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Approach to the development of a frailty index based on comprehensive geriatric assessment in nursing home

Aproximación al desarrollo de un índice de fragilidad basado en la valoración integral geriátrica en centros sociosanitarios

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Abstract

Objective: To carry out an approach for the development of a frailty index in nursing homes and to analize its potential use in order to individualize the pharmacological treatment.

Method: The frailty index was constructed from the information included in the comprehensive geriatric assessment established in nursing homes. The index has been retrospectively applied to the patients of two centers using the last comprehensive geriatric assessment of each one.

Results: 17 variables that included 27 deficits were selected and classified in 4 domains. 269 patients (mean age 82.9 ± 8.8 years) were included in the analysis. The frailty index indicated that 86% of patients should be considered frail and 60% of these to moderate-advanced level.

Conclusions: The frailty index is simple and quick to apply. It seems to have discriminative capacity in terms of quantifying the degree of frailty and it could be useful in prescribing the most appropriate therapeutic aggressiveness to each patient.

Resumen

Objetivo: Realizar una aproximación al desarrollo de un índice de fragilidad en centros sociosanitarios y analizar su posible repercusión en el desarrollo de una farmacoterapia adecuada a la situación del paciente.

Método: El índice de fragilidad se elaboró a partir de la información incluida en la valoración integral geriátrica y se aplicó de forma retrospectiva a los pacientes de dos centros a partir de la última valoración de cada uno de ellos.

Resultados: Se seleccionaron 17 variables, que incluyeron 27 déficits. El análisis se realizó a 269 pacientes (edad media, 82,9 ± 8,8 años). El índice de fragilidad consideró frágiles al 86% de los pacientes, estando el 60% de estos en un nivel de fragilidad moderado-avanzado.

Conclusiones: El índice de fragilidad resulta sencillo, rápido de aplicar y parece tener capacidad discriminatoria en la cuantificación del grado de fragilidad, pudiendo ser de ayuda para establecer la intensidad terapéutica más adecuada para cada paciente.

KEYWORDS
Frailty index; Geriatric comprehensive assessment; Nursing home; Pharmaceutical care; Drug therapy.

PALABRAS CLAVE
Índice de fragilidad; Valoración integral geriátrica; Centro sociosanitario; Atención farmacéutica; Farmacoterapia

Introduction

The management of elderly patients with multiple morbidity is complex and represents one of the most important challenges for the healthcare system. The care of these patients involves great clinical uncertainty. Given that care protocols usually address a single health issue, they are less useful in this setting, and thus tools are needed to facilitate decision-making[1]. This situation is common in nursing homes for the elderly or in socio-health centres.

Frailty is a multidimensional clinical entity defined as a state of vulnerability to everyday stressors due to limiting compensatory mechanisms that puts the individual at high risk of poor health outcomes[2,3]. As a continuous variable, a Frailty Index (FI) based on the accumulation of deficits model with different domains can measure the individuals' degree of vulnerability and therefore their biological age[2]. In this sense, FIs could be defined as quantified comprehensive geriatric assessment (CGA)[2].

The objective of this study was to describe a first approach to the development of an FI based on CGA within the social and health care setting (i.e., nursing homes), and to conduct a first analysis of the potential of this tool to help healthcare professionals make decisions for individualized drug prescription based on the actual status of the patient.

Methods

The development of the Frailty Index for Nursing Homes (Spanish acronym: IF-CSS) was based on data provided by the recently published FRAGILVIG study[2] and on other similar proposals aimed at defining a prognostic index[4]. The development process comprised 2 stages: a) The construction of the IF-CSS, which included selecting the variables and determining their weights; and b) A preliminary analysis, which comprised the administration of the IF-CSS to patients at 2 nursing homes.

Constructing the IF-CSS

Each variable selected had to fulfil the following criteria: it was included in the CGA; it was associated with age and health problems; it should cover a range of domains; it should not saturate too early; and it should not be too prevalent or too rare[5].

The variables and deficits were grouped into 4 domains (functional, cognitive/emotional, geriatric syndromes, and disease). The score assigned to each domain aimed at establishing weights similar to those assigned in current validated FIs[2,3,5].

The IF-CSS value was obtained by dividing the number of accumulated deficits by the total potential accumulated deficits using a score that ranged from 0 (absence of deficits) to 1 (presence of all deficits)[6]. Individuals were considered to be frail if they had an IF score greater than 0.2. The submaximal limit was set at 0.7. This limit is a usual characteristic of most FIs and indicates that a person cannot cope with further deficits.

Analysis of the IF-CSS

The performance of the IF-CSS was assessed in 2 nursing homes serving a total of 296 patients. All patients who had been administered a CGA in the previous 6 months were included. The IF-CSS scores were retrospectively obtained by using the variable scores from the previous CGA.

Results

Constructing the IF-CSS

Table 1 shows the IF-CSS items. The 17 selected variables included 27 deficits. The weights assigned to each domain were as follows: functional,

Table 1. Description of the IF-CSS index organized by domains and variables, with the score for each deficit

Domains	Variables	0	1	2	3	4
FUNCTIONAL	BARTHEL index (IB)	100-95	90-65	60-45	40-20	<20
	INCONTINENCE	None	At least 1			
	MOBILITY	Autonomous without help	Autonomous with help	Totally Dependent		
COGNITIVE/ EMOTIONAL	MEC (out of 35)	35-30	29-20	19-15	<14 NA	
	GDS	0-5	6-9	>9 NA with active treatment		
GERIATRIC SYNDROMES	DELIRIUM	No	Had a disorder that required a visit to psychologist and neuroleptics			
	RISK OF FALLS (Tinetti Test)	19-24	<19	≥2 falls, fall requiring hospitalization		
	PRESSURE SORES	>12	≤12	PS		
	POLYPHARMACY	0-5	6-9	≥10		
	%WEIGHT LOSS	No	WL-specific oral supplement: 6 mo: 10% 3 mo: 7-55% 1 mo: 5%			
	DYSPHAGIA	Food texture normal/soft	Dysphagia/Mashed Diet Uses NGT/PEG			
DISEASES	CANCER	No	Yes			
	RESPIRATORY	No	Yes			
	CARDIAC	No	Yes			
	NEUROLOGIC	No	Yes			
	HEPATIC	No	Yes			
	RENAL (GFR <60)	No	Yes			

GFR: glomerular filtration rate; MMSE: mini-mental state examination; NA: non-assessable; NGT: nasogastric tube; PEG: percutaneous endoscopic gastrostomy; PS: pressure sores; WL: weight loss.

26%; cognitive/emotional, 19%; geriatric syndromes, 33%; and disease, 22%.

Analysis of the IF-CSS

A total of 269 patients were included (average age: 82.9 years; SD: 8.8); 76% were women.

In the functional domain, the BARTHEL index (BI) showed that 49% had severe dependence (BI ≤ 45) and 32% had total dependence (BI ≤ 20). In total, 76% had at least 1 type of incontinence, and 45% needed a wheelchair or were bedridden.

In the cognitive/emotional domain, the Mini-Mental State Examination (MMSE) showed that 79% had some degree of cognitive impairment (MMSE < 30), and of these patients 45% had severe cognitive impairment (MMSE ≤ 14; n = 95). The Yesavage Geriatric Depression Scale (GDS) could not be administered to 32% of the patients due to their cognitive deterioration; 29% of these patients were receiving antidepressant treatment.

In the geriatric syndrome domain, 23% of patients had experienced an episode of delirium and 22% had experienced a fall. In total, 39% of the patients (n = 106) were at risk of pressure sores (Norton score ≤ 12) and 14 patients had at least 1 pressure sore. The average number of medications taken per patient was 9 (SD 3), with 36% taking 10 or more medications. In total, 5% of patients had experienced a weight loss of more than 10% in the previous 6 months, 14% were receiving oral nutritional supplements, and 29% had dysphagia or received a mashed diet.

The most common diseases were neurological (64%) and cardiac (43%).

Figure 1 shows the distribution of observed values for the IF-CSS index in the study population and the typical values used as cut-off points to determine the level of frailty.

The IF-CSS used in the study population retained the FI submaximal limit of 0.7. This value was reached by 8 patients, and only 1 patient exceeded it (0.37%) with a score of 0.74. In total, 14% (n = 39) of the patients had a score of less than 0.2, and therefore 86% of the patients were considered to be frail. In total, 60% had either moderate frailty (n = 95; IF-CSS: 0.35–0.55) or advanced frailty (n = 67; IF-CSS > 0.55) (Figure 1). Given that all the variables are included in the CGA, the index can be calculated in 2 to 3 minutes.

Discussion

As a continuous variable, the FI is a useful tool to assess overall patient status. It could therefore be useful in individualizing pharmacological treatment by determining the level of therapeutic intensity to be implemented.

The literature recommends the inclusion of 30 to 40 deficits in these kinds of indices to maintain their predictive capacity. However, in this first approach, we only included 27 deficits grouped into 17 variables commonly included in the CGA administered in nursing homes to facilitate the implementation of the index in caregiving practice. One of the objectives was that the index should be quick and simple to administer.

The IF-CSS fulfilled the criteria established for the selection of the variables and preserved the weight of each domain in the final result. The geriatric syndrome domain had the greatest weight and was slightly greater than that described in other FI proposals. This aspect may be because such deficits are followed-up with increased frequency in nursing homes due to their impact on the patient's quality of life and the level of care required. Most of the variables included were measured using indices by assigning a value according to the score obtained. Dichotomous scoring (0-1) was applied to variables with less diversity. For example, it is simple to determine if a patient has dysphagia or not (i.e., a dichotomous variable), but variables such as cognitive or functional impairment require a greater number of deficits to obtain a more accurate score. This approach to scoring also allowed us to balance the weight of each domain and to maintain the percentages proposed by other authors[2,3,5]. In the emotional domain (i.e., the GDS scale), the use of antidepressant treatment (Table 1) was assigned a positive score to avoid assigning a negative score for the absence of depression due to the treatment itself or due to its not being assessable in patients with advanced cognitive impairment.

The final selection of variables differed from that of other proposals. For example, we did not include functional capacity as measured by the instrumental activities of daily living (IADL), because the vast majority of people in nursing homes are fully dependent at this level. Neither was the social domain included, because it is understood that the social needs of institutionalized patients are almost completely covered by the center, and thus there would be few differences between patients.

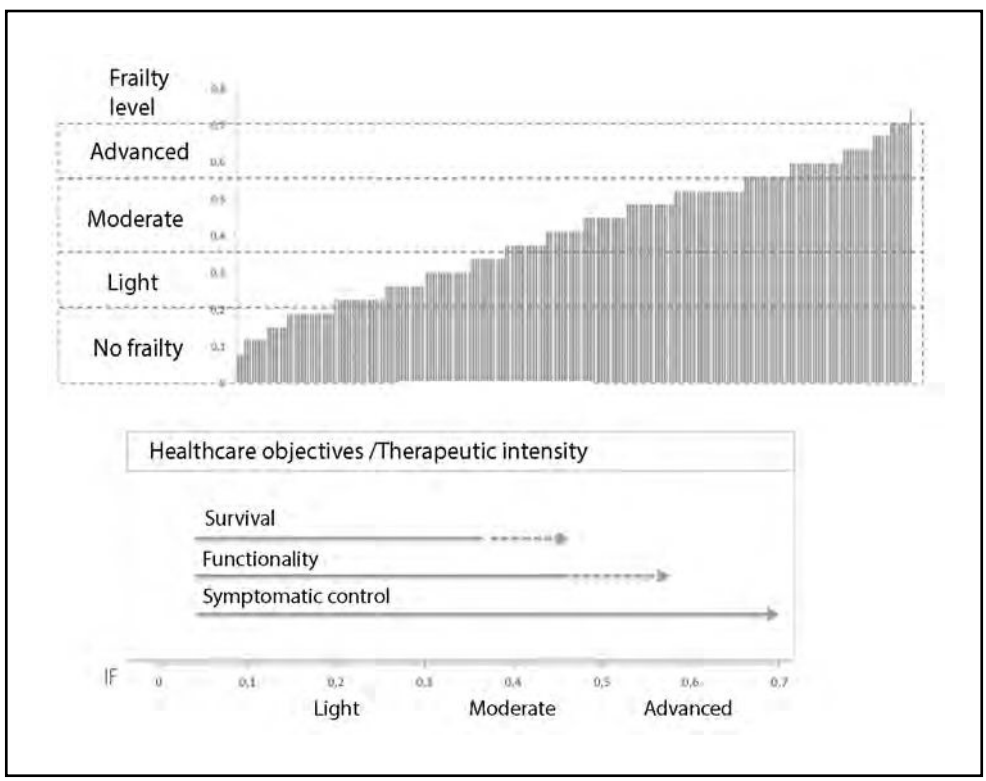

Figure 1. *Distribution of observed values for the IF-CSS index in the study population. Relationship between patient status as diagnosed using the FI and level of therapeutic intensity (adapted from ref. 6).*

Despite this study being a first approach, the results show that the IF-CSS has discriminative capacity regarding the level of frailty. As an example of its potential usefulness, the results of the IF-CSS suggest a therapeutic approach addressing functional maintenance in the 35% of patients with moderate frailty, or a more conservative approach mainly addressing symptomatic or palliative control in the 25% of patients with advanced frailty.

This first approach is being developed in two directions. On the one hand, we are going to assess the inclusion of some of the deficits which were excluded in this first proposal. These deficits are included in the CGA and we consider that they can have an impact on patient vulnerability. Thus, we will include: a) the variable family support for the institutionalized person (i.e. within the social domain); b) the variable moderate-severe pain as a symptom of severity; and c) the variable hospital admission in the previous 6 months. On the other hand, we will attempt to validate the predictive capacity of the FI for mortality. This will be achieved by incorporating the IF-CSS into the CGA routine administered every 6 months to patients in nursing homes in which pharmaceutical care forms part of the work of the interdisciplinary team.

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Conflicts of interest

No conflicts of interest declared.

Contribution to the scientific literature

This study describes a first approach to the use of a frailty index as a basic tool to diagnose patient frailty in the setting of nursing homes.

The frailty index could be a very useful tool to facilitate decision making when individualizing pharmacological treatment in complex chronic patients.

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