Conflict of interest statement

None of the authors have any conflicts of interest. The corresponding author has had full access to all the data in the study and has final responsibility for the decision to submit for publication.

Role of the funding source

No external funding was used for this study

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doi:10.1093/ageing/afl023
Published electronically 11 May 2006

Validity and reliability of the Edmonton Frail Scale

SIR—Age is broadly recognised to confer a risk for adverse health outcomes, but it is an insensitive and non-specific measure for use in individual decision-making. Frailty has been emerging to take its rightful place as a better measure for over a decade [1]. Despite general consensus that the concept of frailty is clinically useful, the lack of agreement on its definition and the challenge of its measurement by front-line health providers mean that frailty remains only 'heir apparent' to chronological age as a criterion to select older persons at risk [2].

Frailty is multidimensional, heterogeneous and unstable, thus distinguishing it from disability or ageing alone [3]. Rather, it is widely conceived of as a state of vulnerability. Frailty is measured in many ways, including 'rules based' instruments, summative impairment lists and algorithms derived from clinical judgement [4–6]. However much these tools might have advanced research in frailty, most are impractical for bedside screening by front-line providers because they require the multidimensional clinical data that constitute a comprehensive geriatric assessment (CGA) and/or require special training. Often, neither is available to the primary care providers who care for these patients. Furthermore, previously validated frailty assessments are time-consuming, making them impractical in more volume-driven settings, such as a primary care physician's office. We therefore developed and tested a brief and user-friendly screening interview for frailty in seniors commonly encountered by geriatricians in both the inpatient and outpatient settings.

Methods

Our objective was to assess the validity and reliability of the Edmonton Frail Scale (EFS) in a sample referred for CGA (Table 1). All patients aged 65+ years were approached for informed consent; exclusions were only for communication barriers (deafness, blindness or the need for translation), problems with manual dexterity or previous enrolment in our study. Patients were a referral population for CGA seen during July 2000 in acute care wards, rehabilitation units, day hospitals and outpatient clinics in Edmonton, Alberta, a major Canadian metropolitan centre (population one million).

A lay research assistant who had no formal medical training collected demographic and medical data and then administered the EFS [7]. The EFS samples 10 domains; the maximum score is 17 and represents the highest level of frailty. Two domains are tested using performance-based items: the Clock test [8] for cognitive impairment and the 'Timed Get Up and Go' [9] for balance and mobility. The other domains are mood, functional independence, medication use, social support, nutrition, health attitudes, continence, burden of medical illness and quality of life (all standard historical items in geriatric assessment).

All patients had a minimum of 1 h specialist CGA, which included a personal and informant history, a physical

examination, a functional performance assessment, a mental status examination and a formulation. The CGA was completed independent of and blinded to the EFS scoring. Following each CGA, the specialist completed a questionnaire (developed by the study investigators, with its content validity tested by a panel of geriatricians) summarised as a Geriatrician's Clinical Impression of Frailty (GCIF) [10]. The GCIF (Appendix: available online at http://ageing.oxfordjournals.org) included nine items for pre-morbid geriatric syndromes that threaten future independence and six items about acute atypical disease presentations. Finally, using each of the four different definitions of frailty, subjects were rated on a scale from 0 (not frail) to 5 (maximal frailty). These included definitions based on physical frailty (e.g. muscle wasting and weakness), physiological frailty (organ system-based vulnerability), frailty as disability (impairment in functional independence) and dynamic frailty (functional instability inclusive of social reserve). The GCIF thus has a score ranging from 0 (none) to 35 (maximal) frailty, which was correlated with the EFS score.

In a randomly selected subset, the EFS was re-administered within 24 h by a geriatric assessment nurse blinded to the first score and to the CGA. For additional convergent construct validity, other subsets of participants were similarly requested to complete the Mini-Mental State Examination (MMSE) [11] and the Barthel Index [12].

To estimate the sample size for construct validity using a Pearson correlation, we reckoned a modest correlation of 0.30 and an expected correlation of 0.70, with $\alpha = 0.05$ and $\beta = 0.90$ showing a need for 60 subjects [13]. This was doubled to allow for multiple testing. To test inter-rater reliability of the EFS using the kappa coefficient (κ) and assuming that excellent agreement was indicated by a value of ≥0.80, we calculated a requirement of 23 subjects [12]. The EFS score was also correlated with age, gender, number of medications, MMSE and Barthel Index. We used *t*-tests to compare mean scores by residence and consultation site. Crohnbach's α was employed to test internal reliability. The health research ethics board of the University of Alberta approved the project.

Results

During the 8-week period of enrolment, 364 individuals were considered to be eligible. Of these, 163 were excluded because of the unavailability of the patient or the assessor before the geriatric assessment. No systematic information was available on non-responders. Another 34 declined participation, leaving 158 participants (43% of those eligible). The patients' mean age was 80.4 years (SD = 6.8); 53% were women and 59% were unmarried (including widowed). The average number of medications was 5.4 (SD = 3.3). Most

Table 1. The Edmonton Frail Scale

The Edmonton Frail Scale:				Score: ___/17
Frailty domain	Item	0 point	1 point	2 points
Cognition	Please imagine that this pre-drawn circle is a clock. I would like you to place the numbers in the correct positions then place the hands to indicate a time of 'ten after eleven'	No errors	Minor spacing errors	Other errors
General health status	In the past year, how many times have you been admitted to a hospital?	0	1–2	≥2
	In general, how would you describe your health?	'Excellent', 'Very good', 'Good'	'Fair'	'Poor'
Functional independence	With how many of the following activities do you require help? (meal preparation, shopping, transportation, telephone, housekeeping, laundry, managing money, taking medications)	0–1	2–4	5–8
Social support	When you need help, can you count on someone who is willing and able to meet your needs?	Always	Sometimes	Never
Medication use	Do you use five or more different prescription medications on a regular basis?	No	Yes	
	At times, do you forget to take your prescription medications?	No	Yes	
Nutrition	Have you recently lost weight such that your clothing has become looser?	No	Yes	
Mood	Do you often feel sad or depressed?	No	Yes	
Continence	Do you have a problem with losing control of urine when you don't want to?	No	Yes	
Functional performance	I would like you to sit in this chair with your back and arms resting. Then, when I say 'GO', please stand up and walk at a safe and comfortable pace to the mark on the floor (approximately 3 m away), return to the chair and sit down'	0–10 s	11–20 s	One of >20 s patient unwilling, or requires assistance
Totals	Final score is the sum of column totals			

Table 2. Correlation between the Edmonton Frail Scale and patient characteristics

Variable	Pearson's correlation coefficient, *r*	*P* value
Age	0.27	0.015
Sex	0.05	0.647
Medication	0.34	<0.001
Geriatrician's clinical impression of frailty	0.64	<0.001

patients came from the community (43% home without help and 42% home with help compared with 14% in assisted living and 1% in a nursing home). Assessments were conducted in both outpatient (56% in specialty clinics, 4% in day hospitals) and inpatient settings (22% acute care units, 18% geriatric rehabilitation units).

The EFS was normally distributed (mean score 7.6, SD = 3.0, range = 0–16), as was the GCIF (mean score of 15.7, SD = 6.95, range = 0–32). The EFS correlated significantly with the GCIF, age and medication count but not with sex (Table 2). Inpatients had higher scores than outpatients (9.9 ± 2.5 versus 6.2 ± 2.5; $t = -8.9$, $P<0.001$) and those who lived with assistance had higher scores than those who lived independently (8.1 SD = 2.8 versus 7.0 SD = 2.8; $t = -2.29$, $P = 0.02$). In the construct validation sub-samples, the correlation with the Barthel Index was statistically significant ($r = -0.58$, $P = 0.006$, $n = 21$), but the correlation with the MMSE was not ($r = -0.05$, $P = 0.801$, $n = 30$).

The EFS showed good inter-rater reliability ($\kappa = 0.77$, $P = 0.0001$, $n = 18$). The internal consistency of the EFS using Crohnbach's α was 0.62. The EFS required <5 min to administer and was reported to be acceptable to the operators and study participants.

Discussion

In this community-based referral sample, the EFS was a valid measure of frailty compared to the clinical impression of geriatric specialists after their more comprehensive assessment. The EFS also had good construct validity, good reliability and acceptable internal consistency. A unique characteristic of the EFS as a clinical frailty instrument is its inclusion of the domain of social support, suggesting an endorsement of the dynamic model of frailty [1]. Of note, the EFS was validated in the hands of non-specialists who had no formal training in geriatric care. Thus, the EFS has the potential as a practical and clinically meaningful measure of frailty in a variety of settings.

Although the GCIF has a good face validity and includes most current concepts of frailty (physical, physiological, functional and dynamic), it is no 'gold standard'. Still, it reflects the blinded, systematic judgement of geriatric specialists about individual patients after completing a CGA and thus captures the clinical essence of frailty. Ours was a select population referred for CGA. Caution should therefore be exercised in generalising these findings to either an unscreened community population or, conversely, a more narrow research population in whom social support, health attitudes, mood, cognition and functional dependence are potentially much less relevant to the frailty phenotype. Moreover, the identification of someone as frail needs to be used to alert health care providers to their special needs, not to consign them to inferior care.

Indeed, interest is building around the frailty phenotype model [14] defined as any three of weight loss, self-reported exhaustion, low activity levels, low walking speed and low grip strength. The precision and clarity in definition of this tool is attractive, and it appears to correlate with specific physiological alterations, particularly enhanced inflammation and coagulation [15], as have other measures [16, 17]. Still, this may be less useful in the care of everyday patients in whom health-related vulnerabilities cannot be so easily separated from cognition, mood and social support [18].

The EFS is shorter than another recent clinical proposal [18] that focused on change; further studies are needed to test the responsiveness of the EFS. Another new judgement-based measure, the Canadian Study of Health and Aging (CSHA) Clinical Frailty Scale [4], is short but was validated only after a CGA was carried out. Similarly, the FI-CGA [19] still requires a CGA, which also limits its potential for routine application. Still, each of these CGA-dependent tools correlates highly with a validated standard [20], and both predict death and institutionalisation in tightly graded patterns.

In summary, the EFS appears to be valid, reliable and feasible for routine use by non-geriatricians. The need for cross-validation in other settings and evaluation of responsiveness is motivating further enquiries by our group.

Key points

- What is known: Frailty is broadly used and measurable, but the need for a brief tool that can be used by non-specialist geriatrician remains.
- What this study adds: The EFS is a brief, valid and reliable tool that can be completed by people without special training in geriatric medicine.

Acknowledgements

This study was supported by the Division of Geriatric Medicine, University of Alberta. Funding for additional analyses came from CIHR grant MOP 62823. K.R. receives career support from the Canadian Institutes of Health Research through a Career Investigator Award and from the Dalhousie University Medical Research Foundation as the Kathryn Allen Weldon Professor of Alzheimer Research. S.R.M. receives career support from the Alberta Heritage Foundation for Medical Research (AHFMR) and from the Canadian Institutes of Health Research (New Investigator). R.T.T. is supported by the Merck Frosst Chair in Patient Health Management at the University of Alberta.

The authors are grateful to Yan Wang, MSc of the Geriatric Medicine Research Unit, Dalhousie University for assistance with the analysis.

Conflicts of interest

The authors each declare no conflict of interest.

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doi:10.1093/ageing/afl041
Published electronically 6 June 2006

Postal questionnaire survey: the use of sleeping with the head of the bed tilted upright for treatment of orthostatic hypotension in clinical practice

SIR—Orthostatic hypotension (OH) is common and affects one in five community-living older persons [1]. The incidence is higher amongst older in-patients [2] and those attending a syncope clinic [3].

The treatment of OH is through increasing peripheral vascular resistance and/or intravascular volume. Existing treatments such as increased water intake, salt replacement [4] and medications may lead to hypertension, and older people tend to tolerate these interventions poorly [5]. Drinking 2–2.5 l of fluids daily may be effective in younger patients [6, 7] but may be undesirable in older patients who can be prone to urinary incontinence.

Sleeping with the head of the bed elevated (SHU) is established as part of the treatment modality for OH [6, 8, 9]. The European Society of Cardiology guidelines [9] recommend raising the head of the bed on blocks to permit gravitational exposure during sleep, which results in chronic intravascular volume expansion. Mathias and Bannister [10] recommend SHU as first-line treatment for OH in patients with autonomic failure (AF).

Our literature review suggests that SHU at 12° or greater confers some benefit in patients with OH. However, the studies were small with sample sizes of eight subjects or less with varying ages (23–66 years), and the majority of the patients had AF (Table 1). A number of those studies used a