The Journal of Frailty & Aging 15 (2026) 100130

Contents lists available at ScienceDirect

The Journal of Frailty & Aging

journal homepage: www.elsevier.com/locate/tjfa

Screening and managing frailty in older nursing home residents with Frail-VIG index: Feasibility, reliability and predictive validity for mortality

Cristina Jiménez-Domínguez *, Lourdes Rexach-Cano, Carlos Verdejo-Bravo, Manuel Vicente Mejía-Ramírez-Arellano, Carlota Manuela Zárate-Saez, Mª Nieves Vaquero Pinto, Cristina Roldán-Plaza, Nuria Pérez-Panizo, Mª Loreto Álvarez-Nebreda

Hospital Ramón y Cajal, Spain

A R T I C L E I N F O

Keywords:
Frailty
Frail older adults
Nursing homes
Comprehensive geriatric assessment
Advanced care planning

A B S T R A C T

Frailty is prevalent among older nursing home residents, although there is limited evidence regarding frailty screening and management in this setting.

Objective: To evaluate the measurement properties of the Frail Index based on the Comprehensive Geriatric Assessment (Frail-VIG).

Design: Prospective observational longitudinal study of 571 residents from 3 nursing homes. Frail-VIG scores were calculated at baseline and at 6 and 12 months. Sociodemographic variables were studied. Feasibility was assessed based on simplicity of application and requirements for score calculation. Reliability was evaluated through inter-rater agreement and test-retest assessments. Construct and content validity were examined by comparing it with other frailty indexes. Predictive validity was evaluated using log-rank tests and AUC-ROC curves for mortality prediction.

Results: Mean (SD) resident age was 88.2 (6.5) years, and 80.6 % were women. The mortality rate was 11.4 % at 6 months and 20 % at 12 months. Calculating Frail-VIG scores required 5.15 min and no additional space or equipment, and there was low risk of missing data. The inter-rater consistency and score stability over time indicate strong reliability. The Frail-VIG maintains the characteristics of other established frailty indexes and shows strong convergent validity with the FRAIL-NH and CFS scales. Baseline scores have an AUC-ROC curve (confidence interval) of 0.69 (95 % CI, 0.63–0.76) at 6 months and 0.65 (95 % CI, 0.6–0.71) at 12 months.

Conclusions: The measurement properties of the Frail-VIG in older nursing home residents validate its use in this population and setting. Its predictive ability for mortality suggests important implications for advanced care planning.

1. Introduction

Frailty is a clinically recognizable geriatric condition affecting multiple body systems and involving a gradual loss of physiological reserve. It increases vulnerability to a wide range of adverse health outcomes, such as disability, hospitalization, or death [1]. Accurate identification of frailty can help shape appropriate care processes that are tailored to the needs of older adults [2]. Although an operational definition of frailty syndrome has been established from the findings of a Delphi consensus [3], there is no gold standard measure [4].

Over the past two decades, two conceptual models have been used to identify frail individuals, each taking a different approach [5]: frailty as a state, as assessed by the Fried Frailty Phenotype [6]; and frailty as a process of poor health resulting from the age-related accumulation of deficits over time, measured using a frailty index such as the one developed by Rockwood [7]. These divergent conceptualizations underline the need for assessment tools and approaches that are more adequate to screen and manage frailty in specific populations and care settings, ensuring consistency and accuracy in research and tailoring individual interventions in clinical practice [8–11].

Although high rates of frailty diagnosis are expected among nursing home residents, the evidence in this setting remains limited due to the

* Corresponding author.
E-mail address: cristj08@ucm.es (C. Jiménez-Domínguez).

https://doi.org/10.1016/j.tjfa.2025.100130
Received 21 September 2025; Received in revised form 23 November 2025; Accepted 19 December 2025
Available online 31 January 2026

small number of studies, methodological variability, and inconsistent definitions of frailty [12]. Moreover, in this population, the high prevalence of chronic functional disability or cognitive impairment likely prevents the use of the Frailty Phenotype as a screening test [6]. To address this problem, new validated tools have been developed to screen for the state of frailty in nursing homes: the FRAIL-NH scale [13] and a modified version of the Fried criteria [14,15]. In contrast, quantitative approaches that view frailty as a continuum reflecting the accumulation of deficits probably offer a more precise depiction of the frailty process in older nursing home residents. This comprehensive approach takes into account multiple interacting conditions, polypharmacy, malnutrition, geriatric syndromes, and multimorbidity, without reducing the evaluation to a disability score. Therefore, the Nursing Home Frailty Scale [16] or the Index from the interRAI long-term care facility database [17] have been developed *ad hoc* in this care setting, although their psychometric properties are poor [18].

The Frail-VIG (Frailty Index based on the Comprehensive Geriatric Assessment (CGA)), a process-based screening and severity-assessment tool for frailty, could be useful in this setting. It is composed of 22 items that evaluate 25 deficits based on variables recorded during the routine clinical CGA. The score is obtained by dividing the accumulated deficits by the total number of potential deficits, yielding a score ranging from 0 (no deficits) to 1 (all possible deficits). The variables included are shown in Table 1 and evaluate the following 8 domains: functional (common instrumental activities of daily living (IADLs), money, telephone and medication management, and basic activities of daily living); nutritional (weight loss ≥5 % in the last 6 months); cognitive impairment; emotional markers including the presence of depressive syndrome or insomnia/anxiety; social vulnerability; geriatric syndromes (delirium, falls, polypharmacy, and dysphagia); severe symptoms including pain and dyspnea; and the presence of chronic diseases (cancer, respiratory, cardiac, neurological, digestive, and renal disease). It has been broadly validated in acute hospital inpatients [19,20], with additional validation studies conducted in the community [21] and the emergency department (ED) [22].

The aim of this study was to evaluate the measurement properties of the Frail-VIG in accordance with Consensus-Based Standards for the Selection of Health Measurement Instruments (COSMIN) guidelines [23]. Specifically, we assessed the feasibility, reliability, and the construct and content validity of the Frail-VIG, as well as its predictive

Table 1
Sociodemographic and clinical variables of the whole sample and a comparison of outcomes between surviving/deceased older nursing home residents at 6 months of follow-up.

Variable			Death at 6-month follow-up		*P*-value
		Total *N* = 571	No *n* = 502	Yes *n* = 65	
Mean age (±SD) y		88.2 (±7.6)	87.8 (±7.6)	91.1 (±5.7)	<0.001
Sex n (%)	Women	460 (80.6)	407 (88.9)	51 (11.1)	0.360
	Men	111 (19.4)	95 (87.2)	14 (12.8)	
Length of NH stay (±SD) y		3.7 (± 6.5)	3.7 (6.9)	3.8 (3.2)	0.88
Mean Charlson index (±SD)		3.3 (± 1.3)	3.2 (1.3)	3.8 (1.5)	0.001
Mean DDCL (±SD)		2.7 (± 0)	2.6 (0.5)	2.9 (0.5)	0.01
Mean Barthel index (±SD)		43.1 (± 28.7)	44.7 (±28.9)	28.9 (±23.1)	< 001
Mean Reisberg GSD (±SD)		5 (± 1.5)	4.9 (±1.5)	5.6 (± 1.3)	<0.001
Mean MMSE (±SD)		15.4 (±8)	15.8 (±8)	12.1 (±7.7)	<0.001
Mean MNA-SF (±SD)		9.7 (±2.4)	9.8 (±2.4)	9.1 (±2.1)	0.01
Mean drugs received (±SD)		6.5 (±1.9)	6.5 (±1.9)	6.2 (±1.7)	0.258
Mean Frail-VIG (±SD)		0.45 (±0.13)	0.44 (±0.12)	0.52 (±0.11)	<0.001
Mean CFS (±SD)		5.2 (± 1.5)	5.1 (±1.5)	6.1 (±1.3)	<0.001
Mean NH-FRAIL (±SD)		6.5 (± 2.3)	6.4 (±2.5)	7.4 (±2.1)	0.001
IADLs n (%)	Money	549 (96.1)	482 (83.3)	64 (11.7)	0.49
	Telephone	468 (80.7)	399 (87.3)	58 (12.7)	0.06
	Medication	345 (59.5)	292 (86.1)	47 (13.9)	0.03
Mean sum IADLs (±SD)		2.4 (± 0.8)	2.3 (± 0.8)	2.6 (±0.7)	0.01
Degree IB n (%)	IB <95	38 (6.7)	37 (97.4)	1 (2.6)	<0.001
	IB 65–90	159 (27.8)	148 (94.3)	9 (5.7)	
	IB 25–60	209 (36.6)	185 (89.4)	22 (10.6)	
	IB <20	165 (28.9)	132 (80)	33 (20)	
Degree GDS n (%)	GDS 1	25 (4.4)	22 (89.5)	2 (12)	<0.001
	GDS 2–5	317 (55.5)	287 (91.4)	27 (8.6)	
	GDS >6	229 (40.1)	193 (84.3)	36 (15.7)	
Malnutrition n (%)		170 (29.8)	142 (84.5)	26 (15.5)	0.06
Depression n (%)		175 (30.6)	159 (91.4)	15 (8.6)	0.19
Insomnia/anxiety n (%)		394 (69)	349 (89)	43 (11)	0.57
Social Vulnerability n (%)		217 (38)	195 (90.3)	21 (9.7)	0.34
Geriatric syndromes n (%)	Delirium	64 (11.2)	55 (87.3)	8 (12.7)	0.679
	Falls	123 (21.5)	101 (82.8)	21 (17.2)	0.03
	Ulcers	39 (6.8)	29 (74.4)	10 (25.6)	0.008
	Polypharmacy	498 (87.2)	437 (88.5)	57 (11.5)	1
	Dysphagia	80 (14)	61 (76.3)	19 (23.8)	<0.001
Severe symptoms (%)	Pain	138 (24.2)	127 (92)	11 (8)	0.16
	Dyspnea	44 (7.7)	34 (79.1)	9 (20.9)	0.07
Chronic diseases n (%)	Cancer	19 (3.3)	15 (78.9)	4 (21.1)	0.315
	Respiratory	109 (19.1)	91 (85.8)	15 (14.1)	0.57
	Cardiac	210 (36.8)	173 (82.8)	36 (17.2)	<0.001
	Neurological	546 (96.6)	481 (88.5)	62 (11.4)	0.02
	Digestive	117 (20.5)	98 (84.4)	18 (15.5)	0.09
	Renal	137 (24)	111 (81.1)	26 (18.9)	0.002
Advance directives n (%)		3 (0.5)	3 (100)	0 (0)	1
Advance care planning n (%)		16 (2.8)	7 (43.8)	9 (56.3)	<.001

Notes: SD = standard deviation; NH =nursing home; DDCL = Degree of Dependency Care Law; GDS = Global Deterioration Scale); MNA-SF = Mini Nutritional Assessment short form; MMSE = Mini-Mental State Examination of cognition; CFS = clinical frailty scale; IADLs = instrumental activities of daily living.

ability for mortality and other adverse health outcomes, in older nursing home residents.

2. Methods

2.1. Study design and participants

We conducted a prospective observational study of older adults living in 3 nursing homes which have a tertiary Hospital, as the reference center. Patients were included if they were 65 years of age or older and they were living permanently in one of the participating nursing homes. Individuals residing only temporarily and those who left the residence during the study period were excluded. Patient recruitment and initial data collection took place between January and May 2023. Follow-up was performed from July 2023 to May 2024. The sample size was determined based on the number of items of the index and the area under the receiver operating characteristic (ROC) curve for mortality prediction established in the original study [19].

The Frail-VIG score of all participants was calculated at baseline and at 6- and 12-month follow-up in surviving participants by the principal investigator in collaboration with the healthcare team at the nursing home, who had known the participants for at least 3 months. Additional assistance was provided by researchers at the Hospital Geriatric Unit for Nursing Home Coordination.

The sociodemographic variables studied comprised sex, age, and place and date of institutionalization. In addition to the clinical variables included in the Frail-VIG, we collected data for the Barthel Index of activities of daily living [24], Mini-Mental State Examination (MMSE) [25], the Charlson Comorbidity Index [26], the Mini-Nutritional Assessment Short Form (MNA-SF) [27], as well as information on current medications.

To measure the feasibility of the tool, the percentage of unanswered items at baseline and at 6- and 12-month follow-up was calculated. As indicated in the COSMIN recommendations [23], we evaluated the index for other aspects of feasibility such as simplicity of application and requirements concerning assessor training, physical space, and time.

The inter-rater reliability of the Frail-VIG was assessed at baseline in a sample of 106 residents through blind, independent testing conducted by the principal investigator and a physician from a participating nursing home who was familiar with the tool. To evaluate test-retest reliability, the principal investigator and one physician from a participating nursing home calculated index scores at 2 time points, assessed in a sample of 50 residents with unchanged clinical conditions 1 week after the initial assessment.

Regarding construct validity, Frail-VIG scores were analyzed to determine whether they showed properties of other frailty indexes described by Searle et al. [28]. For content validation, Frail-VIG was compared with 2 other validated frailty measures used in nursing homes. One such tool was the FRAIL-NH, a phenotype scale [29] designed specifically for the nursing home setting, which includes 7 items (ie, fatigue, resistance, ambulation, incontinence, weight loss, nutrition, dressing). The other was the Clinical Frailty Scale (CFS), a continuous index derived from the Rockwood approach [30,31] that is based on 9 descriptive categories and pictograms and scored from 1 (robust) to 9 (terminally ill). To assess the ability of the Frail-VIG to predict survival, we recorded the date of death of the deceased patients at 6- and 12-month follow-up by searching either the electronic medical records of the hospital or administrative data of the Health Service. Data related to adverse health outcomes included ED visits, hospitalizations, and the onset of new geriatric syndromes such as delirium, falls, dysphagia, and pressure sores.

2.2. Statistical analysis

A database was created using the Microsoft Access 10.0 software program. Qualitative variables were expressed as absolute frequencies and percentages. Quantitative variables were shown as mean values and standard deviations. Differences in mortality rates for each individual study variable were compared across repeat measurements.

To assess construct validity [28], we determined whether the Frail-VIG scores at baseline and over 6 and 12 months exhibited a skewed density distribution in a histogram and preserved the submaximal limit of the 99th percentile. The rate of deficit accumulation was determined by calculating the slope of the best fit in a logarithmic analysis of Frail-VIG scores versus age at baseline and at 6- and 12-month follow-up to evaluate whether deficits increased with age. To investigate the association between the Frail-VIG and the FRAIL-NH, the area under the curve (AUC-ROC) was calculated. These tools were used to estimate the prevalence of frailty among the study participants, and we determined the sensitivity, specificity, positive and negative predictive value, and the Youden Index for Frail-VIG detection cutoffs proposed in the literature of $\geq$0.2, $\geq$0.23, and $\geq$0.25 versus the FRAIL-NH threshold of $\geq$2 [29]. Pearson correlation was used to assess convergence between the Frail-VIG and the CFS.

Predictive validity was evaluated using survival data. Survival curves were compared with log-rank hypothesis testing based on baseline Frail-VIG scores and mortality at 6 and 12 months. The area under the curve (AUC-ROC) was calculated for baseline scores and mortality at these time points. The Kruskal-Wallis ANOVA test was applied to analyze whether baseline Frail-VIG scores were associated with adverse health outcomes (ie, ED visits, hospitalizations, onset of geriatric syndromes).

A value of $P < 0.05$ was considered statistically significant. Data were analyzed with the IBM SPSS Statistics 27 software package.

3. Results

Of the 752 patients living in the 3 participating nursing homes as of January 5, 2023, 571 gave written consent to participate in the study. The participation rates were 97 %, 91 %, and 59 % in the 3 centers, as shown in the study flowchart (Supplemental Fig. 1). The sociodemographic and clinical characteristics of the study participants at baseline and at 6 and 12 months of follow-up are shown in Table 1 and Supplemental Table 1. At baseline, the average age was 88.2 years ($\pm$7.6 years), 80.6 % were women, and the mean length of stay was 3.6 years ($\pm$6.5 years). Regarding the profile of participants, 65.5 % were moderately dependent (Barthel Index <60). A high number of participants (36.8 %) had severe dementia, as indicated by a score <12 on the MMSE. The cohort showed a high degree of social vulnerability (38 %), defined as the absence of close relatives or permanent residency in a public nursing home. The most prevalent geriatric syndromes were polypharmacy (>5 drugs, 87.2 %), with an average of 6.5 ($\pm$1.9) drugs received; insomnia/anxiety treated with hypnotic drugs (69 %); weight loss (>5 kg in the previous 6 months, 29.8 %); and malnutrition or risk of malnutrition, with an MNA-SF score <11 (80.9 %). Regarding chronic diseases, the mean Charlson Index score was 3.3. It was noteworthy that 96.6 % of the sample had neurological diseases (40 % considered advanced according to the severity and disease-progression criteria appearing in the NECPAL instrument [32], 36.8 % cardiovascular disease (2.4 % advanced), and 24 % chronic kidney disease (5.8 % advanced).

After the initial CGA, the average time needed to calculate the Frail-VIG score was 5.15 min. The time required to train the healthcare team in the nursing homes where it had not been previously used was 1 h.

The intraclass correlation coefficient (ICC) for baseline inter-rater agreement of the Frail-VIG was 0.93 (95 % CI, 0.90–0.97). The test-retest reliability showed an ICC of 0.95 (95 % CI, 0.91–0.99) (Fig. 1).

Regarding construct validity [28], 96.3 % of the residents had a Frail-VIG score >0.2, indicating frailty, and the mean baseline score for our sample was 0.45 ($\pm$0.13). There was no loss of data when calculating the Frail-VIG, neither at baseline nor during follow-up. The distribution of Frail-VIG scores displayed a normal curve with a tendency toward asymmetry, with positive coefficients at baseline and follow-up in

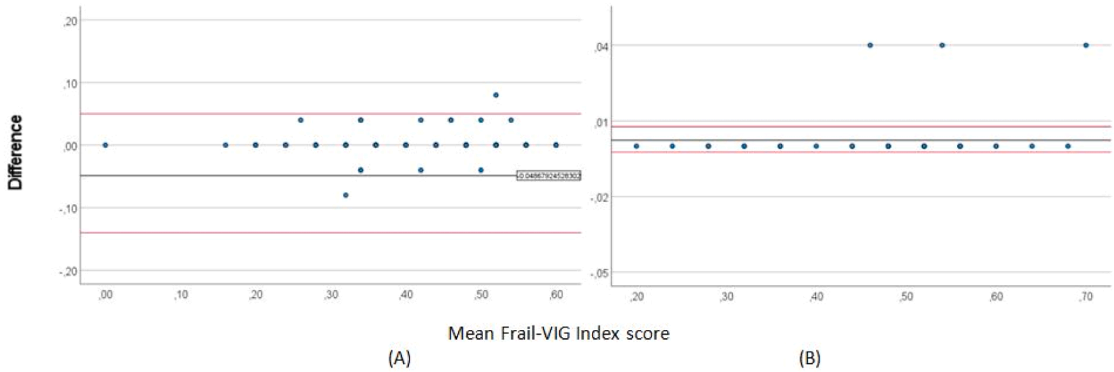

Fig. 1. Bland-Altman correlation for the inter-rater reliability (A) and test-retest reliability (B).

surviving residents, respectively, which shifted the curve to the right, reflecting a greater proportion of residents with a higher accumulation of deficits (Fig. 2). In our cohort, the Frail-VIG preserved its submaximal limit, with 99.7 % of participants scoring <0.72 at baseline and 99.1 % of the surviving participants with scoring <0.76 at 6- and 12-month follow-up. Univariate analysis revealed that Frail-VIG scores at baseline and at 6- and 12-month follow-up were not dependent on age. However, the slope of the best fit log of the Frail-VIG scores *versus* age showed a relative annual rate of deficit accumulation of approximately 2 % (Supplemental Fig. 2).

For content validity, the baseline Frail-VIG score, analyzed as a continuous value and compared with the FRAIL-NH [29], demonstrated excellent convergent validity, with an AUC-ROC of 0.96 (95 % CI, 0.94–0.98) (Supplemental Fig. 3). The highest Youden Index score (0.62) with the FRAIL-NH threshold of ≥2 at a Frail-VIG cutoff of ≥0.25 had 97 % sensitivity, 65 % specificity, 58 % positive predictive value and 3 % negative predictive value . Pearson correlation was used to assess the convergence between the Frail-VIG and the CFS, which produced a result of r = 0.91 (P <0.001) (Supplemental Fig. 4).

We observed a mortality rate of 11.4 % at 6 months and 20 % at 12 months, both independent of age and sex. The predictive ability of the baseline Frail-VIG score for mortality at 6- and 12-month follow-up was assessed using the AUC-ROC, which yielded values of 0.69 (95 % CI, 0.63–0.76) and 0.65 (95 % CI, 0.6–0.71), decreasing over time (Fig. 3). A Cox regression model comparing survival curves at 6 months according to baseline Frail-VIG scores grouped into intervals (0.15; 0.16–0.25; 0.26–0.35; 0.36–0.45; 0.46–0.55; 0.56–0.65; >0.66) revealed significant differences among them (χ^2 = 32.5 P <0.001) (Fig. 4) and at 12 months ((χ^2 = 24.5 P <0.001) Supplemental Fig. 5). The Kruskal-Wallis ANOVA showed that baseline Frail-VIG scores were not associated with hospitalizations or ED visits at 6- and 12-month follow-up. However, baseline scores were significantly associated with the Barthel Index, increasing disability, and the onset of geriatric syndromes such as delirium, dysphagia, falls, and pressure sores at 6 and 12 months (P <0.001).

4. Discussion

To our knowledge, this is the first time that the Frail-VIG has been used to detect frailty in a cohort of older nursing home residents. The results add scientific evidence to the limited body of high-quality data on the psychometric characteristics of frailty indexes [18] and

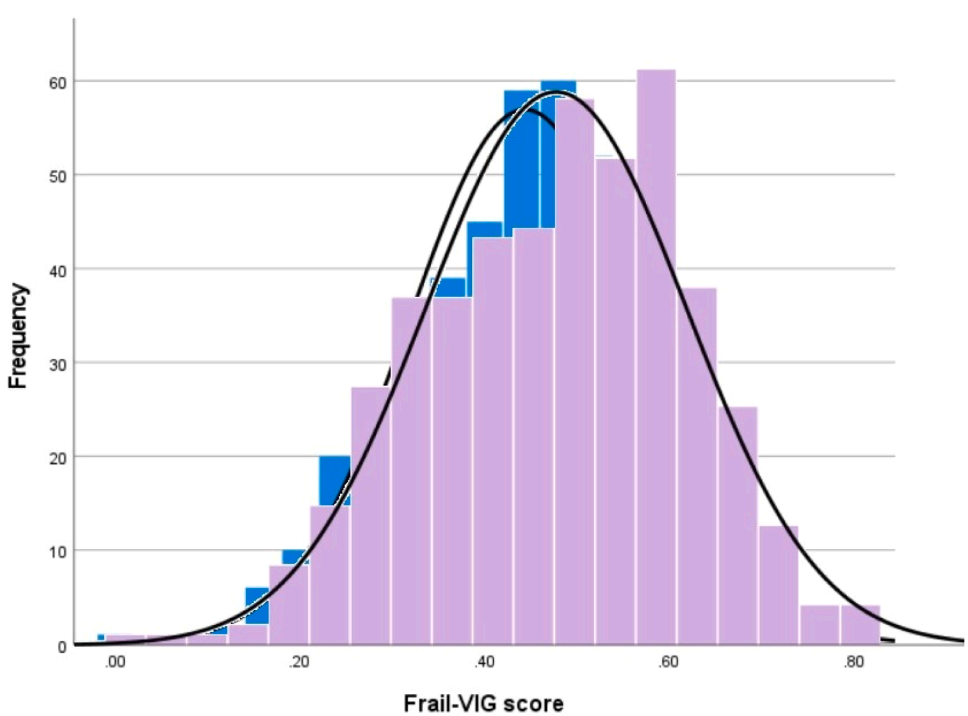

Fig. 2. Frail-VIG Index Score at baseline and at 12-month follow up.

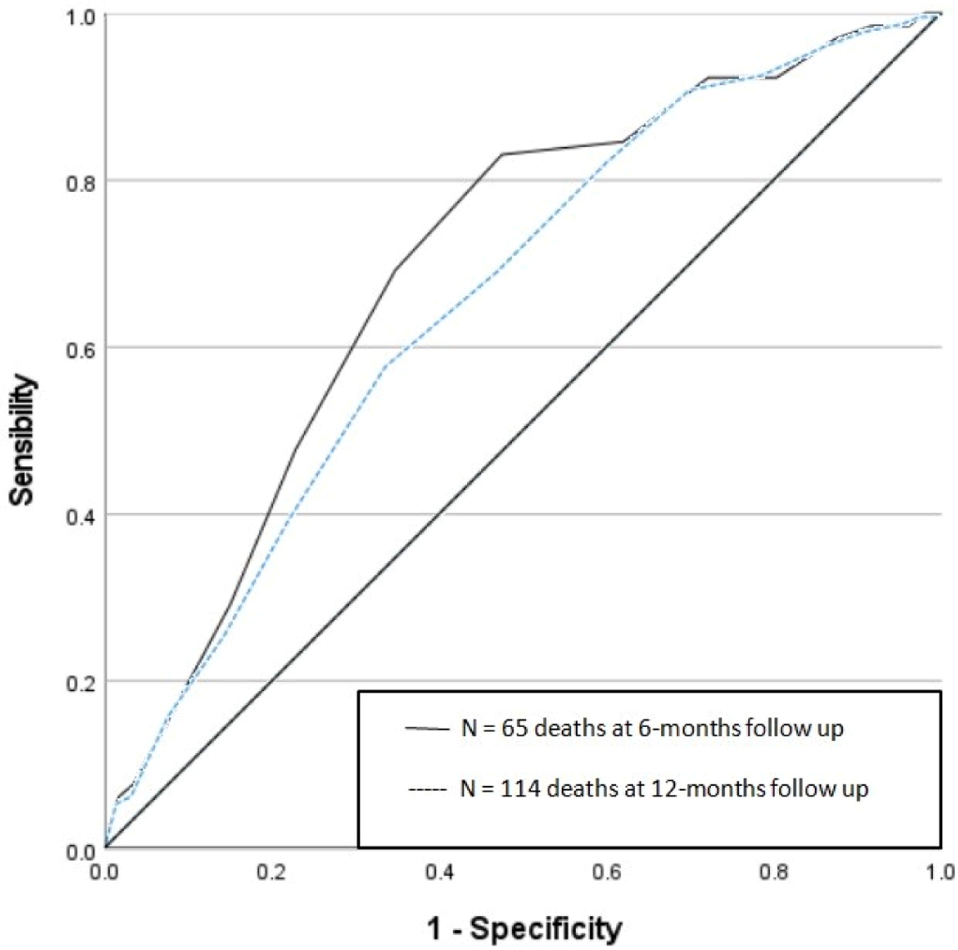

Fig. 3. Area under the curve (AUC-ROC) of the Frail-VIG score at baseline and mortality at 6- and 12-month follow up.

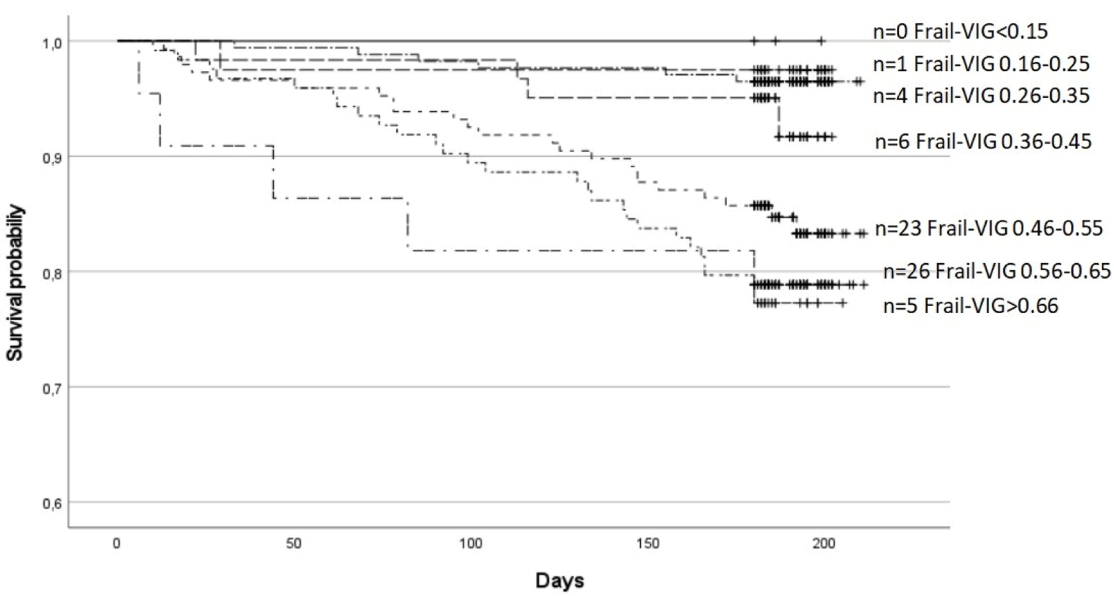

Fig. 4. Kaplan-Meier curves according to Frail-VIG Index score at 6-month follow-up.

validation of the index supports its use in this population and setting.

In terms of feasibility, the time required to calculate the different frailty indexes could limit Frail-VIG use in clinical practice [33]. The mean time needed to calculate the Frail-VIG score (5.15 min) is less than the 10 to 20 min required in many others [9]. The lack of missing data for calculating Frail-VIG score could be explained by the use of data from the CGA, frequently performed in this setting. As an additional strength, the Frail-VIG does not require any other equipment or space.

The inter-rater reliability of the Frail-VIG scores (ICC, 0.93) was as strong as shown in previous studies (0.94) [20]. It was comparable with that obtained using the CFS (0.97) [30] and superior to the Edmonton Frail Scale (0.77) [34]. The test-retest reliability (ICC, 0.95), which examined the stability of the index over time, was also excellent, as shown previously (0.97) [20]. The Frail-VIG had higher reliability than other frailty indexes (0.88) [35], the CFS (0.87) [30], the Tilburg Frailty Indicator (0.79) [36], and the FRAIL questionnaire (0.71) [37]. This suggests that the Frail-VIG can likely be used to assess individual levels of frailty in order to implement programs to better manage older nursing home residents or to support clinical decision-making. Where frailty exists, measuring the accumulation of deficits across different domains could identify the factors contributing to deterioration or improvement.

Regarding construct validity, our results show that the characteristics of the Frail-VIG are preserved and could be used to describe frailty as a dynamic process in this setting [19,28]. The presence of a submaximal limit, with 99 % of participants scoring 0.72 at baseline and 0.76 at follow-up, reflects a biological constraint in which the accumulation of deficits is limited to approximately two-thirds of all possible deficits [38, 39]. In our cohort, this suggests that systemic failure is more frequent among participants nearing this threshold.

The strong convergent validity between the Frail-VIG and FRAIL-NH indexes (AUC-ROC, 0.96) supports its content validity, as observed with other indexes [40,41]. The higher sensitivity and specificity at a cutoff of 0.25 for the Frail-VIG, compared with the FRAIL-NH, suggests that this threshold could be effective for screening older adults in nursing home settings, as supported by findings from similar studies [9]. Using Frail-VIG to detect pre-frail residents may help direct interventions to prevent functional dependence. The high degree of correlation found between Frail-VIG and CFS ($r = 0.91$), similar to earlier research [20], further supports its validity in this setting.

Baseline Frail-VIG scores were significantly associated with worsening cognitive and functional impairment at 6 and 12 months, in addition to their high prevalence in this setting [15,17]. Yuan et al. [42] described similar prevalence of physical frailty, assessed with the FRAIL-NH, and cognitive impairment established as two prominent conditions whose reversibility and modifiability are debatable. Furthermore, the more items included in the Frail-VIG score apart from cognitive and functional impairment, the better we can individualize care in order to prevent the onset of other frailty-related geriatric syndromes.

The ability of the Frail-VIG to predict mortality at 1 and 2 years, as demonstrated in previous reports in other settings [19,43], was also observed in this study of nursing home residents at 6 and 12 months. Similar 12-month AUC values have been reported for other tools used in nursing homes [44,45]. Furthermore, a strong mortality gradient is observed between the different Frail-VIG intervals in the Kaplan-Meier curves, and confirms the clinical relevance of the index [43].These findings, expected in older adults with advanced frailty and high clinical instability, suggest that the Frail-VIG could be a valuable tool for grading frailty and stratifying individuals at increased risk of mortality. The lower predictive accuracy for mortality over time is interpreted in the context of dynamic process of frailty, the expected limits of the accumulation of deficits [39] and the competing risks inherent in nursing home residents.

Frail-VIG was not designed as a predictive index of mortality, unlike others prognostic indexes (Mortality Prognosis Index from Pilotto et al. [46]), nor does it detect palliative needs as NECPAL does [32]. Therefore, use of the Frail-VIG as the only prognostic score of mortality independently from CGA would not result in accurate scoring. Its clinical utility does not depend exclusively on its predictive accuracy, but on its ability to stratify risk of mortality, identify deficit domains, and provide situational diagnosis, with the aim of guiding individual advance care planning and monitoring frailty progression [47]. As the number of deficits accumulates, the complexity of residents' healthcare needs is expected to increase. This information could help in developing advance care planning, a clinical practice infrequently used in our cohort (Table 1), based on an updated CGA and in collaboration with the older patient or their relatives.

A multivariate analysis could further stratify the risk of death based on age, sex, and other clinical variables, as observed in previous reports [17,48,49]. Although frailty is associated with multiple adverse outcomes [50], our study did not find a correlation between Frail-VIG scores and ED visits or hospitalizations, possibly due to unmeasured factors influencing these outcomes.

A key strength of our study is the inclusion of a large cohort of older residents from different nursing homes, which may be representative of the population in this setting in our country. Additionally, having a single investigator calculate all Frail-VIG scores ensures consistency in the assessments. However, the low representation of non-frail individuals in these centers may introduce bias into our findings. Another potential limitation is the difficulty of extrapolating our results to other countries or long-term care structures with differing systems. Further research is needed to assess variations in Frail-VIG scores over time, particularly in response to interventions and transitions between different levels of frailty [51] or decreasing deficits in advanced frailty. As highlighted by Stolz et al. [52], understanding these transitions in the dynamic process of frailty is crucial for developing individualized care plans for older adults in nursing homes. Further research is needed to assess mortality ability over 12 months.

5. Conclusions

The measurement properties of the Frail-VIG observed in our cohort support its use as a tool for screening and managing frailty in nursing homes. The minimal time, specific space, and equipment required, as well as the low risk of missing data make it feasible as an instrument. The reliability of the index is shown in the stability of the scores over time and consistency across evaluators. The index also maintains the characteristics of other established frailty indexes and has a strong convergent validity with the FRAIL-NH and CFS scales. Finally, its predictive ability for mortality at 6- and 12-month follow-up, along with its potential to identify deficit domains and provide situational diagnosis, suggests important implications for advanced care planning in this setting.

Ethics approval statement and patient consent statement

The Ethics Committee of the Hospital Ramon y Cajal approved the study (approval number 277/22). Written informed consent to collect data was obtained from all participants.

Funding statement

This work was not funded.

Data statement

As these results form part of a PhD thesis, there is no data availability statement.

Declaration of generative AI use

We declare no use of generative AI and AI-assisted technologies in scientific writing, and in figures, images, and artwork.

CRediT authorship contribution statement

Cristina Jiménez-Domínguez: Writing – review & editing, Writing – original draft, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Lourdes Rexach-Cano:** Writing – review & editing, Visualization, Validation, Supervision, Methodology, Investigation, Formal analysis, Conceptualization. **Carlos Verdejo-Bravo:** Writing – review & editing, Validation, Supervision, Methodology, Investigation, Formal analysis, Conceptualization. **Manuel Vicente Mejía-Ramírez-Arellano:** Writing – review & editing, Visualization, Supervision. **Carlota Manuela Zárate-Saez:** Writing – review & editing, Visualization, Supervision. **Mª Nieves Vaquero Pinto:** Writing – review & editing, Visualization. **Cristina Roldán-Plaza:** Writing – review & editing, Visualization. **Nuria Pérez-Panizo:** Writing – review & editing, Visualization. **Mª Loreto Álvarez-Nebreda:** Writing – review & editing, Visualization, Validation, Supervision, Methodology, Investigation, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

We thank Oliver Shaw for his feedback on translation and Alfonso Muriel for his statistical issues.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.tjfa.2025.100130.

References

[1] Kim DH, Rockwood K. Frailty in older adults. N Engl J Med 2024;6(6):538–48. https://doi.org/10.1056/NEJMra2301292.
[2] Dent E, Finbarr CM, Bergman H, et al. Management of frailty: opportunities, challenges, and future directions. Lancet 2019;10206:1376–86. https://doi.org/10.1016/S0140-6736(19)31785-4.
[3] Morley J, Vellas B, Abellan van Kan G, et al. Frailty consensus: a call to action. J Am Med Dir Assoc 2013;6:392–7. https://doi.org/10.1016/j.jamda.2013.03.022.
[4] Bouillon K, Kivimaki M, Hamer M, et al. Measures of frailty in population-based studies: an overview. BMC Geriatr 2013;13:64. https://doi.org/10.1186/1471-2318-13-64.
[5] Cesari M, Gambassi G, Abellan van Kan G, Vellas B. The frailty phenotype and the frailty index: different instruments for different purposes. Age Ageing 2014;43(1):10–2. https://doi.org/10.1093/ageing/aft160.
[6] Fried LP, Tangen CM, Walston J, et al. Frailty in older adults: evidence for a phenotype. J Gerontol A Biol Sci Med Sci 2001;56(3):M146–57. https://doi.org/10.1093/gerona/56.3.M146.
[7] Mitnitski AB, Mogilner AJ, Rockwood K. Accumulation of deficits as a proxy measure of aging. Sci World J 2001;1:323–36. https://doi.org/10.1100/tsw.2001.58.
[8] Hoogendijk EO, Afilalo J, Ensrud KE, et al. Frailty: implications for clinical practice and public health. Lancet 2019;394:1365–75. https://doi.org/10.1016/S0140-6736(19)31786-6.
[9] Dent E, Kowal P, Hoogendijk EO. Frailty measurement in research and clinical practice: a review. Eur J Intern Med 2016;31:3–10. https://doi.org/10.1016/j.ejim.2016.03.007.
[10] Buta BJ, Walston JD, Godino JG, et al. Frailty assessment instruments: systematic characterization of the uses and contexts of highly-cited instruments. Ageing Res Rev 2016;26:53–61. https://doi.org/10.1016/j.arr.2015.12.003.
[11] Callahan KE, Kuchel GA. Frailty as an upstream target for intervention: a unifying approach to intervening in the trajectories of health, function, and disease in late life. J Am Geriatr Soc 2024;72:1650–3. https://doi.org/10.1111/jgs.18864.
[12] Kojima G. Prevalence of frailty in nursing homes: a systematic review and meta-analysis. J Am Med Dir Assoc 2015;16(11):940–5. https://doi.org/10.1016/j.jamda.2015.06.025.
[13] Kaehr E, Visvanathan R, Malmstrom TK, Morley JE. Frailty in nursing homes: the FRAIL-NH scale. J Am Med Dir Assoc 2015;16(2):87–9. https://doi.org/10.1016/j.jamda.2014.12.002.
[14] González-Vaca J, De La Rica-Escuín M, Silva-Iglesias M, et al. Frailty in INstitutionalized older adults from ALbacete. The FINAL study: rationale, design, methodology, prevalence and attributes. Maturitas 2014;77:78–84. https://doi.org/10.1016/j.maturitas.2013.10.005.
[15] Martínez-Velilla N, Aldaz Herce P, Casas Herrero A, et al. Heterogeneity of different tools for detecting the prevalence of frailty in nursing homes: feasibility and meaning of different approaches. J Am Med Dir Assoc 2017;18(10). https://doi.org/10.1016/j.jamda.2017.06.016. 898.e1-898.e8.
[16] Howard EP, Morris JN. The nursing home frailty scale: an efficient approach to assessing frailty in long-term care. Ann Longterm Care 2018;26.
[17] Damiano C, Onder G, Zazzara MB, et al. Frailty, multimorbidity patterns and mortality in institutionalized older adults in Italy. Aging Clin Exp Res 2022;34(12):3123–30. https://doi.org/10.1007/s40520-022-02269-8.
[18] Sutton JL, Gould RL, Stephanie Daley S, et al. Psychometric properties of multicomponent tools designed to assess frailty in older adults: a systematic review. BMC Geriatr 2016;16(1):55. https://doi.org/10.1186/s12877-016-0225-2.
[19] Amblàs-Novellas J, Martori JC, Molist Brunet N, et al. [Frail-VIG index: design and evaluation of a new frailty index based on the Comprehensive Geriatric Assessment] [Article in Spanish]. Rev Esp Geriatr Gerontol 2017;52(3):119–27. https://doi.org/10.1016/j.regg.2016.09.003.
[20] Torné A, Puigoriol E, Zabaleta-Del-Olmo E, et al. Reliability, validity, and feasibility of the Frail-VIG index. Int J Environ Res Public Health 2021;18(10):5187. https://doi.org/10.3390/ijerph18105187.
[21] Zamora-Sánchez JJ, Zabaleta-del-Olmo E, Fernández-Bertolín S, et al. Profiles of frailty among older people users of a home-based primary care service in an urban area of Barcelona (Spain): an observational study and cluster analysis. J Clin Med 2021;10:2106. https://doi.org/10.3390/jcm10102106.
[22] Blázquez-Andión M, Montiel-Dacosta JA, Rizzi-Bordigoni M, et al. Frailty and mortality: utility of Frail-VIG index in ED short-stay units for older adults. Arch Gerontol Geriatr 2023:115105208. https://doi.org/10.1016/j.archger.2023.105208.
[23] Mokkink LB, Prinsen CAC, Patrick DL, et al. COSMIN study design checklist for patient-reported outcome measurement instruments. The Netherlands: Amsterdam University Medical Centers: Amsterdam; 2019.
[24] Mahoney FI, Barthel DW. Functional evaluation: the Barthel Index: a simple index of independence useful in scoring improvement in the rehabilitation of the chronically ill. Md State Med J 1965;14:61–5.
[25] Lobo A, Gómez FB, Sala JM, Seva A. [Cognitive mini-test (a simple practical test to detect intellectual changes in medical patients] [Article in Spanish]. Actas Luso-Esp Neurol Psiquiatr 1979;(7):189e202.
[26] Charlson M, Szatrowski TP, Peterson J, et al. Validation of a combined comorbidity index. J Clin Epidemiol 1994;47:1245–51.
[27] Salva A, Coll-Planas L, Bruce S, et al. Nutritional assessment of residents in longterm care facilities (LTCFs): recommendations of the task force on nutritional and ageing of the IAGG European region and the IANA. J Nutr Health Aging 2009;13:475e483.
[28] Searle SD, Mitnitski A, Gahbauer EA, et al. A standard procedure for creating a frailty index. BMC Geriatr 2008;8(1):24. https://doi.org/10.1186/1471-2318-8-24.
[29] Liau SJ, Lalic S, Visvanathan R, et al. The FRAIL-NH scale: systematic review of the use, validity and adaptations for frailty screening in nursing homes. J Nutr Health Aging 2021;25(10):1205–16. https://doi.org/10.1007/s12603-021-1694-3.
[30] Rockwood K. A global clinical measure of fitness and frailty in elderly people. Can Med Assoc J 2005;173(5):489–95. https://doi.org/10.1503/cmaj.050051.
[31] Church S, Rogers E, Rockwood K, Theou O. A scoping review of the clinical frailty scale. BMC Geriatr 2020;20(1):393. https://doi.org/10.1186/s12877-020-01801-7.
[32] Gómez-Batiste X, Martínez-Muñoz M, Blay C, et al. Prevalence and characteristics of patients with advanced chronic conditions in need of palliative care in the general population: a cross-sectional study. Palliat Med 2014;28(4):302–11. https://doi.org/10.1177/0269216313518266.
[33] Rodríguez-Mañas L, Walston JD. Frailty, what are we talking about? Implications for the daily clinical practice. Rev Esp Geriatr Gerontol 2017;52(4):179–81. https://doi.org/10.1016/j.regg.2017.04.004.
[34] Rolfson DB;, Majumdar SR, Tsuyuki RT, et al. Validity and reliability of the Edmonton Frail Scale. Age Ageing 2006;35(5):526–9. https://doi.org/10.1093/ageing/afl041.
[35] Stolz E, Mayerl H, Godin J, et al. Reliability of the frailty index among community-dwelling older adults. J Gerontol A Biol Sci 2024;79(2):glad227. https://doi.org/10.1093/gerona/glad227.
[36] Gobbens RJJ, van Assen MALM, Luijkx KG, et al. The Tilburg frailty indicator: psychometric properties. J Am Med Dir Assoc 2010;11(5):344–55. https://doi.org/10.1016/j.jamda.2009.11.003.
[37] Dong L, Qiao X, Tian X, et al. Cross-Cultural adaptation and validation of the FRAIL scale in Chinese community-dwelling older adults. J Am Med Dir Assoc 2018;19(1):12–7. https://doi.org/10.1016/j.jamda.2017.06.011.
[38] Rockwood K, Mitnitski A. Frailty defined by deficit accumulation and geriatric medicine defined by frailty. Clin Geriatr Med 2011;27(1):17–26. https://doi.org/10.1016/j.cger.2010.08.008.
[39] Rockwood K, Mitnitski A. Limits to deficit accumulation in elderly people. Mech Ageing Dev 2006;127(5):494–6. https://doi.org/10.1016/j.mad.2006.01.002.
[40] Theou O, Tan ECK J, Bell JS, et al. Frailty levels in residential aged care facilities measured using the Frailty index and FRAIL-NH scale. J Am Geriatr Soc 2016;64(11):e207–12. https://doi.org/10.1111/jgs.14490.
[41] Jadczak AD, Robson L, Cooper T, et al. The Frailty in residential sector over time (FIRST) study: methods and baseline cohort description. BMC Geriatr 2021;21:99. https://doi.org/10.1186/s12877-020-01974-1.
[42] Yuan Y, Lapane KL, Tjia J, et al. Physical frailty and cognitive impairment in older nursing home residents: a latent class analysis. BMC Geriatr 2021;21(1):487. https://doi.org/10.1186/s12877-021-02433-1.
[43] Amblàs-Novellas J, Martori JC, Espaulella J, et al. Frail-VIG index: a concise frailty evaluation tool for rapid geriatric assessment. BMC Geriatr 2018;18(1):29. https://doi.org/10.1186/s12877-018-0718-2.
[44] Yang M, Zhuo Y, Hu X, et al. Predictive validity of two frailty tools for mortality in Chinese nursing home residents: frailty index based on common laboratory tests

(FI-Lab) versus FRAIL-NH. Aging Clin Exp Res 2018;30:1445–52. https://doi.org/10.1007/s40520-018-1041-7.
[45] Hirdes JP, Poss JW, Mitchell L, et al. Use of the interRAI CHESS scale to predict mortality among persons with neurological conditions in three care settings. PLoS One 2014;9(6):e99066. https://doi.org/10.1371/journal.pone.0099066.
[46] Pilotto A, Ferrucci L, Franceschi M, et al. Development and validation of a multidimensional prognostic index for one-year mortality from comprehensive geriatric assessment in hospitalized older patients. Rejuvenation Res 2008;11:151–61. https://doi.org/10.1089/rej.2007.0569.
[47] Rockwood K. Grading frailty in long-term care. J Am Med Dir Assoc 2015;16:544–5. https://doi.org/10.1016/j.jamda.2015.03.006.
[48] De La Rica-Escuín M, González-Vaca J, Varela-Pérez R, et al. Frailty and mortality or incident disability in institutionalized older adults: the FINAL study. Maturitas 2014;78:329–34. https://doi.org/10.1016/j.maturitas.2014.05.022.
[49] Chong E, Chia JQ, Law F, et al. Validating a standardized approach in administration of the clinical frailty scale in hospitalised older adults. Ann Acad Med Singap 2019;48(4):115–24. https://doi.org/10.47102/annals-acadmedsg.V48N4p115.
[50] Zhang XM, Dou QL, Zhang WW, et al. Frailty as a predictor of all-cause mortality among older nursing home residents: a systematic review and meta-analysis. J Am Med Dir Assoc 2019;20(6):657–63. https://doi.org/10.1016/j.jamda.2018.11.018.e4.
[51] Thompson M, Mark Q, Jadczak AD, et al. Frailty change based on minimally important difference in nursing home residents: FIRST cohort study findings. Age Ageing 2022;51:1–8. https://doi.org/10.1093/ageing/afac246.
[52] Stolz E, Mayerl H, y Hoogendijk EO. Frailty in the oldest old: is the current level or the rate of change more predictive of mortality? Age Ageing 2022;51(2). https://doi.org/10.1093/ageing/afac020.