VALIDATION OF THE GÉRONTOPÔLE FRAILTY SCREENING TOOL TO DETECT FRAILTY IN PRIMARY CARE

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ABSTRACT

Introduction. Frailty is a condition characterized by increased vulnerability to stressors that poses the older subject at risk of progressing to adverse health-related outcomes, including hospitalization, disability and mortality. Early identification of community-dwelling frail older subjects is of paramount relevance in order to implement preventive strategies against negative health-related outcomes, in particular disability.

Materials and Methods. The aim of the present study, promoted by the European Union Geriatric Medicine Society (EUGMS) working group on "Frailty in older persons", is to verify the validity of the Gerontopole Frailty Screening Tool GFST (administered by the general practitioner) using the Fried and colleagues' criteria for frailty phenotype as reference measure (administered by a blind assessor). The validation is performed in older primary care patients in nine European countries after translation of the GFST into eight languages.

Results. The sample (n=109 older patients,)was constituted by 37.6%, 56.9%, and 5.5% of robust, prefrail or frail, and disabled individuals, respectively. The GFST showed a sensitivity of 71.0%, a specificity of 70.2%, a positive predictive value of 75.9% and a negative predictive value of 64.7% at the identification of non-disabled frail elders (as detected by the reference measures). The positive and negative likelihood ratios were 2.38 and 0.41, respectively. In logistic regression models only slow gait speed (odds ratio [OR] 19.65, 95% confidence interval [95%CI] 4.69-82.35) and mobility issues (OR 18.04, 95%CI 3.11-104.78) were significantly associated with the condition of frailty in the absence of disability.

Conclusions. Our findings demonstrate an overall moderate agreement between the GFST and the frailty phenotype.

Keywords: Prevention, Disability, Frailty, Screening, General practitioners, Community

INTRODUCTION

Frailty is a condition characterized by increased vulnerability to stressors that poses the older subject at risk of developing adverse outcomes, including hospitalization, disability and mortality [1]. With population aging, frailty is becoming a silent epidemic. The prevalence of frailty is high in the older population. In the largest survey performed in Europe (i.e., the Survey of Health, Aging and Retirement in Europe, SHARE), the prevalence of frailty in subjects older than 65 years was 17% [2]. If this figure is applied to recent (i.e., year 2010) estimates of the European population [3], it can be estimated that there are currently 20.5 million frail older subjects in our continent. The early identification of frail older subjects is of paramount relevance in order to develop preventive strategies against negative health-related outcomes, in particular disability [4, 5].

A major barrier preventing the systematic detection of frailty is the lack of a universally accepted operational definition for this syndrome. Moreover, a large proportion of frail older persons is referred too late for evaluation to specialists in geriatrics, when the vicious cycle of frailty has developed into disability and is harder to reverse. These issues imply the need of increased involvement of general practitioners in the screening and treatment of frailty.

Currently, the ability of general practitioners to identify frail older subjects is extremely variable, mainly depending on their own professional background and interests. The development of a screening instrument to support the general practitioner in the detection of frailty among his/her older patients would represent an important advancement. In fact, this would allow an easier and more consistent case finding of frail older subjects in the community, whom could be treated by the general practitioner or, when appropriate, referred to a geriatrician for further investigation.

Since 2011, the Gérontopôle of the Centre Hospitalier Universitaire de Toulouse (Toulouse, France) has been conducting a novel model of healthcare service specifically devoted to the assessment and treatment of community-dwelling, non-disabled frail older persons. One of the key-aspects of the so-called Frailty Clinic resides in its close collaboration with primary care. General practitioners in the Toulouse area were first informed about the concept of frailty and its clinical relevance. In parallel, they have been trained at the use of a specific questionnaire (i.e., the Gérontopôle Frailty Screening Tool, GFST). A positive result at the GFST allows the general practitioner at referring his/her non-disabled frail patient to the Frailty Clinic. In this setting, a multidisciplinary team coordinated by a geriatrician then conducts a comprehensive geriatric assessment for the identification of the causes of the frailty status, and proposes (in agreement with the general practitioner) a personalized intervention for preventing negative health-related events [6, 7].

The aim of the present study, supported by the European Union Geriatric Medicine Society (EUGMS) working group on "Frailty in older persons" [8], is to verify the agreement of results obtained from the GFST (administered by the general practitioner) and standard instruments measuring frailty and disability (administered by a blind assessor).

METHODS

The present study is based on data collected by general practitioners accepting to collaborate with members of the EUGMS working group on "Frailty in older persons" [8] for this specific research activity. In particular, members from nine countries (eight different languages) accepted to participate. Each member of the EUGMS working group involved in the present study invited one to four general practitioners in the area at collaborating for this research activity. The present study was conducted at the office of the participating general practitioners.

Participating general practitioners were trained in the use of the GFST by the member of the EUGMS working group with the additional support (on demand) of the coordinating center (Centre Hospitalier Universitaire de Toulouse). They were then asked to administer the GFST at the end of the standard assessment of eligible patients referring to their practice.

The inclusion criteria adopted in the present study were: age of 65 years or older; living in the community and evaluated by the general practitioner for whatever reason; willing to participate in the study and able to provide written informed consent. The exclusion criteria were: person under legal tutorship; presence of any condition potentially threatening the participant or the study personnel's safety during the conduction of the study activities.

At the end of the clinical visit and after the general practitioner had completed the GFST, a specifically trained blind assessor conducted in a separate room a new assessment of the patient's frailty profile using the reference measures. A total of 109 consecutively assessed, community-dwelling individuals aged 65 years and older were recruited in the present study.

The study protocol was approved by the Institutional Review Boards at each participating study site. All the study participants provided written informed consent.

GFST

The GFST instrument (Appendix 1) is structured in three parts [9, 10]. First, it is required to administer the Basic Activities of Daily Living (ADL) scale [11]. A score lower than 5/6 at this scale identifies individuals with relevant dysfunction in basic activities of daily life. Such condition precludes them from being referred to a (possible) Frailty Clinic for preventing the onset of disability.

The second part of the GFST is a questionnaire. Its main objective is to attract the general practitioner's attention to general signs and/or symptoms potentially indicating the presence of an underlying frailty. These questions largely mirror the criteria that are commonly used to operationalize the frailty status [12, 13]. They remind the general practitioner to pay attention to the gait speed of the individual, his/her recent unintentional weight loss, or the possible presence of exhaustion. This part also contains a specific question about memory complaints of the subject (based on current evidence linking the cognitive and physical domains in the determination and manifestation of frailty [14-16]) and another item about the social status of the person (a major component to consider in the design of preventive interventions against disability [17, 18]).

Finally, in the third section of the GFST, the general practitioner is invited to express his/her opinion on the frailty status of the individual. The clinical judgment of the general practitioner is used to determine whether, after the evaluation of the previous criteria, he/she indeed believes the person is frail or not. Only if he/she agrees with the results of the second section identifying the possible presence of frailty, the patient is identified as a "non-disabled frail elder". Otherwise, the subject is considered as "robust" or "disabled" according to the results of the initial ADL score.

Designing the GFST, it was decided to have the instrument strongly relying on the subjective perception of the general practitioner for two main reasons: 1) to avoid that a

major clinical decision (i.e., referral of the individual to a clinical intervention) is only left to a screening tool, and 2) to directly involve the general practitioner in the diagnosis and subsequent follow-up of the frail older patient. On the other hand, although the final decision is left to the clinical judgment of the general practitioner, it is still driven by the second section listing the main defining criteria of the frailty syndrome.

Before the conduction of the present study, each participating center took care of translating the GFST instrument from the English version (Appendix 1) to the local language. A translation into the local language and a subsequent back-translation into English were performed by two independent translators, each one fluent in the local and English language, respectively. The two English versions (the original one and the back-translation) were then compared in order to detect/discuss possible disagreements and improve the final version. All the translations of the GFST instrument are available at the website www.frailty.net (currently, nine: French, English, Greek, Czech, Spanish, Italian, Dutch,).

Reference measures

For the present study, the so-called frailty phenotype originally developed and validated in the Cardiovascular Health Study by Fried and colleagues [12] was used as the reference measure for frailty. The frailty phenotype has shown to be highly predictive of negative outcomes (e.g., disability, hospitalization, falls, death) in community-dwelling older persons [12]. It is constituted by five criteria: 1) involuntary weight loss, 2) exhaustion, 3) sedentary behavior, 4) slow gait speed, and 5) poor handgrip strength. Individuals presenting three or more of these criteria are considered as frail, those with one or two are pre-frail, and those having no criterion robust. For the present analyses, the defining criteria (and their cut-points) were the same as those validated in the Cardiovascular Health Study [12], except for the sedentary behavior criterion. This was not defined according to the Minnesota Leisure Time

Activity questionnaire [19] because it is too long and complicated to be administered in the primary care setting where the present study was conducted. A simplified scale was used asking the participant to estimate the level of physical activity conducted during the past 12 months [20]. This item has been previously used in literature [21-23] and its results were found to be in good agreement (i.e., 77.8%, kappa=0.537; $p<0.001$) with those obtained from the Minnesota Leisure Time Activity questionnaire [24].

To measure the presence/absence of physical disability, both the general practitioner and the blinded assessor independently used the basic ADL scale proposed by Katz and colleagues [11]. The ADL scale considers the following functions of daily life: bathing, mobility, eating, dressing, continence, and toileting. For the present analyses (and in line with the disability definition included in the GFST instrument [9]), a score lower than 5/6 was indicative of physical disability.

Since the goal of the GFST is to identify non-disabled individuals with increased risk profile for negative health-related outcomes, the pre-frail and frail categories (in the absence of disability) detected by the frailty phenotype are combined in the present analyses. In this way, both assessments provided a classification of participants into three groups: robustness (i.e., absence of frailty and disability), frailty (i.e., presence of pre-frailty or frailty in the absence of disability), and disability. Such three-level categorization is useful for identifying individuals eligible for preventive interventions against disability.

Statistical power considerations

In a test for agreement between two raters using the Kappa statistic [25], a sample size of 109 subjects achieves 93.4% power to detect a true Kappa value of 90% in a test of H0: Kappa≤0.70 vs H1: Kappa>0.70 when there are two categories (pre-frail/frail vs. non-frail

according to Fried and colleagues [12]) with frequencies equal to 0.583 and 0.417, respectively [2]. This power calculation is based on a significance level of 0.05.

Statistical analysis

The results obtained from the GFST (completed by the general practitioner) were compared to those from the second assessment (completed by the blinded assessor). Analyses of correlation and agreement were performed between the two sets of results in order to compare the findings obtained by the two raters. In particular, unweighted and quadratic weighted kappa coefficients were calculated for measuring the agreement of the two assessments at discriminating robust, frail, and disabled individuals. Sensitivity, specificity, predictive values, and likelihood ratios of the GFST were calculated. Finally, logistic regression models were performed to investigate which of the frailty criteria was most strongly associated with the perception of frailty (in the absence of disability) among general practitioners. For the present study a p value lower than 0.05 was considered as statistically significant.

Analyses have been conducted using Stata for Mac version 12 (StataCorp LP, college Station, TX, United States).

RESULTS

The main characteristics of the study sample (n=109) are presented in Table 1. The mean age was 77.8 (standard deviation, SD 0.78) years, and women tended to be more prevalent than men (66.0% vs 34.0%, respectively). According to the assessment conducted using the reference measures (i.e., frailty phenotype and ADL scale), the sample was constituted by 37.6%, 56.9%, and 5.5% of robust, prefrail/frail, and disabled individuals, respectively.

Results from the comparison of the evaluations conducted by the two raters are shown in Table 2. Unweighted results reported a modest agreement (70.64%, unweighted kappa=0.446, $p<0.001$) between the two assessments. If quadratic weights were applied to the statistical model, the agreement and kappa coefficient increased to 92.66% and 0.54 ($p<0.001$), respectively.

The GFST showed a sensitivity of 71.0%, a specificity of 70.2%, a positive predictive value of 75.9% and a negative predictive value of 64.7% for the identification of non-disabled frail elders (as detected by the reference measures). The positive and negative likelihood rations were 2.38 and 0.41, respectively.

Logistic regression models were conducted for exploring the GFST items most associated with the condition of "frailty in the absence of disability" as detected by reference measures (Table 3). Slow gait speed, mobility issues, weight loss, fatigue, and memory complaints (in descending order of strength) were all singularly associated with the outcome of interest. However, when all the GFST items were simultaneously included in the model, only slow gait speed (odds ratio [OR] 19.65, 95% confidence interval [95%CI] 4.69-82.35) and mobility issues (OR 18.04, 95%CI 3.11-104.78) maintained a statistically significant association with the condition of frailty in the absence of disability.

DISCUSSION

In the present study, we tested the agreement of a simple screening tool specifically designed to be administered in primary care (i.e., the GFST) with reference measures in the detection of non-disabled frail elders. The agreement of the GFST with reference measures was overall moderate. Interestingly, our secondary analyses suggest that slow gait speed and mobility difficulties are key conditions driving the subjective judgment of the general practitioners in the identification of the non-disabled frail individual.

The main goal of geriatric medicine is to maintain the highest possible level of autonomy of older people, by preventing the development of disability or reducing its progression. The frailty syndrome today is largely recognized as a process that in the early stages is amenable to treatment in order to prevent the onset or progression of disability [26, 27]. Although a growing body of literature demonstrates the high prevalence and major clinical relevance of the frailty syndrome in older adults, an effective management of this condition in daily clinical practice is still lacking [1, 5].

In the current healthcare system, subjects at risk often fail to be identified before their vulnerability becomes evident by the onset of a major clinical event (e.g., falls, emergency room referral, hospitalizations). In this respect, general practitioners should play a major role in the early detection of frailty in older adults. Besides of representing the primary referents for the individual's health and being responsible for the implementation of preventive actions, the general practitioners are also usually the first at identifying and treating minor ailments (which in a frail individual may escalate to major problems). To efficiently and correctly identify frail older persons among their patients, general practitioners must be supported. The provision of easy and quick screening tools for detecting the frailty condition in primary care may indeed represent the first step to fulfill such task.

The GFST was specifically designed for this purpose and overall fulfills these characteristics. It is largely based on simple information, easily available to the general practitioner. It takes few minutes and does not need any special equipment. Interestingly, the final result of the GFST relies on the clinical judgment of the general practitioner in order to 1) not delegate the decision of a clinical intervention to the results of a test, and 2) well involve the general practitioner in the follow-up and subsequent decisions to be taken for his/her patient.

Our results show that the GFST only moderately agrees with reference measures. This is not completely surprising. In fact, although the GFST is largely based on the frailty phenotype proposed by Fried and colleagues [12], it contains additional items, i.e. the evaluation of cognitive functions and social status. Moreover, it has been demonstrated in literature that the agreement across frailty instrument tends to be quite modest [28, 29]. Nevertheless, the clinical experience is that the population identified by the GFST is still a population presenting a high-risk profile for negative health-related events [6, 7]. In other words, although a higher agreement might have been desirable, our findings do not preclude the GFST capacity to serve as instrument for the detection of older persons at risk of disability.

The GFST items of "mobility issues" and "slow gait speed" were those that were most strongly associated with the identification of the frailty condition (in the absence of disability). This may implicitly suggest that 1) the general practitioners indeed associate the frailty syndrome with more "physical" characteristics, and 2) physical performance (and especially gait speed) might well serve as screening instruments for standardize the detection of frailty in the next future. After all, one of the objectives in the design and development of the GFST was to promote the familiarization of general practitioners at the concept of frailty. It could be expected that the GFST (which is still largely relying on the clinical judgment of the physician) might be overcome in the future by better instruments [9]. At the same time, the

multidimensional and clinical-friendly characteristics of the gait speed test may render it particularly suitable for the screening of frailty in primary care [30].

The present study has some limitations worth to be noted. Due to the absence of a universally accepted definition of frailty, the choice of the phenotype proposed by Fried and colleagues [12] as reference measure of frailty might be argued. It was decided to use this operational definition simply because it is the most commonly used in research and clinics. Moreover, compared to other instruments, the design of the frailty phenotype indeed resembles that of a screening tool (in line with the purposes of the GFST) [31]. A further limitation might be represented by the use of a physical activity questionnaire different from the original one adopted in the Cardiovascular Health Study for defining the sedentary behavior in the reference measure. Unfortunately, the conduction of the Minnesota Leisure Physical Activity questionnaire was not feasible in the primary care setting where the present study was conducted. Nevertheless, as mentioned above, the questionnaire we used as part of the frailty phenotype has shown to provide consistent results. Finally, our sample population was recruited by general practitioners willing to participate in this initiative. Thus, the study participants cannot be described a priori as representative of a larger population (e.g., community dwelling European elders) and their primary care physicians may be better motivated/trained than others at detecting frailty.

In conclusion, our findings demonstrate an overall moderate agreement between the GFST and the frailty phenotype proposed by Fried and colleagues [12]. Such result (in line with previous evidence) does not delegitimize the use of the GFST as instrument for the case findings in the field of frailty. General practitioners in our study were more likely to identify the frailty syndrome (in the absence of disability) with physical conditions, in particular mobility and physical performance. This may open and support new important avenues to consider in the screening of frailty in primary care.

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All the translations of the GFST instrument in different languages are available at the website www.frailty.net

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Table 1. Main characteristics of the study sample (n=109).

Variable	**Mean (SD), or percentage**
Age (years)	77.8 (0.8)
Gender (women)	66.0
Body Mass Index (kg/m^2)	26.3 (4.5)
Arthritis	43.6
Coronary heart disease	34.3
Cerebrovascular disease	6.5
Dementia	3.7
Diabetes	25.6
History of cancer	10.1
Hypertension	66.7
Osteoporosis	14.8
Respiratory disease	19.4
Frailty status (as per reference measures) - Robust - Pre-frail/Frail - Disabled	 37.6 56.9 5.5

Table 2. Agreement of results obtained from the two evaluations.

		Reference measures	
		Non-disabled frail participants	*Robust or disabled participants*
GFST	*Non-disabled frail participants*	44 (45.0)	14 (11.0)
	Robust or disabled participants	18 (16.5)	34 (27.5)

Results are presented as n (percentage).

Table 3. Results of logistic regression models testing the association between the GFST items in the prediction of the condition of frailty in the absence of disability (as per the assessment conducted using the reference measures).

		Univariate	**Multivariate**
GFST items	**Prevalence (%)**	*OR (95%CI)*	*OR (95%CI)*
Living alone	41.5	1.21 (0.56-2.61)	0.58 (0.17-2.02)
Weight loss	15.1	6.85 (1.47-31.84)	6.26 (0.92-42.60)
Fatigue	25.8	5.08 (2.03-12.68)	2.58 (0.71-9.41)
Mobility issue	28.3	20.84 (4.64-93.63)	18.04 (3.11-104.78)
Memory complaints	31.1	2.82 (1.15-6.86)	2.38 (0.67-8.52)
Slow gait speed	36.7	22.50 (6.27-80.74)	19.65 (4.69-82.35)

In the univariate analyses, each GFST item is singularly entered in the logistic regression model predicting the outcome of interest. In the multivariate analysis, all the GFST items are simultaneously entered in the logistic regression model predicting the outcome of interest.

Appendix. The GFST instrument.

THE GERONTOPOLE FRAILTY SCREENING TOOL (GFST) Patients aged 65 years and older without both functional disability (Activities of Daily Living score ≥5/6) and current acute disease.			
	YES	***NO***	***Do not know***
Does your patient live alone?	☐	☐	☐
Has your patient involuntarily lost weight in the last 3 months?	☐	☐	☐
Has your patient been more fatigued in the last 3 months?	☐	☐	☐
Has your patient experienced increased mobility difficulties in the last 3 months?	☐	☐	☐
Has your patient complained of memory problems?	☐	☐	☐
Does your patient present slow gait speed (i.e., >4 seconds to walk 4 meters)?	☐	☐	☐
If you have answered YES to one or more of these questions:			
Do you think your patient is frail?	***YES*** ☐	***NO*** ☐	
If ***YES***, is your patient willing to be assessed for his/her frailty status at a future Frailty Clinic?	***YES*** ☐	***NO*** ☐	