








FRAILITY IN OLDER ADULTS ATTENDING AN OUTPATIENT GERIATRIC CLINIC AS MEASURED BY THE VISUAL SCALE OF FRAILITY

Fragilidade de idosos atendidos em ambulatório de geriatria segundo a escala visual de fragilidade

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ABSTRACT

BACKGROUND: Existing instruments for the diagnosis of frailty are limited by their focus on mobility evaluation, failure to incorporate comorbidities, and dichotomous classification of patients as frail or non-frail, which hinders adequate identification of frail older adults. **OBJECTIVE:** To evaluate the frailty profile of outpatients seen at a secondary geriatric care service in Belo Horizonte, Brazil, as measured by the Visual Scale of Frailty, and describe the five levels of health status proposed by this instrument in terms of function, disabilities, and comorbidities. **METHODS:** The medical records of patients who attended the clinic between February 2011 and February 2014 were evaluated, and the patients classified in accordance with the Visual Scale of Frailty. Continuous variables were analyzed by ANOVA or the Kruskal-Wallis test, and categorical variables, by the χ^2 test. Analyses were performed in SPSS Version 19.0. **RESULTS:** A total of 813 medical records were evaluated. Among these patients, 5.2% were considered robust, 31% at risk of frailty, 24.6% as frail, 34.8% as highly complex frail, and 4.4% as frail individuals in the final stage of life. Analysis of the health status categories demonstrated an association between these categories, greater functional impairment, and greater presence of disabilities and comorbidities. **CONCLUSION:** The Visual Scale of Frailty is a useful tool in assessing the health status of older adults and indicated a high prevalence of frailty in the studied population. **KEYWORDS:** aging, comorbidity, frail elderly, health of the elderly, health vulnerability.

RESUMO

INTRODUÇÃO: Os instrumentos atualmente existentes para diagnóstico de fragilidade apresentam limitações relacionadas à incorporação exclusiva de métodos de avaliação da mobilidade, não incorporação de comorbidades e dicotomização em frágil e não frágil, prejudicando a adequada identificação do idoso frágil. **OBJETIVO:** Avaliar o perfil de fragilidade da população em serviço de atenção secundária de geriatria de Belo Horizonte, Brasil, segundo a Escala Visual de Fragilidade e descrever os cinco níveis de estado de saúde aventados quanto à funcionalidade, incapacidades e comorbidades. **METODOLOGIA:** Foram avaliados prontuários de pacientes atendidos entre fevereiro de 2011 e fevereiro de 2014 e foi realizada a classificação desses idosos segundo a Escala Visual de Fragilidade. As análises de variáveis contínuas foram realizadas pelo teste ANOVA ou Kruskal-Wallis e, para as variáveis categóricas, o teste do χ^2 , por meio do *Statistical Package for the Social Sciences* (SPSS®) 19.0. **RESULTADOS:** Foram avaliados 813 prontuários, entre esses pacientes, 5,2% foram considerados como robusto, 31% sob risco de fragilização, 24,6% como frágil, 34,8% como frágil de alta complexidade e 4,4% como frágil em fase final de vida. A análise das categorias de estado de saúde demonstrou associação entre essas categorias e o maior comprometimento da funcionalidade e maior presença de incapacidades e comorbidades. **CONCLUSÃO:** A Escala Visual de Fragilidade demonstrou ser uma importante ferramenta na avaliação do estado de saúde dos idosos e indicou elevado nível de fragilidade na população estudada. **PALAVRAS-CHAVE:** envelhecimento, comorbidade, idoso fragilizado, saúde do idoso, vulnerabilidade em saúde.

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INTRODUCTION

The global population is aging rapidly. It is estimated that the number of older adults (over 65) will increase from 461 million in 2004 to over 1.5 billion in 2050.¹ This process poses a challenge to the structure of health care networks, due to the greater burden of chronic diseases and functional disability borne by this age group, which requires intensive use of existing resources and creates new demands.^{2,3}

The concept of good health status as the absence of disease is inadequate for older adults, as the absence of chronic health conditions is exceptionally rare⁴ in this population group. Although many older persons are healthy, approximately 91% have one or more chronic health conditions, 40% have functional decline, and 23% are frail.⁵

The frailty syndrome is not a consequence of normal aging. It is the result of a deterioration of bodily systems, a determinant of greater vulnerability to further health decline and a risk factor for falls, delirium, and functional impairment, among other issues. Different models for evaluation of the frailty syndrome have been described in the literature, resulting in substantial discrepancy in prevalence data; indeed, across studies, the prevalence of frailty in older adults has been reported to range from 4 to 59.1%.^{3,6} Another important factor to consider is that these studies were conducted predominantly in whites, while the prevalence of frailty appears to be higher among African Americans, Hispanic Americans, and Mediterranean Europe.³

Functional decline represents the loss of independence in performing the tasks necessary for individuals to take care of themselves and manage their own lives. Depending on their degree of complexity, these tasks are classified into basic, instrumental, and advanced activities of daily living (ADLs). Loss of independence for ADLs is related to the impairment of functional systems, such as cognition, mood, mobility, and communication, and is implicated in the major geriatric syndromes.⁷ The presence of disability reduces quality of life and increases the risk of institutionalization and death.⁸ The Rotterdam study (2007) found a 31.8% prevalence of disability at baseline.⁹ A Brazilian population-wide study detected impairment for basic ADLs in 6.9% of older adults in the National Household Survey (PNAD) sample from 1998 to 2008, but did not evaluate impairment for instrumental ADLs.¹⁰

Although frailty, disability, and comorbidity are distinct constructs, they are generally interrelated, and can result in serious health consequences and increased mortality.⁵

The 2001 Cardiovascular Health Study, which sought to evaluate the association between frailty, disability, and comorbidity, found an association between frailty and comorbidity in 46.2% of the sample, and between frailty and disability in 5.7%. All three constructs were present in 21.5%, while frailty alone occurred in 26.6% of older adults.¹¹ A recent study found lower rates of isolated frailty, ranging from 3.6 to 8.6%.⁵

Approximately 20 instruments for assessment of frailty are already available in the literature; thus, whether new instruments are warranted or even needed is a recurring question.¹² However, most existing instruments only cover aspects related to mobility, failing to include such fundamental factors as cognition, mood, family context, and social support.^{12,13} These limitations create a risk of underdiagnosis of frailty, justifying the recent growth in proposals for new instruments to assess this condition.¹²

Recently, Moraes et al. proposed a new clinical-functional classification, the Visual Scale of Frailty, which combines the constructs of frailty, comorbidity, and disability to create a representation of the health status of the older adult.⁷

The objective of the present study was to classify the health status of older adults who attend the specialist geriatric secondary care service at Instituto Jenny de Andrade Faria/Hospital das Clínicas da Universidade Federal de Minas Gerais (UFMG), as assessed by the Visual Scale of Frailty. This would allow us to ascertain the frailty profile of the population served by this facility, as well as characterize functional and clinical differences at different degrees of clinical frailty.

METHODS

In this cross-sectional chart review study, the first-visit medical records of all patients aged 60 years and older who had attended the study facility between February 2011 and February 2014 were evaluated by physicians trained in comprehensive geriatric assessment (CGA), under the supervision of author MTGC.

These records were evaluated in 2015 by authors FFG, CTS, FSTL, and EDM, after training by author ENM, to reclassify these patients according to Visual Scale of Frailty five-level model of clinical frailty. All subjects included in the analysis had had their first visit prior to implementation of said model at the study facility, which took place in 2015.

The Visual Scale of Frailty divides patients into five frailty profiles, to wit:⁷

- Robust: individuals who are independent for basic, instrumental, and advanced ADLs. These individuals may have chronic health conditions and degenerative diseases that do not result in any limitations in ADLs;
- At risk of frailty: individuals who are capable of managing their lives in an independent and autonomous manner, yet remain in a dynamic state between senescence and senility, resulting in the presence of functional limitations (imminent functional decline), but without functional dependency. They display one or more chronic health conditions predictive of adverse outcomes, such as evidence of sarcopenia, mild cognitive impairment, and/or presence of multiple comorbidities. They may be dependent for advanced ADLs;
- Frail: older adults with established functional decline, who are incapable of managing their own lives as a result of single or multiple disabilities. These individuals have varying degrees of dependence for instrumental and basic ADLs;
- Highly complex frail: displays functional dependency for instrumental and/or basic ADLs, together with health conditions that are difficult to manage as a result of doubts regarding diagnosis or therapy;
- Frail individual in the final stage of life: displays a high degree of functional dependency and an estimated life expectancy of less than 6 months. Despite the existence of a clear association between higher levels of functional decline and higher mortality, some individuals may be able to function relatively well despite having diseases with a high potential for mortality, such as certain types of cancer.

ADLs, chronic degenerative diseases, and chronic health conditions were evaluated, as well as sociodemographic parameters and the current number of medications taken. Patients were also checked for postural instability and immobility. Postural instability was defined as loss of individual ability to mobilize in the environment in a safe and efficient manner, while immobility was defined as a complete or partial loss of the ability to mobilize in or manipulate the external environment.¹⁴ All changes in vision, hearing, and speech/voice/oral motor skills described in patients' records were quantified to ascertain the percentage of patients with impaired communication ability.

Sarcopenia was defined by a left calf circumference measurement < 31 cm, obtained with the patient in the seated position.¹⁵ Multiple comorbidities was defined as the presence of five or more chronic health conditions, or polypharmacy (defined as the use of five or more medications),

or presence of family insufficiency.¹⁶⁻¹⁸ Family insufficiency, in turn, was defined as the loss of ability of the family to provide care and support to the older adult, whether due to absence of family members or to a lack of resources.¹⁸

Cases of Parkinson's disease, Parkinson-plus syndromes, and secondary parkinsonism were pooled into a single "parkinsonism" variable for purposes of analysis. Cases of diagnostic uncertainty involving dementia vs. mild cognitive impairment were evaluated by neuropsychologists. All patients with cognitive impairment underwent neuroimaging unless contraindicated. Creatinine clearance was estimated by the Cockcroft-Gault formula.¹⁹ These parameters were all compared among the aforementioned groups.

The specialist geriatric secondary care service of Instituto Jenny de Andrade Faria at Hospital das Clínicas da UFMG provides care to older adults referred by primary health care units in the city of Belo Horizonte, Brazil. These patients are treated by a combined geriatrics-gerontology team, composed of geriatricians, gerontologists, pharmacists, dietitians, neuropsychologists, social workers, and rehabilitation specialists, including physical therapists, occupational therapists, and speech and language pathologists.

Assessment is multidimensional and interdisciplinary, performed in a standardized manner and consolidated into a care plan, consisting of a set of preventive, curative, palliative, and/or rehabilitative diagnoses and interventions, defined individually and shared with each patient's primary care team, which is responsible for actually implementing the care plan in cases of lower complexity. Patients with more complex needs are followed by the secondary care team.

For analysis of continuous variables, mean-based calculations were performed once the Shapiro-Wilk test had confirmed normal distribution of the sample. Comparisons across groups were done by ANOVA or the Kruskal-Wallis test, depending on the distribution of the data. For categorical variables, means were compared by the Chi-square test with four degrees of freedom. Statistical analysis was performed in the Statistical Package for the Social Sciences (SPSS), Version 19.0. The study was approved by the local Ethics Committee with opinion number 09099612.3.0000.5149, and conducted in accordance with the Declaration of Helsinki.

RESULTS

The sample comprised 813 patients selected by convenience from February 2011 to February 2014. Mean age was 76.8 (SD, 8.4) years, and mean educational attainment was 3.3 (SD, 2.9) years; 49.7% of participants were

female. Regarding function, 18.1% were dependent for basic ADLs and 61.1% for instrumental ADLs. Figure 1 describes how these patients were classified according to the frailty model.

Table 1 describes the main functional changes and relevant clinical conditions observed in the sample. Particularly prevalent conditions included dementia (36%), postural instability (55.1%), urinary incontinence (57%), and family insufficiency (26.7%). Hypertension was present in nearly 80% of the sample; 14% had a history of stroke, and 8.7% of acute myocardial infarction (AMI). In addition, a substantial portion of the patients had visual and/or hearing impairment.

These variables were subsequently compared among the groups of patients with different functional profiles,

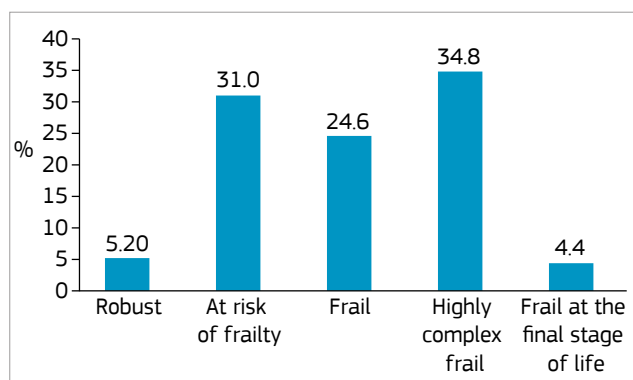


Figure 1 Frailty as assessed by the Visual Scale of Frailty (n = 813).

as described in the Methods. Table 2 shows that the mean age of the patients rose with greater functional decline ($p < 0.001$), while educational attainment was higher among robust patients and those at risk of frailty than among frail individuals ($p < 0.001$). The prevalence of dementia, urinary incontinence, partial immobility, and complete immobility also increased with functional dependence in a linear fashion. The same phenomenon was detected with family insufficiency ($p = 0.036$), which reached a prevalence of 33.3% among frail individuals in the final stage of life.

Table 3 shows a comparative analysis of the presence of degenerative and chronic health conditions, stratified by frailty categories. Linear reductions in creatinine clearance, calf circumference, and body mass index were observed with increasing degree of frailty ($p < 0.001$ for all three variables). A similar relationship was detected for the diagnosis of dyslipidemia ($p < 0.001$). Conversely, the prevalence of dysphagia and history of stroke increased linearly with increasing frailty severity ($p < 0.001$). Most patients with Parkinsonism were in the final stage of life or were classified as highly complex frail ($p < 0.001$). However, a significant proportion of the evaluated diseases were not associated differentially with functional impairment profiles.

When care plans are designed, the decision is made to implement it in primary care or refer the patient for secondary care at the geriatrics service. Among the patients included in the sample, 45.1% were referred for secondary care. Stratified by functional classification, the

Table 1 Functional evaluation and comorbidities of patients seen by the *Mais Vida* Program (n = 813). Belo Horizonte, MG, Brazil, 2011–2014.

Dependent for basic ADL	18.1%	Family insufficiency	26.7%
Dependent for instrumental ADL	61.1%	Hypertension	79.9%
Dementia	36.0%	Diabetes mellitus	25.8%
Mild cognitive impairment	13.5%	Dyslipidemia	28.0%
Depression	45.2%	<i>Creatinine clearance (mL/min)</i>	55.4 ± 22.8
Parkinsonism	7.8%	Chronic obstructive pulmonary disease	8.6%
Postural instability	55.1%	Hypothyroidism	14.3%
Partial immobility	15.0%	Hyperthyroidism	3.8%
Complete immobility	4.0%	History of acute myocardial infarction	8.7%
Urinary incontinence	57.0%	History of stroke	14.4%
Dysphagia	8.1%	Atrial fibrillation	4.3%
Visual impairment	80.0%	Current number of medications	5.4 ± 2.5
Hearing impairment	38.2%	Calf circumference (cm)	34.5 ± 4.3
Speech, voice, and oral motor disorders	11.3%	Body mass index (kg/m ²)	26.1 ± 5.2

ADL: activities of daily living.

Table 2 Classification of functional and sociodemographic impairment, stratified by frailty categories (n = 813). Belo Horizonte, MG, Brazil, 2011–2014.

	Robust	At risk of frailty	Frail	Highly complex frail	Frail at the final stage of life	P
Female sex (%) ^a	57.1%	46.4%	49.0%	53.0%	41.7%	0.378
Age, mean (years) ^b	69.1	74.2	77.5	79.0	81.4	< 0.001
Educational attainment (years) ^c	5.0	4.0	2.5	3.0	2.9	< 0.001
Dependent for basic ADL ^a	0%	1.2%	12.5%	30.1%	94.4%	< 0.001
Dependent for instrumental ADL ^a	0%	1.6%	95.5%	93.9%	100%	< 0.001
Mild cognitive impairment ^a	0%	26.9%	5.5%	11.1%	0%	< 0.001
Dementia ^a	0%	0.8%	23.0%	74.4%	94.4%	< 0.001
Depression ^a	7.1%	45.2%	49.0%	51.6%	19.4%	< 0.001
Postural instability ^a	4.8%	49.0%	65.5%	64.6%	25%	< 0.001
Partial immobility ^a	0%	4.8%	17.1%	21.9%	38.2%	< 0.001
Complete immobility ^a	0%	0%	0.5%	4.6%	50.0%	< 0.001
Urinary incontinence ^a	35.7%	46.2%	60.5%	63.7%	86.1%	< 0.001
Visual impairment ^a	78.0%	81.7%	79.0%	81.5%	63.9%	0.142
Hearing impairment ^a	26.8%	32.7%	37.5%	44.1%	47.2%	0.027
Speech, voice, and oral motor disorders ^a	2.5%	2.8%	8.0%	15.2%	69.4%	< 0.001
Family insufficiency ^a	12.2%	29.5%	21.2%	29.4%	33.3%	0.036

ADL: activities of daily living; ^a χ^2 test; ^bANOVA; ^cKruskal-Wallis test.

Table 3 Classification of degenerative and chronic health conditions, stratified by frailty categories (n = 813). Belo Horizonte, MG, Brazil, 2011–2014.

	Robust	At risk of frailty	Frail	Highly complex frail	Frail at the final stage of life	P
Hypertension ^a	69.0%	79.8%	81.0%	81.2%	77.8%	0.457
Diabetes mellitus ^a	7.1%	27.9%	24.0%	29.9%	11.1%	0.005
Dyslipidemia ^a	38.1%	34.8%	29.1%	22.1%	8.3%	0.001
Hypothyroidism ^a	11.9%	17.9%	11.1%	13.9%	13.9%	0.327
Hyperthyroidism ^a	2.4%	3.6%	2.5%	5.0%	5.7%	0.629
Chronic obstructive pulmonary disease ^a	0%	6.4%	11.1%	10.6%	5.6%	0.063
History of acute myocardial infarction ^a	2.4%	9.1%	8.5%	10.3%	2.8%	0.327
History of stroke ^a	0%	5.6%	10.0%	24.5%	38.9%	< 0.001
Atrial fibrillation ^a	4.7%	2.4%	4.5%	5.7%	5.6%	0.445
Parkinsonism ^a	2.4%	2.4%	2.0%	16.3%	16.7%	< 0.001
Dysphagia ^a	0%	2.0%	4.0%	9.2%	75.0%	< 0.001
Creatinine clearance (mL/min) ^b	79.0	60.0	52.9	51.0	38.7	< 0.001
Current number of medications ^b	3.4	5.8	5.4	5.5	4.7	< 0.001
Calf circumference (cm) ^b	37.1	35.4	34.5	33.6	30.9	< 0.001
Body mass index (kg/m ²) ^b	27.6	26.6	26.2	25.5	21.0	< 0.001

^a χ^2 test; ^bKruskal-Wallis test.

rate of referral to secondary care was 4.8% among robust patients, 24% among those at risk of frailty, 27.9% in the frail, 82.8% in the highly complex frail, and 38.9% among those in the final stage of life ($p < 0.001$).

DISCUSSION

The results of this study show that the Visual Scale of Frailty represents an interesting alternative for evaluation of the frailty syndrome, as it goes beyond the limitations of assessment of mobility alone to include other disabilities, the social and familial context, and comorbid conditions.⁷

The results also show that greater functional impairment is associated with worse clinical severity, in a linear and directly proportional fashion. A similar relationship was observed with the classic “geriatric giants”, including partial and complete immobility and urinary incontinence, demonstrating that the Scale is able to discriminate adequately between robust and frail patients and to detect discrete levels of severity among frail older adults.

Overall, the Visual Scale of Frailty classified 63.8% of patients as frail, 31% as being at risk of frailty, and 5.2% as robust. This prevalence of frailty is higher than in the studies included in a recent systematic review, which reported rates between 4 and 59.1%.⁶ However, as our evaluation was conducted in a specialist secondary (referral) outpatient geriatrics clinic, higher rates were expected than those observed in primary-care populations.

There is substantial controversy as to whether comorbidities should be included in the evaluation of frailty. Some authors have argued that the point of investigation of the frailty phenotype is to identify older adults in whom prophylactic and rehabilitative measures can be implemented to prevent development of disability or mitigate damage. As many comorbidities are not amenable to preventive measures, they should not be included in the assessment of frailty.¹¹ However, many rehabilitation measures can prevent target organ damage and reduce direct or indirect functional impairments associated with chronic illness.²⁰

Some authors, despite the controversy surrounding the topic of comorbidities, have incorporated chronic diseases and health conditions into their instruments of evaluation of frailty, such as in the cumulative deficit model.²¹ For the Visual Scale of Frailty, the concept of multiple comorbidities was proposed. Under this concept, it does not matter which disease the patient has *per se*, but rather the number of diseases, the number of current medications, and whether these resulted in recent hospitalization.⁷ This type of evaluation prevents the presence of

comorbidities from leading to overestimation of the number of frail individuals, while still accounting for their role in the frailty syndrome.⁷

It bears noting that, in contrast to the concept proposed by the cumulative deficit model, several chronic health conditions—including arterial hypertension, thyroid disorders, chronic obstructive pulmonary disease, and history of AMI—were not determinants of the degree of frailty as assessed by the Visual Scale of Frailty.¹⁵ These findings are consistent with the multiple comorbidities concept of the Visual Scale, which points to chronic health conditions in general as a predisposing factor for frailty.⁷

On the other hand, the directly proportional reduction of creatinine clearance, calf circumference, and body mass index as frailty severity (assessed by the Visual Scale) increased was remarkable. These results possibly reflect a point of convergence between the cumulative deficit model, the model of physical decline proposed by the Cardiovascular Health Study, and the Visual Scale of Frailty multiple-comorbidities model, integrating the concepts of sarcopenia, comorbidities, and frailty.^{7,11,21}

It should be noted that half of the existing instruments for assessing frailty use a simple dichotomous classification (frail vs. non-frail). This dichotomous model precludes classification of frail patients into different levels of severity, and does not allow assessment of the effect of rehabilitation on health status.¹² By establishing five categories of health status, the model used in this study avoids the limitations imposed by dichotomous evaluation of the frailty syndrome.

Nevertheless, this study has some limitations of its own. First, it used a cross-sectional chart review design, which increases the risk of bias. Some of the analyzed variables are determinants of functional status; therefore, correlation with greater frailty severity on the Visual Scale was expected. Finally, the study presents descriptive characteristics of a model for the diagnosis of the frailty syndrome. Construct validation and reliability analysis have yet to be conducted.

CONCLUSION

We conclude that the Visual Scale of Frailty represents an interesting proposal that incorporates the constructs of disability, frailty, and comorbidity to evaluate the health status of older adults. Further studies of construct validation and reliability analysis are needed to confirm these results.

CONFLICT OF INTERESTS

The authors declare no conflict of interests.

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