as they don't include cognitive and psychological factors. As a consequence thereof, multidimensional models have been developed to describe a widened spectrum of frailty indicators. Furthermore, the deficit-accumulation model quantifies some other health-related features, such as chronic diseases (7). A wide range of brief screening instruments is available for application across outpatient clinics, inpatient wards, emergency departments, and preoperative settings. These tools may depend on patient self-report, such as the FRAIL questionnaire (addressing Fatigue, Resistance, Ambulation, Illnesses, and Weight Loss), clinician assessment, as exemplified by the Clinical Frailty Scale, or data extracted from electronic health records. Notably, a gait speed of less than 0.8 meters per second demonstrates a 99% sensitivity for identifying individuals who meet the Fried frailty phenotype criteria (1). Performance-based measures may be impractical for hospitalized patients, as acute conditions might affect their accuracy (8). Frailty is characterized as a clinical condition in which individuals exhibit increased vulnerability to exogenous pressures, heightening their risk of adverse outcomes such as functional dependence or mortality. Multiple factors, including physiological alterations, age-related diseases, sarcopenia, polypharmacy, physical inactivity, socioeconomic deprivation, and social isolation, influence its development. Frailty is recognized as a dynamic process, capable of progressing or regressing across varying degrees of severity, especially during its early stages (3). Frailty is closely linked to gait, falling risk, mobility, and nutrition. Gait speed has been recognized as a critical indicator of frailty, with reduced

walking speed serving as a predictor of increased mortality and hospitalization risk (2). Impaired mobility and an elevated risk of falls are common consequences of frailty, further exacerbating the likelihood of adverse health outcomes. Poor nutritional status, including malnutrition and weight loss, is a core component of frailty, often preceding physical deterioration. Addressing these factors through early intervention and comprehensive geriatric assessment can help mitigate frailty-related decline and improve patient outcomes (1).

1.3 PREVIOUS RESEARCH ON FRAILTY ASSESSMENT TOOLS

Limited studies have evaluated specific frailty assessment tools' sensitivity, specificity, or validity across different clinical settings. While many papers mention specificity and sensitivity, they often focus on a single clinical setting, making it difficult to compare the performance of these tools across multiple settings. Additionally, not all studies present the specificity and sensitivity of the chosen assessment tools in a clear, comprehensible manner. The graphs and tables illustrating results are not always concrete or easy to interpret. Only a few studies have included more than one clinical setting in their analysis. Although numerous studies explore various frailty assessment tools, there is still no definitive recommendation for their application in specific settings. Clinical trials evaluating frailty interventions frequently involve small and heterogeneous populations, often lacking standardized screening tools, intervention protocols, and outcome measures. This results in less evidence regarding the effectiveness of frailty assessment tools. While frailty assessment determines eligibility for clinical trials, uncertainty remains about whether routine frailty screening improves health outcomes or reduces healthcare utilization and costs. Further research is needed to refine frailty measurement methods, develop new treatment strategies, improve clinical management, and enhance the training of healthcare professionals (1).

1.4 PURPOSE AND OBJECTIVES OF THE THESIS

Frailty assessment is a crucial aspect of geriatric healthcare, given its significant implications for patient management, resource allocation, and health outcomes. Although multiple scales and questionnaires exist

to identify frailty, there is still no universally endorsed approach for its screening and diagnosis in clinical practice. Therefore, this thesis aims to evaluate the effectiveness of frailty assessment tools across different clinical and social settings, to establish their role in screening, assessment, and management protocols for frail older patients. A significant challenge in frailty research is the lack of consistency in applying and validating frailty instruments. Although various scales exist, their ability to predict adverse outcomes and guide clinical decision-making has not been comprehensively evaluated across different healthcare environments. The primary objective of this literature review is to identify standardized strategies from clinical practice guidelines (CPGs) that healthcare providers can utilize to screen, assess, and manage frailty in diverse clinical settings. Despite the broad spectrum of frailty assessment tools available, little research has examined their feasibility, administration times, and interscale agreement. So it is essential for succeeding in everyday practice to know about the practical aspects of frailty assessment tools, such as their feasibility and ease of administration. The feasibility of frailty assessment tools is based on the characteristics of the patients and the healthcare setting in which they are applied. The ease of administration is particularly relevant in environments with different levels of resource availability and personnel expertise. Until now, few multicenter studies have simultaneously compared frailty assessment tools in differernt settings, whereby they are able to disclose their relative effectiveness comprehensively. This research shortcoming must be overcome to optimize frailty detection strategies and improve care for seniors (4).

2. METHODOLOGY

2.1 DATA COLLECTION METHODS

The data collection process for this literature review involved a comprehensive search of multiple databases. The primary sources included PubMed, Scopus, Elsevier, Google Scholar, and Cochrane, as these were identified as the most extensive databases for medical, nursing, and public health journals. However, Cochrane and Google

Scholar were excluded due to the high volume of nonspecific results generated. Database-specific search terms were applied, including "elderly,", “older adult”, "patients," "frailty," "frail tool," "frailty screening," "different clinical settings," "primary care," "nursing homes," "LTC," "ward," "hospital," "inpatient," "feasibility," and "applicability." In addition to database searches, a manual search was conducted through the websites of guideline databases to expand the scope of the review. Zotero was used to filter and organize the retrieved studies. This literature review was conducted using the PICOS (Population, Intervention, Comparator, Outcome, Study) method. The study population consisted of elderly patients aged 65 years and older who were not terminally ill. The primary objective of this review was to determine which frailty assessment tools are most suitable for different clinical settings, including primary care, hospital emergency departments (EDs), and nursing homes. The outcomes assessed in this review included the performance of frailty assessment instruments in different clinical settings and their feasibility. Feasibility was determined based on the time and resources required to complete each assessment. This factor is particularly relevant in high-demand environments where time constraints limit the feasibility of lengthy evaluations. The usefulness of each frailty assessment tool was assessed according to predefined criteria, taking into account the prevalence of frailty within each specific setting and the tool’s classification performance. Performance metrics included positive and negative predictive values, specificity, sensitivity, likelihood ratios, and overall feasibility. The inclusion criteria for the studies in this review were as follows: publications from the last eleven years (2014-2025), availability as free full-text articles, written in English, categorized as articles, reviews, experimental trials, clinical trials, or cohort studies, and within the fields of medicine, nursing, public health, and geriatrics. The exclusion criteria included studies with fewer than 100 participants, articles based on clinical vignettes, studies focused solely on the definition and models of frailty, papers examining frailty in relation to specific diseases (such as cancer,

diabetes, cardiac diseases, or sarcopenia), and correlations between frailty and sarcopenia. Additionally, ongoing studies were excluded from the review. No new statistical analysis of raw data was conducted for this review. Instead, the study relied on the analyses presented in the selected sources without modifications.

3. RESULTS

3.1 OVERVIEW OF PRIMARY CARE SETTINGS

Germany represents a notable example of a European Union member state with a robust primary health care system that is presently confronting the challenges associated with an ageing population. The number of people 67 years or older, that means seniors at retirement age, will increase by approximately 4 million, so there will be more than 20.0 million by 2035 (9). As a result of this demographic shift, there is an increasing demand for primary health care services. The growing number of chronically ill individuals also leads to a rising need for more general practitioners (GPs) (10). Caring for frail older adults presents a particular challenge to primary health care systems. Family physicians are well-positioned to incorporate frailty identification and management into their clinical practice (11). Many countries are implementing more proactive and personalized approaches to primary health care. A range of interventions, including the advancement of care integration, the formulation of individualized care strategies, and the adoption of case management practices, has been proposed to strengthen primary health care. These efforts address the complex needs of frail elderly populations and individuals with multiple chronic illnesses (12).

3.2 ROLE OF FRAILTY ASSESSMENT IN PRIMARY CARE

There is an ongoing debate regarding the feasibility of conducting frailty assessments and care planning in primary care. When performed thoroughly, this process can take up to two hours per patient, excluding the six-monthly review, which affects approximately 2% of a general practitioner’s patient population, or around 40 patients per GP (13). Early intervention is crucial, as frailty progression often leads to a rapid decline in health. As a consequence, it becomes more and more

difficult to slow or reverse the course once it has progressed. In primary care settings, an optimal frailty assessment tool must detect individuals who are already frail as well as those featuring early signs of frailty, given its high prevalence within the community. Moreover, ideal assessment tools should identify specific functional deficits that can be dealt with successfully by early intervention, for instance, unhealthy habits or shortcomings in specific functions like cognitive performance or mobility. Targeting these modifiable factors would enable primary care practitioners to deliver individualized interventions aimed at improving health outcomes and preventing the advancement of frailty (2). The successful integration of frailty assessment into primary care requires appropriate allocation of time, personnel, and technological resources. While the initial implementation of frailty assessments may demand significant resources, research suggests that the long-term benefits justify these investments (7).

3.3 OVERVIEW OF HOSPITAL SETTINGS

Across Europe, countries are undergoing significant demographic shifts, marked by a growing proportion of individuals aged 65 and older, with the most rapid increase occurring among those over 80. As a result, acute hospitals are increasingly focused on the care of older patients, many of whom present with frailty, dementia, or multiple chronic conditions that complicate their acute illnesses. While hospital bed capacity has generally declined and ambulatory and community-based treatments have expanded, critical service gaps remain. These gaps often fail to adequately address the needs of frail older adults, frequently leading to hospital admissions (5). Rising emergency admissions—particularly among older adults—have placed increasing pressure on acute services, shifting the focus of geriatricians towards hospital-based care. This shift risks weakening connections with community-based teams (13).

3.4 ROLE OF FRAILTY ASSESSMENT IN HOSPITALS AND EMERGENCY DEPARTMENTS

Meta-analyses of numerous studies conducted across Europe prove that comprehensive assessments for older adults admitted to hospitals yield long-term benefits (5). These benefits include improved survival rates, a greater likelihood of remaining in their homes, and reduced cognitive decline. Geriatrics and frailty services within emergency departments offer specialized geriatric input to support decision-making for frail older adults. However, evidence supporting emergency frailty units remains limited. The implementation of frailty screening in emergency settings presents challenges, primarily due to the complexity of identifying frailty. Contributing factors include the lack of standardized frailty assessment tools, limited awareness of frailty among healthcare providers, and no clear guidelines for managing frailty in emergency care (2).

A meta-analysis by Van Craen et al., which examined studies from the United States, Austria, Germany, and Norway, found that acute frailty units significantly positively impacted reducing physical impairment at discharge and lowering institutionalization rates after one year (14). The study also highlighted the added value of multidisciplinary CGA for hospitalized frail older adults, as it better addressed their specific needs and led to higher patient satisfaction with the care received. Across Europe, the development of acute frailty units is progressing at different rates. In countries such as Germany and Austria, specialized geriatric trauma centers have been introduced, providing interdisciplinary care. (5). Given that conditions presented in the ED are typically acute, efficient patient flow and time management are critical factors. The growing complexity and comorbidities associated with an aging population underscores the need for effective assessment and decision-making tools to support ED staff in triaging, managing care, and allocating resources appropriately. However, current triage models often fail to appropriately assess older adults, leading to systematic under-triaging (7).

3.5 OVERVIEW OF LONG-TERM CARE FACILITIES

The growing ageing population across Europe is driving an increased need for long-term care (LTC) services. A 2021 report by the European

Commission projects that the number of people requiring LTC will grow from 30.8 million in 2019 to 38.1 million by 2050 (15). In Lithuania, the old-age dependency ratio is projected to rise from 30.4% in 2019 to 41% in 2030 and 56.5% by 2050. Lithuania's LTC system includes inpatient care in nursing hospitals, residential facilities for older adults, independent living homes, daycare centers, and homecare services. National statistics from 2018 indicate that approximately 13,000 elderly residents resided in residential care homes, while about 19,880 received social services at home (16).

3.6 ROLE OF FRAILTY ASSESSMENT IN LONG-TERM CARE FACILITIES

As populations continue to age, the use of standardized frailty screening tools enables healthcare providers to optimize resource utilization, minimize adverse health outcomes, and improve the overall quality of life for individuals residing in long-term care facilities. However, adopting frailty assessment differs significantly across European countries, with variations in screening methods, policy frameworks, and integration into standard healthcare practices. While some countries have established structured frailty assessment systems, others struggle with limited resources, a lack of standardized guidelines, and disparities in healthcare infrastructure (17). Establishing a unified, evidence-informed framework for frailty assessment is essential to promoting equitable and effective healthcare for the aging population throughout Europe (17). Regular frailty evaluations are essential, as highlighted by the Frailtools Project, which found significant variations in frailty prevalence depending on the care setting. Notably, frailty rates were consistently higher in nursing homes compared to other environments (4).

4. ANALYSIS

4.1 FRAILTY ASSESSMENT TOOLS USED IN PRIMARY CARE (ACCORDING TO CASE STUDIES)

There are several tools to assess frailty in a primary care setting. The Groningen Frailty Indicator (GFI) includes 15 questions designed to evaluate various aspects of frailty, such as cognitive, social,

physical, and psychological domains. A score of four or higher indicates frailty.

The PRISMA-7 tool comprises seven binary (yes/no) questions, where three or more affirmative answers suggest the presence of frailty.

The Edmonton Frail Scale (EFS) assesses frailty across ten domains, including areas like cognitive function, social support systems, medication management, and functional abilities, with a scoring range from 0 to 17.

An adaptation of the EFS, the Reported Edmonton Frail Scale (REFS), is used to assess frailty based on information provided by caregivers, healthcare professionals, or other proxies, rather than relying solely on patient self-reporting or performance tasks. The REFS evaluates similar domains to the EFS, such as cognitive function, overall health status, ability to perform activities of daily living (ADLs), medication use, social support, mood, physical performance, continence, and nutritional status.

The Kihon Checklist features 25 yes/no items addressing a variety of frailty-related domains, with a frailty threshold commonly set at seven or more affirmative responses.

The Frailty Phenotype is a widely recognized framework that conceptualizes frailty as a biological syndrome marked by reduced physiological reserves and heightened vulnerability to external stressors. Individuals are classified as frail if they meet at least three of five criteria: exhaustion, unintentional weight loss, weakness, slow gait speed, and reduced levels of physical activity.

The Timed Up and Go (TUG) test is a straightforward and extensively utilized method for assessing mobility, balance, functional ability, and the risk of falling among older adults. It measures the duration needed for a participant to rise from a chair, walk back, and sit down again. Completion in less than 10 seconds is generally considered a typical result.

The Adelaide Frailty Index (AFI) was developed using information from Australia's Aged Care Assessment Program (ACAP), which evaluates eligibility for government-subsidized aged care services.

Researchers selected 44 variables representing deficits, including activity limitations, medical conditions, and physical symptoms. The AFI score is calculated by dividing the number of deficits observed by the total number of variables assessed, yielding a value between 0 and 1, where higher scores reflect greater degrees of frailty (18).
The Australian Study (2019) by Ambagtsheer et al. assessed the diagnostic test accuracy (DTA) of several frailty screening tools. Among the tools evaluated were the FRAIL Questionnaire (FQ), the Edmonton Frail Scale (EFS), the Kihon Checklist (KC), the Gait Speed Test (GST), Polypharmacy assessment (POLY), the Groningen Frailty Indicator (GFI), PRISMA-7 (P7), the Reported Edmonton Frail Scale (REFS), as well as the Timed Up and Go (TUG) test and the Self-Rated Health (SRH). The performance of these screening tools was compared against two established reference standards: Fried's Frailty Phenotype (FP) and the Adelaide Frailty Index (AFI) (18). This study included 228 participants aged 75 years and older. Frailty prevalence was established as 17.5% frail and 56.6% prefrail according to the Frailty Phenotype (FP), while 48.7% were classified as frail using other measures. Among the self-administered tools, only the Kihon Checklist (KC) and the Reported Edmonton Frail Scale (REFS) satisfied all three criteria for high diagnostic accuracy. Utilizing self-administered screening instruments could help save clinicians' time, with potential applications in settings such as waiting areas. Although PRISMA-7 demonstrated strong overall performance, it narrowly fell short of the 80% sensitivity benchmark, differing from findings in other studies where it exhibited high diagnostic precision. Self-administered tools had lower completion rates than nurse-administered ones, though they offered practical advantages in time-pressured general practice settings. The FRAIL Questionnaire and PRISMA-7 were the fastest to administer, with PRISMA-7 ranking highest in feasibility and acceptability (19). The Dutch Study (2016) by Sutorius et al. compared the diagnostic and prognostic accuracy of 10 frailty identification methods in primary care on 102 people aged 65 and over. The frailty prevalence was between 14.8% and 52.9%. The assessment tools —

including PRISMA-7, the Groningen Frailty Indicator (GFI), Frailty Index (FI), polypharmacy evaluation, general practitioner's clinical judgment, older adults' self-rated health, Identification of Seniors at Risk for Primary Care (ISAR-PC), Edmonton Frail Scale (EFS), InterRAI screener, and gait speed test — were validated by comparing their results against both the Fried's frailty criteria and the clinical evaluations of a multidisciplinary expert panel (20).

The ISAR-PC consists of six self-reported questions focusing on areas such as: Functional Dependence, Recent Hospitalizations, Impaired Memory, Vision Problems, Polypharmacy, and General Health Status. Each affirmative response scores one point. A total score of 2 or more suggests that the patient is at risk and may gain a lot from a comprehensive geriatric assessment or targeted interventions.

The Frailty Index (FI) is a widely used tool to measure frailty as a cumulative deficit model. In contrast to the Frailty Phenotype, which emphasizes five distinct physical attributes, the Frailty Index (FI) measures frailty by evaluating the accumulation of various health deficits. An FI score between 0.25 and 0.4 typically indicates that an individual is considered frail. The InterRAI Pre-Screener Assessment Tool is designed to efficiently identify individuals who may require comprehensive assessments or specialized services. This tool serves as an initial step in the evaluation process (20).

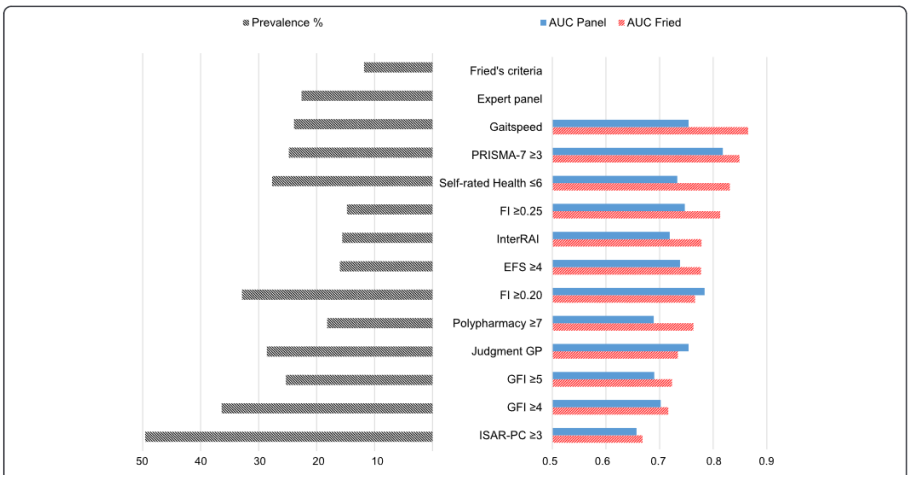


Figure 1. Comparison of different frailty assessment tool accuracies [source: Sutorius et al. (20)] Abbreviations: PRISMA-7, FI-Frailty Index, InterRAI-InterRAI Pre-Screener

Assessment Tool, EFS-, Edmonton Frail Scale, GP-General Practitioner, GFI-Groningen Frailty Indicator

Figure 1 illustrates the prevalence rates and area under the curve (AUC) values, using Fried's criteria and the assessments of a multidisciplinary expert panel as reference standards (20). Reported frailty prevalence varied between 14.8% and 52.9%. The evaluation of the instruments was conducted by comparing their performance against both expert clinical judgment and Fried's frailty framework. Gait Speed had the highest diagnostic accuracy (AUC = 0.865), followed closely by PRISMA-7 (AUC = 0.818 with expert opinion). Self-Rated Health (SRH) and the Frailty Index (FI) also showed good discriminative ability. Stepped approaches, where assessments are conducted in phases, generally perform worse than single-step methods. PRISMA-7 showed the highest agreement with expert assessments (κ = 0.61), highlighting its reliability (20). Another Dutch Study (2015) by van Kempen et al. evaluated the EASY-Care Two-Step Older Persons Screening (EASY-Care TOS), a phased method combining GP judgment with structured assessments when necessary. Five hundred twenty patients of four GP practices participated. A structured evaluation using the EASY-Care assessment tool, administered by a primary care nurse, is reserved for individuals whose available information is deemed insufficient by the general practitioner (GP) for making a clinical decision. After one year, participants' health outcomes were reassessed through the EASY-Care Two-Step Older Persons Screening (TOS) method. The AUC for the EASY-Care TOS approach was found to be comparable to that of a complete Comprehensive Geriatric Assessment (CGA), with an AUC of 0.76. While CGAs are considered the gold standard, they are resource-intensive. EASY-Care TOS offers a feasible alternative in primary care. GPs could efficiently predict negative health outcomes using this method, especially when leveraging prior patient knowledge (21). An Australian mixed-methods study evaluated the ease of implementation of different frailty screening tools, evaluated patients' willingness to engage with these assessments, and gathered nurses' perspectives on the usability and

appropriateness of the instruments they administered. Patients underwent five frailty assessments administered by nurses, including the FRAIL Questionnaire (FQ), Groningen Frailty Indicator (GFI), Edmonton Frail Scale (EFS), PRISMA-7 and Gait Speed Test (GST). Additionally, two self-completed screening tools — the Reported Edmonton Frail Scale (REFS) and the Kihon Checklist (KC) — were provided as part of a written survey. After completing each evaluation, nurses recorded the administration time. Patients who consented to further participation were immediately asked to provide feedback on each tool's acceptability. Separately, the nurses who facilitated the screenings participated in individual interviews, offering insights into the practicality and perceived effectiveness of the instruments they used (18). Self-administered tools like KC and REFS had lower completion rates compared to nurse-administered tests, indicating potential implementation challenges. Self-administered instruments were less often completed than nurse-administered instruments. Nurses found the GFI, KC, EFS, GST, and REFS assessments to be more time-intensive. Tools that did not rely on specialized equipment were generally rated more favorably. In contrast, assessments that required timing, such as the EFS and GST, received lower rankings. The FRAIL questionnaires and PRISMA-7 were the fastest to administer, typically completed in less than five minutes. Among all tools, PRISMA-7 achieved the highest scores for feasibility and user acceptability from both patients and nurses. (18) (Tables 1-3, Figure 2).

Table 1. Frailty screening instruments and reference standards included in the study [source: Ambagtsheer et al. (18)]

Table 1 Frailty Screening Instruments and Reference Standards Included in the Study

Instrument	Frailty Threshold	Training required to administer	Training required to score	Equipment required	Physical space required
Index Tests (Nurse-Administered)					
Edmonton Frail Scale	≥ 8 points	Use of stopwatch (TUG); Distance set up	Clock test; TUG; reverse scoring	Stopwatch; Distance Measure; Tape	3 m straight corridor
FRAIL Questionnaire	≥ 3 points	None	Minimal	None	Minimal
Gait Speed	≤ 0.8 m/s	Use of stopwatch; Distance set up	Metres/second calculation	Stopwatch; Distance Measure; Tape	4 m straight corridor
Groningen Frailty Indicator	≥ 4 points	None	Reverse scoring	None	Minimal
PRISMA-7	≥ 3 points	None	Minimal	None	Minimal
Index Tests (Self-Administered)					
Kihon Checklist	≥ 7 points	None	BMI Calculation	None	Minimal
Reported Edmonton Frail Scale	≥ 8 points	None	Clock test	None	Minimal
Reference Standards					
Frailty Index (Self-Reported)	> = 0.21	None	Minimal	None	Minimal
Frailty Phenotype	3 of 5 criteria	Use of stopwatch (Gait Speed); Distance set up; Use of dynamometer (Grip Strength)	Extensive (PASE measure, Gait Speed incl. Height; Grip Strength incl. BMI)	Stopwatch; Dynamometer; Scales; Height measure	15 ft (4.6 m) straight corridor (Gait Speed); area to assess height, weight, conduct grip strength assessment

Abbreviations: *BMI* Body Mass Index, *PASE* Physical Activity Scale for the Elderly, *TUG* Timed Up and Go

Abbreviations: BMI-Mody Mass Index, PASE-Physical Activity Scale for the Elderly, TUG-Timed Up and Go

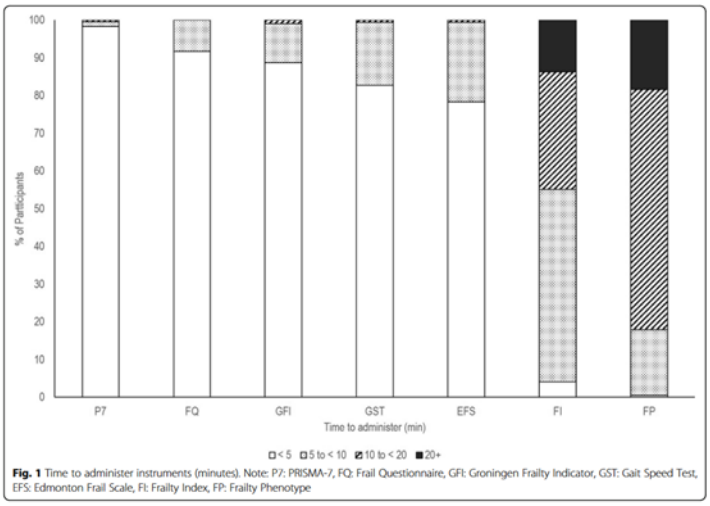


Fig. 1 Time to administer instruments (minutes). Note: P7: PRISMA-7, FQ: Frail Questionnaire, GFI: Groningen Frailty Indicator, GST: Gait Speed Test, EFS: Edmonton Frail Scale, FI: Frailty Index, FP: Frailty Phenotype

Figure 2. Time to administer instruments (minutes) [source: Ambagtsheer et al. (18)]
Abbreviations: P7-PRISMA-7, FQ-Frail Questionnaire, GFI-Groningen Frailty Indicator, GST-Gait Speed Test, EFS-Edmonton Frail Scale, FI-Frailty Index, FP-Frailty Phenotype

Table 2. Joint display of patient acceptability ratings [source: Ambagtsheer et al. (18)]

Table 4 Joint display of patient acceptability ratings ($n = 30$)

Instrument	Very Easy/ Easy n (%)	Participant comments (Easy/Very Easy)	Neutral/ Difficult n (%)	Participant comments (Neutral/Difficult)
EFS	28 (96.6)	•Not as quick as I used to be •It did show me what I can't do anymore •Easy but you need to think first. •Easy enough	1 (3.4)	•Found it frustrating. The clock face. I don't like these sorts of puzzles!
FQ	27 (96.4)	•I had no difficulty. I found it interesting. •A bit of thinking •Nothing hard about the questions	1 (3.6)	•n.a.
GAIT	25 (86.2)	•Easy to complete •No issues to do •Simple task	4 (13.8)	•It's not easy, had to slow down, painful hip •After sitting for a while, my legs cramp. I would have been quicker if I had not been sitting.
GFI	26 (89.7)	•Some questions could go either way. Sometimes yes/ sometimes no. •Once I worked out the questions •Went quickly enough •No problems completing this	3 (10.3)	•You have to think - it can never be cut and dried. •OK question - have to stop and think about questions as don't normally think about these situations
KC	25 (89.3)	•I thought it was challenging, but rather appropriate and it made me realise how fortunate I am to be able to enjoy my activities, and the people in my life •I'm always thankful for anything I can do •Interesting - covered a whole gamut of day to day living	3 (10.7)	•Mostly easy, some didn't apply •My life has been very difficult over the last eighteen months •Don't normally go out much; socialise within street
P7	30 (100.0)	•No worries answering questions •Simple and easy	0 (0.0	•n.a.
REFS	25 (96.2)	•Hated it. Don't like this - not many people would. •Had to think more about this one. Trying to do it a bit too quickly. Made me think. •Didn't have any problems. A long list of what you can't do. •Quite reasonable things to ask older persons •Clock was a bit confusing - wasn't sure of what the question meant re the numbering around the edge	1 (3.8)	•n.a.
ALL	**186 (93.5)**		**13 (6.5)**	

Abbreviations: *P7* PRISMA-7, *FQ* Frail Questionnaire, GAIT: Gait Speed Test, *GFI* Groningen Frailty Indicator, *GST* Gait Speed Test, *EFS* Edmonton Frail Scale, *KC* Kihon Checklist, *REFS* Reported Edmonton Frail Scale

Abbreviations: P7-PRISMA-7, FQ-Frail Questionnaire, GFI-Groningen Frailty Indicator, GAIT-Gait Speed Test, GST-Gait Speed Test, EFS-Edmonton Frail Scale, REFS-Reported Edmonton Frail Scale, KC-Kihon Checklist

Table 3. Administering nurse: perceived feasibility and acceptability [source: Ambagtsheer et al. (18)]

Table 5 Administering Nurse: Perceived Feasibility and Acceptability (Median Rating/10) by Instrument ($n = 5$)

Instrument	Time	Space	Equipment	Skill	Acceptability (Patient)	Acceptability (Nurse)
	Median ($Q_1 - Q_3$)	Median ($Q_1 - Q_3$)	Median ($Q_1 - Q_3$)	Median ($Q_1 - Q_3$)	Median ($Q_1 - Q_3$)	Median ($Q_1 - Q_3$)
P7	10.0 (9.5–10.0)	10.0 (8.25–10.0)	10.0 (9.5–10.0)	10.0 (9.5–10.0)	9.0 (7.5–10.0)	10.0 (8.5–10.0)
EFS	8.0 (6.5–8.0)	6.0 (5.5–7.0)	7.0 (5.5–8.0)	8.0 (6.5–10.0)	8.0 (5.5–8.0)	9.0 (8.5–9.5)
FQ	10.0 (8.5–10.0)	9.0 (8.25–10.0)	10.0 (9.5–10.0)	10.0 (9.5–10.0)	6.0 (6.0–9.5)	9.0 (8.5–10.0)
GST	8.0 (8.0–9.0)	7.0 (5.5–7.75)	8.0 (6.5–8.5)	9.0 (8–10.0)	7.0 (7.0–9.0)	10.0 (9.0–10.0)
GFI	8.0 (7.0–8.0)	9.0 (9.0–10.0)	10.0 (9.5–10.0)	10.0 (8.5–10.0)	8.0 (7.5–9.0)	9.0 (7.0–10.0)
KC	6.0 (5.5–7.5)	9.5 (9.0–10.0)	10.0 (9.5–10.0)	9.5 (7.5–10.0)	7.0 (6.5–7.5)	9.0 (7.5–10.0)
REFS	7.0 (6.0–7.5)	10.0 (9.0–10.0)	10.0 (9.5–10.0)	10.0 (9.25–10.0)[a]	8.0 (7.5–8.0)[a]	9.5 (8.25–10.0)

Abbreviations: *P7* PRISMA-7, *FQ* Frail Questionnaire, *GAIT* Gait Speed Test, *GFI* Groningen Frailty Indicator, *GST* Gait Speed Test, *EFS* Edmonton Frail Scale, *KC* Kihon Checklist, *REFS* Reported Edmonton Frail Scale. [a] Due to missing data, $n = 4$ for these rankings; data was adjusted accordingly

Abbreviations: P7-PRISMA-7, FQ-Frail Questionnaire, GFI-Groningen Frailty Indicator, GAIT-Gait Speed Test, GST-Gait Speed Test, EFS-Edmonton Frail Scale, REFS-Reported Edmonton Frail Scale, KC-Kihon Checklist

The European Frailtools Project (2016–2018) was a multicenter investigation conducted across five countries —France, Spain, the UK, Italy, and Poland — aimed at comparing different frailty screening

tools (4). These included the Clinical Frailty Scale (CFS), the FRAIL questionnaire, the Groningen Frailty Screening Tool (GFST), the 35-item Frailty Index (FI-35), the Frailty Trait Scale with 3 and 5 items (FTS-3, FTS-5), the Survey of Health, Ageing and Retirement in Europe Frailty Instrument (SHARE-FI), and the Frailty Phenotype. The assessment of each tool's appropriateness was based on factors such as feasibility, time required for administration, and the degree of agreement between scales.

The SHARE-FI (Survey of Health, Ageing, and Retirement in Europe—Frailty Instrument) is a validated, gender-specific frailty assessment tool. It uses Fried's Frailty Phenotype model as its foundation and applies a statistical algorithm to classify individuals into frailty categories.

The Frailty Trait Scale with 3 items (FTS-3) assesses frailty by examining physical activity levels, body mass index (BMI), and balance, while the Frailty Trait Scale with 5 items (FTS-5) extends this evaluation to include gait speed and handgrip strength.

The FRAIL scale, an acronym representing Fatigue, Resistance, Ambulation, Illnesses, and Loss of weight, focuses on five key domains commonly associated with frailty.

Designed according to the deficit accumulation model, the 35-item Frailty Index (FI-35) measures frailty in older adults by capturing a variety of health deficits across multiple domains.

The Clinical Frailty Scale (CFS) is a practical and widely adopted clinical tool that categorizes older adults' frailty status on a 9-point scale, based on their overall health, mobility, physical function, and presence of comorbidities.

The Gérontopôle Frailty Screening Tool (GFST) was created to detect frailty early among individuals aged 65 and older who do not exhibit physical disability or acute illness. It combines an initial questionnaire with the clinical evaluation by general practitioners to facilitate early intervention and prevent adverse health outcomes.

In terms of performance, the GFST identified the highest proportion of frail individuals in primary care settings, whereas the FTS-3 and FTS-5

detected the lowest. Both the CFS and GFST demonstrated high feasibility and medium agreement with other frailty scales. Conversely, the FI-35 presented lower feasibility (63%), primarily due to the complexity of data requirements (4).

4.1.1 COMPARATIVE ANALYSIS OF FRAILTY ASSESSMENT IN PRIMARY CARE

Many studies have evaluated diagnostic test accuracy (DTA), feasibility, and acceptability of various frailty screening instruments in different primary care settings. This summary highlights key findings from studies conducted in several countries, focusing on the performance of different frailty assessment tools.

Across studies, PRISMA-7 consistently demonstrated high feasibility, accuracy, and acceptability, especially in primary care (Table 4). It outperformed many tools in terms of ease of administration, requiring minimal resources and time. The FRAIL scale also showed strong performance, particularly in terms of predictive ability for adverse outcomes and quick administration. The CFS and GFST were noted for their feasibility in clinical environments, while the FI provided comprehensive assessments but faced criticism for complexity. Stepped approaches, such as EASY-Care TOS, offered efficient screening comparable to full CGA, making them practical for resource-limited settings. Overall, PRISMA-7, FRAIL, and CFS stand out as the most balanced tools in terms of feasibility, accuracy, and practicality.

Table 4. Comparison of frailty assessment tools used in the primary care setting [source: Luisa Brix]

Study	Best Performing Tools	Highest AUC	Feasibility & Acceptability	Limitations
Ambagtsheer (Australia, 2019)	REFS, KC, PRISMA-7	PRISMA-7 (Se: 77.5%, Sp: 74.5%)	PRISMA-7: Fast, minimal resources, high acceptability	Self-administered tools had lower completion rates
Sutorius (Netherlands, 2016)	PRISMA-7, Gait Speed, FI	Gait Speed (AUC = 0.865), PRISMA-7 (AUC = 0.818)	PRISMA-7: Strong agreement with expert judgment	Stepped approaches showed lower accuracy
van Kempen (Netherlands, 2015)	EASY-Care TOS	AUC = 0.76 (comparable to CGA)	Efficient, resource-saving alternative to full CGA	Relies on GP's subjective judgment
Frailtools (Europe, 2016–2018)	CFS, GFST	Moderate agreement, high feasibility	High completion rates in primary care	FI-35 less feasible due to complex data requirements

PRISMA-7-Program on Research for the Integrating Services for the Maintenance of Autonomy, FI-Frailty Index, EASY-Care TOS- EASY-Care Two-Step Older Persons Screening, CFS-Clinical Frailty Scale, GFST- Gérontopôle Frailty Screening Tool, CGA-Comprehensive Geriatric Assessment, GP-General Practitioner

4.1 FRAILTY ASSESSMENT TOOLS USED IN HOSPITALS (ACCORDING TO CASE STUDIES)

Frailty in older populations is typically evaluated using several instruments, such as the Clinical Frailty Scale (CFS), Hospital Frailty Risk Score (HFRS), Frailty Index (FI), and the frailty phenotype. Although the frailty phenotype is extensively validated and commonly employed in research settings, it has been criticized for its narrow focus and the absence of a gradation scale (22). The Clinical Frailty Scale (CFS), originally designed to categorize older adults by frailty levels and to predict adverse outcomes in critically ill patients, is similarly subject to limitations, notably the potential for subjective interpretation during assessment. Furthermore, a significant drawback shared by both the frailty phenotype and the CFS is their inability to be used retrospectively, which constrains their applicability in clinical research (22). It is also important to note that certain tools may be more appropriate in specific contexts; for example, measurements of gait speed and the Timed Up and Go Test (TUGT) may be valuable

during routine clinical assessments, whereas the PRISMA 7 questionnaire can serve as a self-assessment tool. Although there is limited evidence regarding diagnostic accuracy, the British Geriatric Society (BGS) recommends the Edmonton Frail Scale for pre-operative assessments to aid in optimizing surgical outcomes (13). A prospective, controlled trial conducted in West Sweden between 2013 and 2015 evaluated the efficacy of acute care in Comprehensive Geriatric Assessment (CGA) units versus conventional acute medical units (23). The researchers proposed that patients managed in the Comprehensive Geriatric Assessment (CGA) unit would demonstrate less decline in activities of daily living (ADLs) and a smaller increase in frailty three months post-discharge compared to those receiving standard care. The study employed several measures, including the Charlson Comorbidity Index, which predicts 10-year mortality based on the presence of 19 comorbid conditions, the FRESH frailty screening tool, and assessments of both personal and instrumental ADLs (e.g., dressing, feeding, shopping, and transportation). Patients treated in the CGA unit exhibited a higher baseline comorbidity burden, with an average Charlson score of 7.4 versus 6.2 in the control group ($P < 0.001$). Notably, frailty progression was observed in only 13.6% of the intervention group compared to 41.0% in the control group ($P < 0.0001$). Results indicated that CGA unit care significantly reduced declines in activities of daily living (ADLs) and minimized increases in frailty at the three-month follow-up. Notably, intervention group patients bypassed the emergency room, potentially reducing the time to initiate acute treatments, which may have contributed to improved outcomes (23). The Frailtools Project, a multicenter European study, compared frailty assessment tools across different care settings (4) (Table 5). The ratio between the instrument with the highest prevalence (SHARE-FI) and that with the lowest (FRAIL scale) was 1.5. Feasibility in these settings was limited, with only 82% of scales completed. The FTS-5 was completed by fewer than 50% of participants, and the frailty phenotype (FP) achieved a feasibility rate of 66%. The FRAIL scale identified the fewest frail individuals, while

the SHARE-FI scale showed the highest prevalence. The Clinical Frailty Scale (CFS), FRAIL, and GFST demonstrated high feasibility and shorter administration times, making them preferable in geriatric wards compared to more time-intensive tools like the FTS-5 (4).

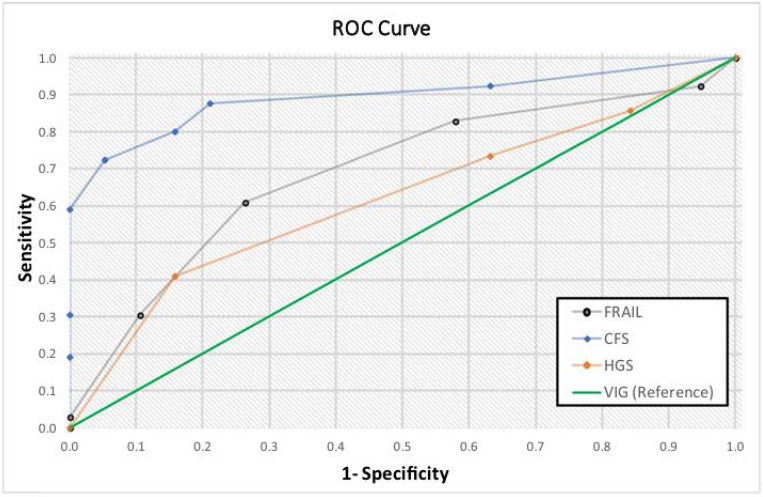
Table 5. Frailty prevalence according to each frailty scale and setting [source (4)]

	Geriatric Wards, %	Nursing Home, %	Primary Care, %	Outpatient Clinic, %	Mean
FP	65.9	60.4	16.2	25.5	38.6
SHARE-FI	74.6	82.5	30.5	42.4	57.5
FTS-3	54.5	71.3	6.9	10.1	35.3
FTS-5	50.6	74.3	7.5	14.2	33.5
FRAIL	49.0	41.3	8.7	11.0	27.6
FI-35	59.5	93.5	15.1	18.4	46.6
GFST	70.9	84.6	32.2	36.2	55.9
CFS	52.4	77.0	15.0	18.6	40.6

FP-Frailty Phenotype, SHARE-FI-Frailty Index developed from the Survey of Health, Ageing and Retirement in Europe, FTS-3-3-item Frailty Trait Scale, FTS-5-5-item Frailty Trait Scale, FRAIL-Fatigue, Resistance, Ambulation, Illnesses & Loss of Weight, FI-35-35-item Frailty Index, GFST- Gérontopôle Frailty Screening Tool, CFS-Rockwood Clinical Frailty Scale.

A Spanish study conducted in 2022 by Bielza and colleagues examined the accuracy and feasibility of frailty instruments in an acute care setting. The instruments evaluated were the Clinical Frailty Scale (CFS), handgrip strength (HGS), the FRAIL scale, and the Spanish version of the Frailty-VIG index. Among the 185 participants, whose median age was 89 years, all tools demonstrated complete feasibility except for HGS, which showed a lower feasibility rate of 67%. Frailty prevalence varied depending on the instrument: 63.2% with the FRAIL scale, 71.7% with HGS, 74.6% with the CFS, and 88.1% with Frailty-VIG. In terms of predictive performance measured by the area under the curve (AUC) compared to Frailty-VIG, the CFS achieved an AUC of 0.89, HGS recorded 0.73, and the FRAIL scale reached 0.69. Frail individuals identified using the FRAIL scale were 2.7 times more likely to experience extended hospitalization (95% CI: 1.385–5.416). Additionally, three-month mortality rates were significantly elevated among frail patients as determined by both the FRAIL scale (OR 2.5; 95% CI: 1.072–5.881) and the CFS (OR 3.7; 95% CI: 1.255–10.812). The receiver operating characteristic (ROC) analysis revealed a substantial difference in AUC values between the CFS and FRAIL

scales (P = 0.003). In contrast, no significant differences emerged between the FRAIL scale and HGS (P = 0.517) or between the CFS and HGS (P = 0.054). In diagnosing frailty, the CFS exhibited a sensitivity of 72.4% and a specificity of 94.7% (24) (see Fig. 3).



Frailty instrument	AUC (95% CI)	P-value	Cut point , (Senstivity, Specificity)
FRAIL	69.0 (56.8 - 81.2)	0.009	2.5, (61-73.7%)
CFS	89.2 (83.4 - 95.1)	< 0.001	4.5, (72.4-94.7%)
HGS	73.1 (62.1 - 84.0)	0.001	14.5, (69.5-73.7%)

Figure 3. The AUCs for FRAIL, CFS, HGS, and VIG [source: Bielza et al. (24)]
FRAIL- Fatigue, Resistance, Ambulation, Illnesses & Loss of Weight, CFS-Rockwood Clinical Frailty Scale, HGS-Hand Grip Strength, VIG- Frailty-VIG

The study found 100% feasibility for all tools except HGS (67%). FRAIL and CFS were effective predictors of three-month mortality, with FRAIL also predicting prolonged hospital stays. However, none of the tools effectively predicted in-hospital mortality, institutionalization, or readmission. The high feasibility and predictive accuracy of FRAIL and CFS support their use in geriatric settings, while VIG and HGS were less recommended (4).

In a 2018 Singaporean study by Chong et al., the FI was used as the gold standard to compare FRAIL, CFS, and Tilburg Frailty Indicator (TFI) (25). The study recruited 210 patients. Information regarding patients' premorbid frailty status, comorbid conditions, severity of illness, functional abilities, and cognitive performance was gathered. Frailty prevalence varied depending on the assessment tool, recorded at 87.1% using the Frailty Index (FI), 81.0% with the Clinical Frailty Scale (CFS), 80.0% via the Tilburg Frailty Indicator (TFI), and 50.0%

using the FRAIL scale. When evaluating ease of use within an acute hospital environment, the CFS emerged as the most practical tool, requiring approximately three to five minutes for completion and offering a straightforward assessment process. The FRAIL scale also required a short administration time (1 to 3 minutes) and has the added benefit of informing targeted interventions based on identified deficits, while the TFI required 5 to 10 minutes on average. The CFS showed the highest diagnostic accuracy (AUC 0.91), while FRAIL had the greatest specificity (81.5%). FRAIL [AUC 0.80 [95% CI 0.65–0.95, P = .004] was significantly associated with in-hospital mortality, whereas CFS predicted 12-month mortality and institutionalization risks. Both tools demonstrated high feasibility and predictive capabilities for adverse outcomes (25). A 2019 Chinese study by Yao-Dan Liang et al. compared five frailty measures—CFS, FRAIL, Fried, Edmonton, and FI—among 1,000 elderly inpatients across different wards. The investigators used a combined index (scores were from 0 to 5, with scores ≥3 defining frailty) derived from the five measures as the gold standard for frailty diagnosis, and multivariate logistic regression was applied to identify isolated risk contributors. Overall frailty prevalence was 32.3% (Fried), 19.2% (FRAIL), 25.2% (Edmonton), 36.2% (CFS), and 35.1% (FI) (Figure 4). No previous studies have simultaneously reported frailty data across different wards, as most have focused on geriatric departments or a single disease type. The CFS showed the highest sensitivity (94.1%) compared to the FRAIL scale (63.0%). At the same time, the FI demonstrated strong sensitivity (89.6%–96.4%) and specificity (81.1%–89.5%) across all wards. FRAIL had the highest specificity in cardiology and non-surgical wards, but lower sensitivity. The Edmonton Frail Scale exhibited the highest specificity (91.7%–98.1%) but lower sensitivity (59.7%–83.5%). The application of the Fried criteria yielded moderate diagnostic performance, with sensitivity values spanning from 71.9% to 86.6% and specificity ranging between 81.8% and 90.1%. The study concluded that CFS is preferable for screening due to its balance of sensitivity, specificity, and ease of administration, while FI is optimal for comprehensive

assessments (26). Each of these studies underscores the complexity of frailty assessment in hospitalized older adults and illustrates that the selection of an appropriate tool is influenced by the healthcare context, the required assessment duration, and the specific outcomes of interest.

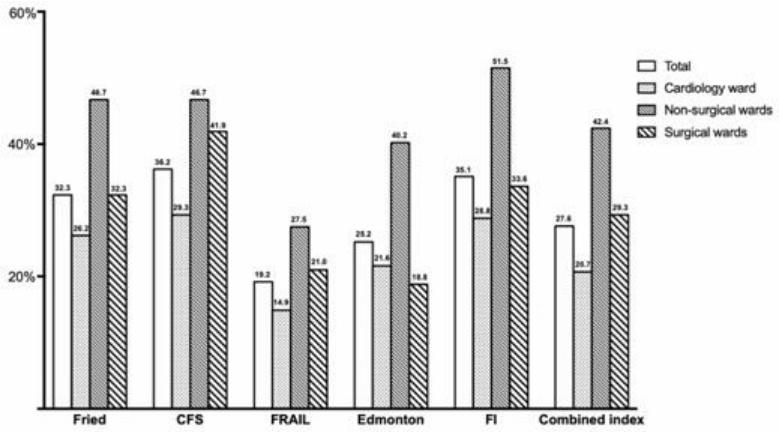


Figure 4. Frailty prevalence in different wards by different measurements [source: Liang et al. (26)] Abbreviations: CFS- Clinical Frailty Scale, FI- Frailty Index

4.1.1 COMPARATIVE ANALYSIS OF FRAILTY ASSESSMENT IN HOSPITALS

Across studies, the Clinical Frailty Scale (CFS) consistently emerged as a reliable tool due to its high sensitivity, feasibility, and quick administration time, making it suitable for acute settings (Table 6). The FRAIL scale, while less sensitive, demonstrated strong specificity and predictive power for short-term mortality and prolonged hospital stays. The Frailty Index (FI) showed superior diagnostic accuracy and predictive capacity for long-term outcomes but required more time and resources to administer. Multidimensional tools like the VIG index provided comprehensive assessments but lacked feasibility in time-constrained environments. In contrast, performance-based measures such as HGS faced challenges in acutely ill populations due to physical limitations. Overall, CFS and FRAIL are recommended for routine screening in geriatric wards, while FI serves as an effective comprehensive assessment tool in specialized settings.

Table 6. Comparison of frailty assessment tools used in the hospital setting [source: Luisa Brix]

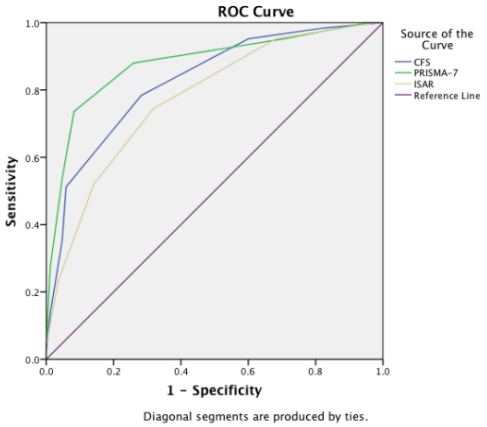
Study	Best Performing Tools	Highest AUC	Feasibility/ Acceptability	Limitations
Swedish Study (2013–2015)	CFS, FI, FRAIL	CFS (0.91), FI (0.79), FRAIL (0.80)	CSF and FRAIL were quick to administer (1-3 min), FI was more detailed but required more time	CFS and FI require clinical judgment; FRAIL may not capture multidimensional frailty
Spanish Study (2022) Rafael Bielza et al.	CFS, FRAIL	CFS (0.91), FRAIL (0.81), TFI (0.87)	FRAIL and CFS had high feasibility; HGS had low feasibility (67% completion rate), VIG was time consuming	Small sample size; VIG and HGS were not useful; no tool predicted secondary outcomes
Frailtools Project (European Multicenter Study)	CFS, FI, FRAIL	CFS (0.91), FI (0.79), FRAIL (0.80)	FTS-5had low feasibility (completed by <50% of patients); CFS and FRAIL had better feasibility	FTS-5 had poor feasibility; Variability in frailty prevalence across tools
Singaporean Study (2018) – Edward Chong et al.	CFS, FRAIL	CFS (0.91), FI (0.79), FRAIL (0.80)	CFS and FRAIL were easier to administer, TFI took ore time (5-10 min); FI required clinical judgment	FRAIL and CFS performed similarly in frailty detection; TFI required more time
Chinese Study (2019) – Yao-Dan Liang et al.	FI, CFS, Edmonton	FI (0.89), CFS (0.94), FRAIL (0.81)	CFS had high sensitivity (94.1%); FI had high specificity and sensitivity; Edmonton had high specificity but low sensitivity	No single gold standard for frailty assessment; different tools performed better in different wards

CFS-Clinical Frailty Scale, FRAIL-Fatigue, Resistance, Ambulation, Illnesses & Loss of Weight, FI-Frailty Index, Edmonton-Edmonton Frail Scale

4.3 FRAILTY ASSESSMENT TOOLS USED IN EMERGENCY DEPARTMENTS (ACCORDING TO CASE STUDIES)

In 2019, O'Caoimh and colleagues carried out a study with 265 participants to evaluate the performance of three established short-form tools in detecting frailty within an emergency department of a teaching hospital. Individuals aged 70 years and older were assessed using the Identification of Seniors at Risk (ISAR) tool, the Clinical Frailty Scale (CFS), as well as the PRISMA-7 questionnaire (27). The ISAR is a simple questionnaire that evaluates factors such as prior hospitalizations, functional decline, vision impairment, cognitive impairment, polypharmacy, and overall functional impairment, with

higher scores indicating a greater risk for adverse outcomes. A comprehensive geriatric assessment (CGA) determined the frailty status of each patient. The median scores were CFS: 4/9 (±2), ISAR: 3/6 (±2), and PRISMA-7: 3/7 (±3). Based on CGA, 58% of the participants were identified as frail. Among the three screening tools assessed, PRISMA-7 exhibited the greatest ability to differentiate between frail and non-frail individuals, achieving an area under the curve (AUC) of 0.88 (95% CI: 0.83–0.93). This was followed by the Clinical Frailty Scale (CFS) with an AUC of 0.83 (95% CI: 0.77–0.88), and the Identification of Seniors at Risk (ISAR) tool, which recorded an AUC of 0.78 (95% CI: 0.71–0.84). Statistical comparisons revealed that PRISMA-7 was more precise than ISAR ($p = 0.008$), although its performance did not differ significantly from that of CFS ($p = 0.15$). Inter-rater reliability (IRR) scores differed across tools, with ISAR achieving a coefficient of 0.62, PRISMA-7 a coefficient of 0.75, and CFS the highest at 0.78. (Figure 5). The PRISMA-7 and ISAR were primarily self-administered (82%), while caregivers or nurses assisted in cognitive or visual impairment cases. The findings support the reliability and accuracy of PRISMA-7 for Emergency Department frailty screening. The British Geriatric Society endorses PRISMA-7 as a simple frailty assessment tool. This study represents the first validation of PRISMA-7 in an Emergency Department setting, confirming its strong sensitivity, specificity, and inter-rater concordance. These findings suggest using short screening instruments in the ED, like the PRISMA-7, which is both precise and consistent (27).



Instrument	Area Under the Curve	95% Confidence Interval
CFS	0.83	0.77–0.88
PRISMA-7	0.88	0.83–0.93
ISAR	0.78	0.71–0.84

Figure 5. ROC Curves with AUC curve scores of CFS, PRISMA-7, and ISAR [source: O'Caoimh et al. (27)] Abbreviations: CFS-Clinical Frailty Scale, PRISMA7-Programme of Research to Integrate Services for the Maintenance of Autonomy, ISAR-Identification of Seniors at Risk

In 2023, Di Prazza and colleagues conducted a study involving 579 older adults to assess the predictive performance of two abbreviated geriatric assessment instruments in forecasting mortality in emergency department (ED) patients. The tools evaluated were the Brief Multidimensional Prognostic Index (Brief MPI) and the Clinical Frailty Scale (CFS). Both demonstrated good discriminative ability, with the CFS achieving an area under the curve (AUC) of 0.754 (95% CI: 0.65–0.83) and the Brief MPI recording an AUC of 0.72 (95% CI: 0.61–0.83). The C-index was 0.85 for Brief MPI and 0.84 for CFS. The multivariate analysis revealed that individuals with higher frailty scores faced a markedly elevated risk of mortality. Specifically, a Brief MPI score greater than 0.66 was associated with a hazard ratio (HR) of 4.65 (95% CI: 1.45–15.00), while a CFS score above 6 corresponded to an HR of 9.24 (95% CI: 1.16–76.90). The study highlighted that while both tools are quick and effective, CFS may be preferred in triage due to its reliance on medical judgment. In contrast, Brief MPI offers a multidimensional view suitable for comprehensive assessments. The primary distinction between the CFS and the Brief MPI is that the CFS provides a unidimensional assessment of frailty, whereas the Brief MPI offers a spectrum of impaired domains that may

be addressed through targeted interventions. Given that both tools require only a few minutes to perform and demonstrate similar mortality prediction, the CFS, which relies solely on clinical judgment and is quicker to administer, may be more appropriate for use during triage and in challenging ED situations, while the Brief MPI may be better suited for a more comprehensive medical evaluation (28). In 2023, O'Caoimh validated the Risk Instrument for Screening in the Community (RISC) with 307 participants aged 70 and above (29). This tool evaluates the risk of institutionalization, hospitalization, and death using three Likert scales combined into an Overall RISC score. Among 193 patients assessed via CGA, the median length of stay was 8 ± 9 days, with 20% readmitted within 30 days, 13.5% institutionalized, and 17% deceased within a year. Frailty was identified in 60% of patients. The RISC showed the highest diagnostic accuracy for predicting one-year mortality (AUC 0.77; 95% CI: 0.68–0.87) and institutionalization (AUC 0.73; 95% CI: 0.64–0.82). It demonstrated good accuracy in identifying frailty (AUC 0.84), though none of the tools accurately predicted 30-day readmissions (AUC < 0.70) (29). Lewis and colleagues assessed frailty prevalence and predictive outcomes using three tools (Fried, CFS, and SUHB scales) in 899 adults aged 65+ across four Australian EDs (Figure 6). Frailty prevalence varied: SUHB (9.7%), Fried (30.4%), and CFS (43.7%). Despite these differences, all scales had comparable predictive accuracy for poor post-discharge outcomes (AUROC: Fried 0.735, CFS 0.730, SUHB 0.720). Post-discharge outcomes were determined via telephone between 3 and 6 months using a standardized questionnaire that included frailty measurements, self-rated health, and a single global question about quality of life and health service use. The SUHB scale classified the majority of participants as either robust (45.3%) or pre-frail (45.1%), whereas the Fried criteria identified most individuals as pre-frail (55.4%), and the Clinical Frailty Scale (CFS) categorized the highest proportion as frail (43.7%). Concordance across all three instruments was observed in only 228 cases (25.4%). In 598 individuals (66.5%), frailty classifications differed by one adjacent category

depending on the tool used, while 73 participants (8.1%) were assigned to opposite ends of the frailty spectrum (robust versus frail) across different scales. The study concluded that, despite some inherent subjectivity, the CFS was the most practical option for use in emergency department (ED) settings due to its simplicity and efficiency. Furthermore, the findings emphasize that self-reported frailty assessments represent a viable alternative to objective measures, particularly in high-demand ED environments where patient immobility and limited staff time may impede comprehensive evaluations (30).

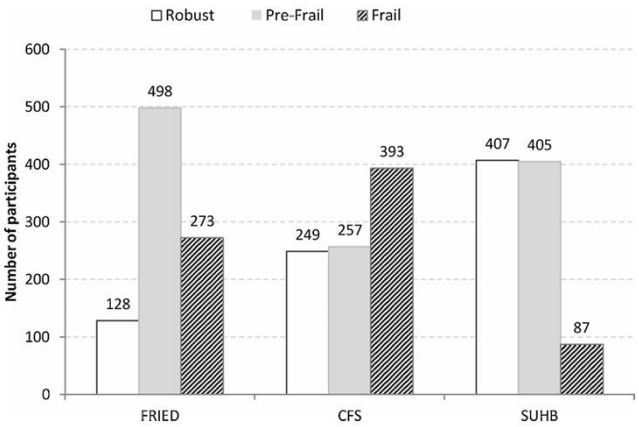


Figure 6. Classification of frailty on admission using three frailty scales [source: Lewis et al. (30)] Abbreviations: FRIED-Fried scale, CFS-Clinical Frailty Scale, SUHB-Stable, Unstable, Help to walk, Bedbound

4.3.1 COMPARATIVE ANALYSIS OF FRAILTY ASSESSMENT IN EMERGENCY DEPARTMENTS

PRISMA-7 shows high accuracy and reliability for frailty screening in EDs (Table 7). CFS is consistently effective, quick to administer, and suitable for triage settings. The Brief MPI provides a comprehensive multidimensional frailty assessment. RISC is accurate for predicting long-term outcomes like mortality and institutionalization. Self-reported frailty can be a feasible alternative in resource-limited ED settings. Standardization of frailty assessment tools and reporting methods is needed for consistency across studies.

Table 7. Comparison of frailty assessment tools used in the Emergency Department setting [source: Luisa Brix]

Study	Best Performing Tools	Highest AUC	Feasibility/ Acceptability	Limitations
O´ Caoimh (2019)	PRISMA-7, CFS	PRISMA-7 (0,88), CFS (0.83), ISAR (0.78)	PRISMA was self-administered by 82% of patients; CFS could be used by triage nurses as quick visual scale	ISAR had poor specificity (high false-positive rate); CFS had low sensitivity, requiring a complementary tool for screening
Di Prazza (2023)	CFS, Brief MPI	CFS (0,754), Brief MPI (0.72), C-index (0.85 for Brief MPI, 0,84 for CFS)	CFS is quick to perform and can be used in triage; Brief MPI offers multidimensional assessment	CFS assesses only one dimension of frailty; Brief MPI provides a broader spectrum of impairment but takes longer
O´ Caoimh (2023)	RISC	RISC (0.77 for mortality, 0.73 for institutionalization, 0.84 for frailty)	RISC is an established risk-prediction instrument and was externally validated for frailty assessment	None of the instruments accurately predicted 30-day readmission (AUC <0.70)
Lewis (2018)	CFS, Fried, SUHB	Fried (0.735), CFS (0.73), SUHB (0.72)	CFS was the most appropriate tool for ED use; self-reported frailty was a reliable alternative for screening	Frailty classification varied widely between tools; CFS lacked clear-cut thresholds for tracking frailty over time

PRISMA-7- Program on Research for the Integrating Services for the Maintenance of Autonomy, CFS-Clinical Frailty Scale, Brief MPI-Brief Multidimensional Prognostic Index, RISC- Risk Instrument for Screening in the Community, Fried-Fried scale, SUBH-Stable, Unstable, Help to walk, Bedbound scale

4.4 FRAILTY ASSESSMENT TOOLS USED IN LONG-TERM CARE FACILITIES (ACCORDING TO CASE STUDIES)

In the European Frailtools Project, a cross-sectional multicenter study, researchers compared frailty assessment instruments across different clinical environments. In geriatric wards and long-term care, the FRAIL scale recorded the lowest percentage of individuals classified as frail, whereas the FI-35 and SHARE-FI reported the highest prevalence rates. The FI-35 identified frailty in 94% of residents, which is more than double the rate detected by the FRAIL scale (41%). In terms of feasibility, self-reported instruments such as the GFST, CFS, SHARE-FI, and FRAIL scale demonstrated high usability, achieving completion rates exceeding 90%. In contrast, tools requiring objective measurements, including the Frailty Phenotype (FP), FTS-5, FI-35, and FTS-3—showed lower completion rates, ranging from 58% to 89%. The CFS had the shortest administration time (≤30 seconds in 75% of cases), followed by GFST (60 seconds) and FRAIL (82 seconds), whereas FTS-5 required up to six minutes in 75% of cases [see Table 8]. The CFS and FTS-5 demonstrated reasonable agreement with other

scales, though FTS-5's feasibility was limited (82% vs. 94% for CFS) (4) (Table 8).

Table 8. Feasibility and administration times of each scale by setting [source: Oviedo-Briones et al. (4)]

Scale	Geriatric Wards		Nursing Home		Primary Care		Outpatient Clinic		All Settings	
	Feasibility, %	Time, s, Median (IQR)	Feasibility, %	Time, s, Median (IQR)	Feasibility, %	Time, s, Median (IQR)	Feasibility, %	Time, s, Median (IQR)	Feasibility, %	T∼ime, s, Median (IQR)
FP	65.9	189 (128-240)	89.4	180 (131-240)	98.5	195 (147-242)	99.2	150 (126-198)	88.0	180 (131-240)
SHARE-FI	98.4	150 (84-240)	96.4	95 (78-180)	99.4	83 (69-134)	99.8	126 (426)	98.2	120 (72-180)
FTS-3	72.7	253 (200-303)	81.9	219 (185-326)	96.2	ND	90.6	245 (200-280)	84.4	253 (200-303)*
FTS-5	48.1	404 (348-479)	82.0	409 (347-525)	90.6	ND	95.3	370 (339-412)	78.8	404 (346-479)*
FRAIL	99.3	120 (69-152)	99.6	84 (48-120)	99.7	70 (33-88)	99.6	78 (102)	99.6	82 (34-123)
FI-35	66.0	213 (141-300)	59.6	203 (135-300)	62.7	126 (81-145)	62.6	648 (474)	62.8	153 (121-258)
GFST	87.0	81 (19-154)	96.1	66 (22-120)	99.7	16 (9-63)	97.0	54 (96)	95.0	60 (15-118)
CFS	86.5	30 (12-60)	94.1	12 (9-27)	99.7	3 (2-8)	91.7	18 (48)	93.2	12 (3-30)

IQR, interquartile range; ND, no data available.
*The median and IQR were calculated using the values in the 3 settings where these variables were measured.

Abbreviations: IQR-interquartile range, ND-no data available

In a 2016 American study by Kaehr et al., the predictive validity of the FRAIL-NH tool was evaluated against the Frailty Index (FI) in elderly living in nursing homes (Table 9). The FRAIL-NH instrument assesses seven modifiable domains associated with frailty: incontinence, ambulatory ability, fatigue, dependence in dressing, muscular resistance, nutritional management, and unintended weight loss. Among 270 participants, FRAIL-NH identified a frailty prevalence of 48.7%, compared to 30.3% by FI. FRAIL-NH was a stronger predictor of six-month mortality (AOR=3.36) than FI (AOR=2.28) and effectively predicted falls and hospice enrollment. The FRAIL-NH performed comparably to FI but was simpler and quicker to administer, making it suitable for nursing homes (31).

Table 9. Comparing the FRAIL-NH and the Frailty Index for the prediction of adverse health outcomes [source: Kaehr et al. (31)]

	Odds Ratio (95% CI)	P-Value*
LR #1: Falls ≥ 1		
FRAIL-NH Pre-Frail	2.42 (1.11-5.92)	.027
FRAIL-NH Frail	1.00 (0.44-2.28)	.999
FI Pre-Frail	1.18 (0.57-2.48)	.654
FI Frail	1.38 (0.59-3.22)	.453
LR #2: Hospitalizations ≥ 1		
FRAIL-NH Pre-Frail	0.70 (0.29-1.68)	.424
FRAIL-NH Frail	0.61 (0.24-1.53)	.294
FI Pre-Frail	1.11 (0.47-2.62)	.819
FI Frail	1.23 (0.46-3.27)	.684
LR #3: Deceased or Hospice		
FRAIL-NH Pre-Frail	2.00 (0.60-6.62)	.259
FRAIL-NH Frail	3.35 (1.04-10.86)	.044
FI Pre-Frail	1.41 (0.52-3.80)	.498
FI Frail	1.20 (0.41-3.50)	.744

* Multivariate Logistic Regressions

Abbreviations: FI-Frailty Index

A 2019 Chinese study by Ge et al. assessed FRAIL-NH cutoff points and compared their performance with FI in nursing homes. Among 302 participants, FRAIL-NH identified 69.5% as frail, while FI identified 66.5%. The correlation between FRAIL-NH and FI was strong (r=0.74), but classification agreement was modest (k=0.39). FI classified more individuals as frail, likely due to its multidimensional nature, capturing more comorbidities and medication-related deficits. FRAIL-NH was more straightforward and effective for overall frailty assessment, while FI provided a more detailed multidimensional frailty profile (32). A 2022 German study by Grosshauser et al. compared FRAIL-NH with the Clinical Frailty Scale (CFS) among 246 elderly in long-term care. FRAIL-NH identified 71.1% as most frail, while CFS identified 66.3% as severely frail. Both tools correlated strongly (r=0.78) and predicted mortality and hospital admissions equally well. Among the tools evaluated, only the FRAIL-NH was significantly associated with predicting recurrent falls (OR 2.57; 95% CI: 1.23–5.39). Its use and predictive validity for adverse outcomes have been documented in over 40 studies spanning 20 countries. Dementia presents a particular challenge in this context, as individuals with cognitive impairment are typically classified as at least mildly to moderately frail under the CFS, whereas dementia is not explicitly considered within the FRAIL-NH framework. When comparing the CFS and FRAIL-NH in nursing home populations, studies have reported strong concordance between the two despite their differing conceptual approaches. Given these findings and the ease of administration, the CFS may serve as a practical alternative to the FRAIL-NH for evaluating frailty among nursing home residents. (33).

4.4.1 COMPARATIVE ANALYSIS OF FRAILTY ASSESSMENT IN LONG-TERM CARE FACILITIES

FRAIL-NH consistently emerges as a simple, effective screening tool with strong predictive validity for adverse health outcomes in nursing home settings (Table 10). Compared to the FI, FRAIL-NH is less comprehensive but more feasible, making it suitable for routine assessments. FI captures a broader range of health deficits, providing a

detailed frailty profile but requiring more resources. The CFS offers a quick, feasible alternative with strong predictive capabilities, though it may miss certain nuances captured by FRAIL-NH. While the FI excels in multidimensional assessments, FRAIL-NH's ease of use makes it ideal for large-scale screenings, with CFS serving as a practical middle ground for quick assessments with reliable outcomes. The prevalence of frailty varies significantly according to the clinical setting and the tool used. For example, the FI-35 identified a much higher frailty prevalence (94%) in nursing homes compared to the FRAIL scale (41%). FRAIL-NH consistently identifies higher frailty prevalence compared to FI. CFS is the quickest tool to administer (≤30 seconds), while FTS-5 requires the most time (~6 minutes), affecting its feasibility. Self-reported tools generally have higher completion rates (>90%) compared to objective measurement tools. FRAIL-NH shows strong predictive validity for adverse outcomes such as mortality, falls, and hospital admissions. FI is comprehensive but time-consuming and complex, making it less feasible in routine care. CFS may underperform in identifying falls and has limitations when assessing individuals with dementia. Overall, FRAIL-NH emerges as a practical, reliable screening tool for frailty in nursing homes, balancing ease of use with predictive accuracy, while tools like FI offer detailed assessments but are more resource-intensive in cut-offs across studies, as FRAIL-NH impacts the comparability of results.

Table 10. Comparison of frailty assessment tools used in the Long-Term Care setting [source: Luisa Brix]

Study	Best Performing Tools	Highest AUC	Feasibility/ Acceptability	Limitations
European Frailtools Project	SHARE-FI, FI-35, CFS	CFS (fastest administration time, high feasibility), FI-35 (comprehensive, captures multidimensional frailty)	CFS quickest (≤30s), FRAIL and GFST also had high feasibility (>90% completion rates)	FTS-5 less feasible; objective measures less completed, required nearly 6 minutes to administer
American study (Kaehr et al., 2016)	FRAIL-NH, FI	FRAIL-NH (AOR 3.36 for 6-month mortality), FI (AOR 2.28 for 6-month mortality)	FRAIL-NH is brief and easy to administer; FI provides more comprehensive frailty assessment but requires more resources	FI is more comprehensive but resource-intensive; FRAIL-NH performed similarly but with better feasibility
Chinese study (F. Ge et al., 2019)	FRAIL-NH, FI	FRAIL-NH (r=0.74 correlation with FI, sensitivity 87.6-94.1%	FRAIL-NH is significantly associated with FI and captures functional, biological, and deficit accumulation model	FI classified a larger number of individuals as frail; modest agreement between FRAIL-NH and FI (kappa=0.39)
German study (Grosshauser et al., 2022)	FRAIL-NH, CFS	CFS (AUC 0.92, sensitivity 90%, specificity 92%)	Both FRAIL-NH and CFS had high agreement (r=0.78); FRAIL-NH is specifically designed for nursing homes	CFS may not fully capture multidimensional frailty; FRAIL-NH does not directly assess dementia

SHARE-FI-Frailty Index developed from the Survey of Health, Ageing and Retirement in Europe, FI-35-35-item Frailty Index, CFS-Clinical Frailty Scale, FRAIL-NH-Fatigue, Resistance, Ambulation, Illnesses & Loss of Weight, FI-Frailty Index

4.5 IMPLICATIONS FOR CLINICAL PRACTICE AND POLICY

In primary care settings, time constraints and the need for self-administered tools pose significant challenges to frailty identification. To address this, PRISMA-7 and EASY-Care TOS are recommended as they offer a balance between accuracy and efficiency while allowing for quick, patient-reported screening (Table 11).

Identifying frailty in hospital settings is complicated by the need for retrospective assessments and the complexity of frailty itself. The FRAIL scale and the Frailty Index (FI) have proven particularly valuable in these contexts, as both instruments effectively forecast risks of hospitalization and mortality, thereby supporting clinical decision-making processes (2). In the emergency department, rapid frailty identification is essential, but there is also a risk of high false-positive rates. PRISMA-7 is the preferred screening tool as it provides the best balance of sensitivity and specificity, allowing for quick yet reliable frailty assessments (2). Long-term care settings face unique challenges due to the high prevalence of frailty and resource limitations. The FRAIL-NH scale is well-suited for broad screening in

these facilities, while the Frailty Index (FI) is recommended for more in-depth, individualized assessments of frailty.

Table 11. Recommended frailty assessment instruments based on clinical setting [source: Luisa Brix]

Setting	Most Accurate Tool(s)	Ease of Use	Sensitivity/Specificity	Key Findings
Primary Care	PRISMA-7, Gait Speed, Self-Rated Health, EASY-Care TOS	High	PRISMA-7: High accuracy	Self-reported tools preferred for feasibility
Hospital	CFS, FRAIL, FI	Moderate	FRAIL: Good for mortality prediction	CGA-based units improve outcomes
ER	PRISMA-7, CFS, Brief MPI	High	PRISMA-7: Best balance of sensitivity/specificity	PRISMA-7 recommended for ED screening
Long-Term Care	FRAIL-NH, FI	High	FRAIL-NH: Best for overall screening	FI captures multidimensional frailty better

ER-Emergency Room/Department, PRISMA-7- Program on Research for the Integrating Services for the Maintenance of Autonomy, EASY-Care TOS-EASY-Care Two step older people screening, CFS-Clinical Frailty Scale, FRAIL- Fatigue, Resistance, Ambulation, Illnesses & Loss of Weight, FI-Frailty Index, Brief MPI-Brief Multidimensional Prognostic, FRAIL-NH- Fatigue, Resistance, Ambulation, Illnesses & Loss of Weight

5. DISCUSSION

5.1 SUMMARY OF FINDINGS

Although a broad range of frailty assessment instruments exists, limited research has been conducted on their feasibility, administration time, and the degree of agreement between scales. Furthermore, little attention has been given to evaluating the performance of these tools across diverse care settings, where both patient profiles and frailty prevalence vary significantly. Given the critical role frailty assessment plays in clinical management, research initiatives, and healthcare policy development, a deeper understanding of these factors is crucial to assess the suitability and acceptability of existing frailty measures (4). In primary care settings, time constraints and the need for self-administered tools pose significant challenges to frailty identification. To address this, PRISMA-7 and EASY-Care TOS are recommended as they offer a balance between accuracy and efficiency while allowing for quick, patient-reported screening. Identifying frailty in hospital

settings is complicated by the need for retrospective assessments and the complexity of frailty itself. Therefore the FRAIL scale and Frailty Index (FI) are the preferred tools, because they allow for predicting hospitalization and mortality risks, aiding clinical decision-making. In emergency departments, rapid frailty identification is essential, but the risk of high false-positive rates must be assessed. PRISMA-7 is the preferred screening tool as it provides the best equilibrium of sensitivity and specificity, allowing for quick yet reliable assessments of frailty. Long-term care settings face unique challenges due to a high prevalence of frailty and resource limitations. The FRAIL-NH scale is well-suited for broad screening in these facilities, while the Frailty Index (FI) is recommended for more in-depth, individualized assessments of frailty. My literature review summarizes the current uses of frailty instruments, which may be essential to consider when selecting instruments for clinical or research purposes. It is advised that the choice of instrument be guided by its intended use and informed by previous applications in similar contexts (34).

5.2 CHALLENGES AND LIMITATIONS IN FRAILTY ASSESSMENT ACROSS CLINICAL SETTINGS

The different frailty assessment tools have different focuses, which makes an objective comparison difficult. The fact that there are now a variety of assessment tools makes the field confusing. Some studies only deal with one frailty assessment tool, and therefore, no statement can be made about the value of other tests. Studies that compare a larger number of frailty assessment tools (such as the Frailtools project) are rather rare. Finally, it should also be mentioned that more training needs to be organized for medical staff to ensure optimal screening. The implementation of frailty assessment tools is also subject to inter-individual variations depending on the examiner. The ageing population often presents with multimorbidity, but our current healthcare systems aren’t designed to handle that yet. Healthcare must adapt to the evolving demographics and the shifting clinical profiles of patient populations (7). For me, it was very hard to find good articles for the Frailty assessment in the ED with actual numbers, tables,

graphs, and that were tested on real patients, not on vignettes. The medical staff needs more teaching so that they know which frailty tool they need for their assessment, and also due to the rising importance of electronic and AI-based frailty tools. A mixed-methods online survey was conducted among 137 UK healthcare professionals (HCPs) to assess their training, confidence, and use of frailty assessment tools in practice. 57% (78 HCPs) reported never receiving formal training in frailty assessment, 43% (59 HCPs) had some training, including in-house courses, external training, geriatrics training, and informal on-the-job training (35). In the United Kingdom, only 38.1% of hospital-based physicians reported having been trained in frailty recognition, while 67.9% indicated an interest in pursuing further training opportunities. Formal training in frailty assessment remains insufficient. There is a lack of standardization in tool use, and awareness of frailty management pathways needs improvement (35). Increasing training opportunities and enhancing consistency in frailty assessment across healthcare settings could improve patient care. There's also a lack of studies that focus on the practitioners' perceptions of the feasibility of common frailty screening instruments.

5.3 FUTURE DIRECTIONS AND ADVANCES IN TECHNOLOGY FOR FRAILTY ASSESSMENT AND MANAGEMENT

New steps in geriatric care could be more patient-oriented treatment, increased introduction of geriatric (day care) hospitals as in France (5), and introducing a geriatric ward as a must in normal hospitals. The Gérontopôle Frailty Clinic, founded in Toulouse in 2011, functions as a day hospital where frail individuals are referred by general practitioners and specialists for multidisciplinary evaluation of frailty and disability risk factors (5). New concepts have arisen in the field of geriatric assessment, like Machine Learning, electronic frailty tools, and AI. Machine Learning (ML) has emerged as a promising approach to improve frailty screening by leveraging healthcare datasets and automated prediction models. ML models can process large healthcare datasets, reducing reliance on manual frailty assessments. ML-based frailty screening methods can identify risk factors and predict pre-

frailty and frailty more accurately than traditional methods. The study reviewed six ML-based frailty screening studies, highlighting various algorithms used for prediction. Predicting frailty using healthcare records, including clinical conditions, medication use, and hospitalization history. Developing electronic frailty scores (eFS) based on individual health data. Using biosignal-based assessments (e.g., heart rate variability) to predict frailty in real-time. ML models integrating multiple variables (e.g., socioeconomic factors, medical history) to improve frailty detection and prediction of health outcomes (16). Another article that I found highlights the increasing importance of AI in geriatrics. It focuses on the pro-arguments of AI tools for frailty screening. AI can analyze large-scale electronic medical records (EMRs) and detect frailty patterns early. AI applications can enhance clinical decision-making and proactive patient care. Deep learning models, inspired by neural networks, offer innovative solutions for classifying frailty risks (36). Electronic assessment tools are also on the run. One example is the Electronic Screening Index of Frailty (e-SIF). e-SIF was developed as an automated tool that uses electronic health records to identify frailty in individuals aged ≥65 years in the primary care setting. It enables real-time classification of frailty levels, helping clinicians and healthcare policymakers manage and allocate resources more effectively (37). According to a study by Brack et al., electronic frailty screening tools like eFI can help identify at-risk individuals, but for now, they should be used as part of a broader frailty assessment strategy. The UK NHS recommends eFI if the in-person assessment isn't possible. While in-person assessments remain the gold standard, they are resource-intensive. Electronic health records (EHRs) provide an efficient alternative by automatically identifying patients at risk (38).

6. CONCLUSION

6.1 RECAP OF KEY FINDINGS

This study reviews the contemporary applications of frailty assessment tools, highlighting their relevance when choosing appropriate instruments for clinical practice or research. It is recommended that

selection be guided by the specific purpose, prior usage, and the domains each instrument measures. (34). Implementing a two-stage approach—initially using a brief questionnaire to screen for frailty, followed by a more detailed assessment to determine individual care needs—may offer an effective strategy for organizing community-based care services (39). Variations across care settings hinder the establishment of a universally applicable set of frailty assessment tools, highlighting the necessity of employing different scales tailored to specific environments. Consequently, frailty evaluation must be adapted to align with the particular needs, available resources, and priorities of each setting (4). I recommend selecting the instruments according to their feasibility and if their assessment spectrum is beneficial for that particular setting. I examined a total of 15 studies from America, Europe, Asia, and Australia. The different frailty assessment tools have different focuses, which makes an objective comparison difficult. The fact that there are now a variety of assessment tools makes the field confusing. Some studies only deal with one frailty assessment tool, and therefore, no statement can be made about the value of other tests. Studies that compare a larger number of frailty assessment tools (such as the Frailtools project) are rather rare.

6.2 FINAL REMARKS

Additional research is needed to enhance the clinical applicability of guidelines for frailty detection and management and to promote the standardization of screening tools across clinical and research settings. Moreover, evaluating the practicality of implementing these guidelines, especially in terms of the cost-effectiveness of frailty screening, remains essential. Future studies should compare screening methods across various healthcare settings and disease conditions, as well as evaluate self-assessment tools to determine the most effective option based on sensitivity and specificity. Moreover, there is a pressing need to develop a worldwide recognized gold-standard frailty screening scale (39).

7. REFERENCES

(1) Kim DH, Rockwood K. Frailty in older adults. N Engl J Med. 2024 Aug 8;391(6):538.

(2) OpenAI. ChatGPT (GPT-4) [Internet]. Available from: https://openai.com/chatgpt

(3) Mehta P, Lemon G, Hight L, et al. A systematic review of clinical practice guidelines for identification and management of frailty. J Nutr Health Aging. 2021;25(3):382-391. doi: 10.1007/s12603-020-1549-3.

(4) Oviedo-Briones M, Rodríguez-Laso Á, Carnicero JA, Cesari M, Grodzicki T, Gryglewska B, et al. A comparison of frailty assessment instruments in different clinical and social care settings: The Frailtools Project. J Am Med Dir Assoc. 2021;22(3):607.e7-607.e12. doi: 10.1016/j.jamda.2020.08.022.

(5) McKee M, Merkur S, Edwards N, Nolte E, editors. The changing role of the hospital in European health systems. European Observatory on Health Systems and Policies. Cambridge: Cambridge University Press; 2020. ISBN: 9781108790055.

(6) Deng Y, Sato N. Global frailty screening tools: review and application of frailty screening tools from 2001 to 2023. Intractable Rare Dis Res. 2024 Feb;13(1):1-11. doi: 10.5582/irdr.2023.01113. PMID: 38404737; PMCID: PMC10883846.

(7) Boreskie KF, Hay JL, Boreskie PE, et al. Frailty-aware care: giving value to frailty assessment across different healthcare settings. BMC Geriatr. 2022;22:13. Doi: 10.1186/s12877-021-02722-9.

(8) Aguayo GA, Donneau AF, Vaillant MT, et al. Agreement between 35 published frailty scores in the general population. Am J Epidemiol. 2017;186(4):420-434. doi: 10.1093/aje/kwx061.

(9)https://www.destatis.de/EN/Press/2022/12/PE22_511_124.html

(10)https://www.ncbi.nlm.nih.gov/books/NBK459004/#:~:text=In%20Germany,%20primary%20care%20includes%20all%20doctors%20treating%20patients%20on

(11) Lacas A, Rockwood K. Frailty in primary care: a review of its conceptualization and implications for practice. BMC Med. 2012 Jan 11;10:4. Doi: 10.1186/1741-7015-10-4. PMID: 22236397; PMCID: PMC3271962.

(12) Coulter A, Entwistle VA, Eccles A, Ryan S, Shepperd S, Perera R. Personalised care planning for adults with chronic or long-term health conditions. Cochrane Database Syst Rev. 2015 Mar 3;2015(3): CD010523. Doi: 10.1002/14651858.CD010523.pub2. PMID: 25733495; PMCID: PMC6486144.

(13) Turner G, Clegg A. Best practice guidelines for the management of frailty: a British Geriatrics Society, Age UK and Royal College of General Practitioners report. Age Ageing. 2014;43(6):744-747. doi: 10.1093/ageing/afu138.

(14) Van Craen K, Braes T, Wellens N, Denhaerynck K, Flamaing J, Moons P, Boonen S, Gosset C, Petermans J, Milisen K. The effectiveness of inpatient geriatric evaluation and management units: a systematic review and meta-analysis. J Am Geriatr Soc. 2010 Jan;58(1):83-92. doi: 10.1111/j.1532-5415.2009.02621.x. Epub 2009 Dec 9. PMID: 20002509.

(15) https://www.europarl.europa.eu/RegData/etudes/ATAG/2023/751475/EPRS_ATA(2023)751475_EN.pdf#:~:text=As%20Europe's%20population%20ages,%20demand%20for%20long-term%20care%20in%20particular

(16) Oliosi E, Guede-Fernández F, Londral A. Machine learning approaches for frailty screening: a narrative review. Int J Environ Res Public Health. 2022 Jul 20;19(14):8825. doi: 10.3390/ijerph19148825. PMID: 35886674; PMCID: PMC9320589.
(17) Pitter JG, Zemplényi A, Babarczy B, Németh B, Kaló Z, Vokó Z. Frailty prevalence in 42 European countries by age and gender: development of the SHARE Frailty Atlas for Europe. Geroscience. 2024 Apr;46(2):1807-1824. doi: 10.1007/s11357-023-00975-3. Epub 2023 Oct 19. PMID: 37855861; PMCID: PMC10828249.
(18) Ambagtsheer RC, Archibald MM, Lawless M, et al. Feasibility and acceptability of commonly used screening instruments to identify frailty among community-dwelling older people: a mixed methods study. BMC Geriatr. 2020;20:152. doi: 10.1186/s12877-020-01551-6.
(19) Ambagtsheer RC, Visvanathan R, Dent E, Yu S, Schultz TJ, Beilby J. Commonly used screening instruments to identify frailty among community-dwelling older people in a general practice (primary care) setting: a study of diagnostic test accuracy. J Gerontol A Biol Sci Med Sci. 2020 May 22;75(6):1134-1142. doi: 10.1093/gerona/glz260. PMID: 31689342.
(20) Sutorius FL, Hoogendijk EO, Prins BA, van Hout HP. Comparison of 10 single and stepped methods to identify frail older persons in primary care: diagnostic and prognostic accuracy. BMC Fam Pract. 2016 Aug 3;17:102. Doi: 10.1186/s12875-016-0487-y. PMID: 27488562; PMCID: PMC4973108.
(21) van Kempen JAL, Schers HJ, Philp I, Olde Rikkert MGM, Melis RJF. Predictive validity of a two-step tool to map frailty in primary care. BMC Med. 2015;13:287. doi: 10.1186/s12916-015-0519-9.
(22) Wang L, Zhang X, Liu X. Association between the frailty index and readmission risk in hospitalised elderly Chinese patients: a retrospective cohort study. BMJ Open. 2024;14:e076861. doi: 10.1136/bmjopen-2023-076861.
(23) Ekerstad N, Dahlin Ivanoff S, Landahl S, Östberg G, Johansson M, Andersson D, et al. Acute care of severely frail elderly patients in a CGA unit is associated with less functional decline than conventional acute care. Clin Interv Aging. 2017;12:1239-1249. doi: 10.2147/CIA.S141085.
(24) Bielza R, Balaguer C, Zambrana F, Arias E, Thuissard IJ, Lung A, et al. Accuracy, feasibility, and predictive ability of different frailty instruments in an acute geriatric setting. Eur Geriatr Med. 2022 Aug;13(4):827-835. doi: 10.1007/s41999-022-00645-1. Epub 2022 Apr 23. PMID: 35460515; PMCID: PMC9034644.
(25) Chong E, Ho E, Tan JS, Chan M, Lim WS. Frailty in hospitalized older adults: comparing different frailty measures in predicting short- and long-term patient outcomes. J Am Med Dir Assoc. 2018;19(5):450-457.e3.
doi: 10.1016/j.jamda.2017.12.004.
(26) Liang Y, Zhang Y, Li YM, Chen YH, Xu J, Liu M, et al. Identification of frailty and its risk factors in elderly hospitalized patients from different wards: a cross-sectional study in China. Clin Interv Aging. 2019;14:2249-2259.
doi: 10.2147/CIA.S229189.
(27) O'Caoimh R, Costello M, Small C, Spooner L, Flannery A, O'Reilly L, et al. Comparison of frailty screening instruments in the emergency department. Int J Environ

Res Public Health. 2019 Sep 27;16(19):3626. doi: 10.3390/ijerph16193626. PMID: 31569689; PMCID: PMC6801910.
(28) Di Prazza A, Canino B, Barbagallo M, Veronese N. The importance of prognosis in geriatric patients attending the emergency department: a comparison between two common short geriatric assessment tools. Aging Clin Exp Res. 2023 Dec;35(12):3041-3046. doi: 10.1007/s40520-023-02603-8. Epub 2023 Nov 6. PMID: 37932645; PMCID: PMC10721668.
(29) O'Caoimh R. Validation of the Risk Instrument for Screening in the Community (RISC) among older adults in the emergency department. Int J Environ Res Public Health. 2023 Feb 20;20(4):3734. doi: 10.3390/ijerph20043734. PMID: 36834429; PMCID: PMC9966437.
(30) Lewis ET, Dent E, Alkhouri H, Kellett J, Williamson M, Asha S, et al. Which frailty scale for patients admitted via the emergency department? A cohort study. Arch Gerontol Geriatr. 2019;80:104-114. doi: 10.1016/j.archger.2018.11.002.
(31) Kaehr EW, Pape LC, Malmstrom TK, Morley JE. FRAIL-NH predicts outcomes in long-term care. J Nutr Health Aging. 2016;20(2):192-198. doi: 10.1007/s12603-016-0682-5.
(32) Ge F, Liu M, Tang S, Lu Y, Szanton SL. Assessing frailty in Chinese nursing home older adults: a comparison between the FRAIL-NH scale and frailty index. J Nutr Health Aging. 2019;23(3):291-298. doi: 10.1007/s12603-019-1156-3. PMID: 30820519.
(33) Grosshauser FJ, Schoene D, Kiesswetter E, Sieber CC, Volkert D. Frailty in nursing homes: a prospective study comparing the FRAIL-NH and the Clinical Frailty Scale. J Am Med Dir Assoc. 2022 Oct;23(10):1717.e1-1717.e8. doi:10.1016/j.jamda.2022.07.028. Epub 2022 Sep 5. PMID: 36065096
(34) Buta BJ, Walston JD, Godino JG, Park M, Kalyani RR, Xue QL, et al. Frailty assessment instruments: systematic characterization of the uses and contexts of highly-cited instruments. Ageing Res Rev. 2016;26:53-61. doi: 10.1016/j.arr. .201512.003.
(35) Frost R, Robinson K, Gordon A, Caldeira de Melo R, Villas Boas PJF, Azevedo PS, et al. Identifying and managing frailty: a survey of UK healthcare professionals. J Appl Gerontol. 2024;43(4):402-412. doi: 10.1177/07334648231206321.
(36) Karunananthan S, Rahgozar A, Hakimjavadi R, Yan H, Dalsania KA, Bergman H, et al. Use of artificial intelligence in the identification and management of frailty: a scoping review protocol. BMJ Open. 2023 Dec 28;13(12):e076918. doi: 10.1136/bmjopen-2023-076918. PMID: 38154888; PMCID: PMC10759108.
(37) Serra-Prat M, Lavado À, Cabré M, Burdoy E, Palomera E, Papiol M, Parera JM. Development and validation of the electronic screening index of frailty. Age Ageing. 2022 Jul 1;51(7):afac161. Doi: 10.1093/ageing/afac161. PMID: 35810395.
(38) Brack C, Kynn M, Murchie P, Makin S. Validated frailty measures using electronic primary care records: a review of diagnostic test accuracy. Age Ageing. 2023 Nov 2;52(11):afad173. Doi: 10.1093/ageing/afad173. PMID: 37993406; PMCID: PMC10873280.
(39) Gilardi F, Capanna A, Ferraro M, Scarcella P, Marazzi MC, Palombi L, Liotta G. Frailty screening and assessment tools: a review of characteristics and use in public health. Ann Ig. 2018 Mar-Apr;30(2):128-139. doi: 10.7416/ai.2018.2204. PMID: 29465150.

8. ANNEXES

Concerning Reference (2), OpenAI. ChatGPT (GPT-4) [Internet]. Available from: https://openai.com/chatgpt - AI was used only for paraphrasing.