Age and Ageing 2013; **42:** 262–265
doi: 10.1093/ageing/afs163
Published electronically 28 October 2012

The identification of frail older adults in primary care: comparing the accuracy of five simple instruments

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Abstract

Background: many instruments are available to identify frail older adults who may benefit from geriatric interventions. Most of those instruments are time-consuming and difficult to use in primary care.
Objective: to select a valid instrument to identify frail older adults in primary care, five simple instruments were compared.
Methods: instruments included clinical judgement of the general practitioner, prescription of multiple medications, the Groningen frailty indicator (GFI), PRISMA-7 and the self-rated health of the older adult. Fried's frailty criteria and a clinical judgement by a multidisciplinary expert panel were used as reference standards. Data were used from the cross-sectional Dutch Identification of Frail Elderly Study consisting of 102 people aged 65 and over from a primary care practice in Amsterdam. In this study, frail older adults were oversampled. We estimated the accuracy of each instrument by calculating the area under the ROC curve. The agreement between the instruments and the reference standards was determined by kappa.
Results: frailty prevalence rates in this sample ranged from 11.6 to 36.4%. The accuracy of the instruments ranged from poor (AUC = 0.64) to good (AUC = 0.85).
Conclusion: PRISMA-7 was the best of the five instruments with good accuracy. Further research is needed to establish the predictive validity and clinical utility of the simple instruments used in this study.

Keywords: *frail elderly, accuracy, frailty identification, primary care, older people*

Introduction

In ageing societies, timely identification of frailty and delivering adequate care for frail persons is a major challenge for health-care professionals [1]. Frailty is defined as a syndrome involving a loss of resources in one or more domains of functioning [2–4]. It is associated with adverse health outcomes, loss of independence and mortality [5, 6]. The primary care setting is well situated for the identification of frailty, as many older adults frequently consult their general practitioner (GP) [7]. For GPs, the identification of frailty needs to be simple and not time-consuming [8]. Previous work on simple frailty instruments did not compare several instruments, did not use valid reference standards or did not focus on primary care [9–12]. The aim of this study was to test the accuracy of five easy-to-use instruments to identify frail older adults in primary care.

Methods

Design and study sample

Data were used from the cross-sectional Identification of Frail Elderly Study in The Netherlands. All patients aged 65 and over from a primary care practice in Amsterdam (n = 606) received, together with a postal invitation for the annual influenza vaccination, a short questionnaire, including the Groningen frailty indicator (GFI) [10]. This is a 15-item

instrument that includes the domains of physical, cognitive, social and psychological functioning. A total of 63% of the patients returned the postal questionnaire ($n = 383$). Age and sex did not differ significantly between responders and non-responders. Subsequently, we selected 120 patients from this group, stratified by age, sex and GFI score. Three groups were formed: non-frail (GFI <2), some frailty (GFI 2 or 3) and moderate to severe frailty (GFI ≥4) [10]. In this way frail older adults were oversampled, to ensure the inclusion of sufficient older adults with frailty. The selected patients were approached for an interview. Trained interviewers (geriatric nurses and medical students) collected the data between October 2009 and December 2009, by means of computer-assisted personal interviewing and performance tests. Since some patients refused to participate or were not able to complete the interview, the final data set consisted of 102 respondents (flow chart is available in Supplementary data available in *Age and Ageing* online). The study received approval by the medical ethics committee of the VU University medical centre. Signed informed consent was obtained from all study participants.

Measurements

The five simple frailty instruments that were tested included the clinical judgement of the GP, polypharmacy, PRISMA-7, GFI and self-rated health of the patient. We asked the GP to make a clinical judgement about each patient, by asking 'Would you consider this patient to be frail, if frailty is defined as a loss of resources in several domains of functioning (physical, psychological, social), increasing the risk of adverse outcomes?' From electronic medical records, we derived the number of medicine prescriptions. A cut-off point of 5 or more medications with different Anatomic Therapeutic Chemical classification system (ATC) codes prescribed over the past 6 months was applied, indicating moderate to major polypharmacy [13]. PRISMA-7 is a brief 7-item questionnaire to identify considerably disabled older adults, which has previously been used in frailty studies [14]. Respondents with a score of 3 or more are considered to be frail [15]. For the GFI, a summed score of 4 or more is considered to indicate frailty [10, 16]. The self-rated health of the patient was assessed with the question 'How would you rate your health status on a scale from 0 to 10?' A cut-off point of 6 or lower was applied to indicate frailty. Additional demographic and health information was collected during the interview: educational level, cognitive functioning (MMSE; [17]) and the InterRAI Community Health Assessment (InterRAI-CHA; [18]).

We used two reference standards with good predictive ability [4, 6], representing both one-dimensional [4, 19] and multidimensional [3, 20, 21] concepts of frailty. First, frailty was assessed with Fried's frailty criteria. Older adults are considered to be frail if three out of the following five criteria are present: weight loss, self-reported exhaustion, weakness, slow walking speed and low physical activity [4]. Second, we identified frailty on the basis of clinical judgement by a multidisciplinary expert panel. Eight clinical experts constituted two expert panels, each consisting of a GP, a nursing home physician, a geriatrician and a geriatric nurse. Each panel judged one-half of the patient descriptions, which were sent to each panel member by e-mail. The patient descriptions contained general demographic information, MMSE score, functional and psychological information from InterRAI-CHA and medical history. Members of the expert panels were asked to rate each patient on the 7-point Clinical Frailty Scale [6], where frailty is defined as a score of 5 or higher. Panel members with an outlying score for a patient were asked to reconsider their score. The final classification 'frail' or 'not frail' was reached by consensus of panel members.

Statistical analysis

Using the area under the ROC curve (AUC), we estimated the accuracy of each instrument for both reference standards. The AUC ranges from 0.5 to 1.0, where 1.0 indicates perfect sensitivity and specificity. An index test AUC of at least 0.8 is considered to indicate good discriminative ability [22]. Furthermore, we calculated the level of agreement (Cohen's kappa) between the different identification instruments and the reference standards. Values between 0.60 and 1 indicate substantial to almost perfect agreement [23]. In ancillary analyses, the robustness of cut-off values of the instruments was studied. Because of the stratified selection and oversampling of frail persons, the outcomes were weighted back to the GFI composition of the population from which the selection of 102 respondents was made, to report numbers representative for the primary care practice (weight factors are available in Supplementary data available in *Age and Ageing* online).

Results

Table 1 shows the demographic and health characteristics of the participants. Table 2 reports the prevalence rates of frailty, as well as the sensitivity, specificity, AUC and kappa values of the five simple instruments for both reference

Table 1. Characteristics of the participants ($n = 102$)

Age, 65–96, mean (SD)	78.6 (7.1)
Sex, % women	56.9
Educational level, 1–8, %	
Low (1–2)	10.3
Middle (3–6)	41.2
High (7–8)	48.5
MMSE, 0–30 mean (SD)	26.1 (2.2)
Mobility limitations,[a] 0–4 (SD)	0.3 (0.6)
Number of chronic diseases, mean (SD)	2.9 (1.9)
Number of prescribed medicine, mean (SD)	4.1 (3.2)

[a]Based on the four GFI items on mobility. Each item scored independent (0) or dependent (1). The use of helping devices, such as walking frame or wheelchair, is considered independent.

Table 2. Prevalence, accuracy and agreement of simple frailty instruments (weighted analyses)

	Frail (%)	Fried (ref.)				Expert panel (ref.)			
		Sensitivity	Specificity	AUC	Kappa	Sensitivity	Specificity	AUC	Kappa
Reference standard									
Fried's frailty criteria (0–5, cut-off ≥3)	11.6								
Expert panel (0–7, cut-off ≥5)	22.8								
Index test									
Clinical judgement GP (not frail/frail)	28.6	0.70	0.77	0.73	0.27	0.68	0.82	0.75	0.47
Polypharmacy (ATC ≥5)	31.9	0.70	0.73	0.71	0.24	0.58	0.75	0.66	0.29
GFI (0–15, cut-off ≥4)	36.4	0.57	0.72	0.64	0.17	0.67	0.79	0.73	0.41
PRISMA-7 (0–7, cut-off ≥3)	24.8	0.86	0.83	0.85	0.47	0.74	0.89	0.82	0.61
Self-rated health (0–10, cut-off ≤6)	34.0	0.85	0.73	0.79	0.31	0.75	0.69	0.72	0.36

AUC, area under receiver operating characteristic curve.

standards. The frailty prevalence in this sample ranged between 11.6% (Fried) and 36.4% (GFI). Using Fried's frailty criteria as a reference standard, PRISMA-7 showed best accuracy (AUC = 0.85). The lowest AUC was found for GFI (AUC = 0.64). The results were rather consistent when the expert panel judgement was used as a reference standard. Again, PRISMA-7 showed the best accuracy (AUC = 0.82). Only the AUC of polypharmacy was lowest with 0.66. The highest agreement was found between PRISMA-7 and the expert panel (kappa = 0.61). Sensitivity analyses did not change our results and confirmed the optimal cut-off values of the instruments, except for polypharmacy that was slightly better at 7 medications or more.

Discussion

This is one of the first studies to evaluate and compare several instruments to identify frailty in primary care. Although there are many measurement instruments for frailty, instruments that may be used in primary care are still in an early stage of development [7]. From five simple instruments compared in this study, the PRISMA-7 questionnaire achieved the best accuracy and agreement.

The simple frailty identification instruments included in this study were based on different types of sources available in primary care. According to our results on accuracy, short patient questionnaires seem to perform best. However, it should be noted that every source has its benefits and drawbacks. Questionnaires, such as GFI and PRISMA-7, have the risk of (selective) non-response, especially when sent by post [24]. Frailty judgement by the GP may be easier to apply than sending questionnaires. In this study, the clinical judgement made by the GP was based on the judgement of only one medical doctor. Further research is needed to compare the results of several GPs and investigate their inter-rater reliability. Although our results suggest that using information about medication from medical records is less appropriate for the identification of frailty, extraction of frailty indicators from electronic medical records has practical advantages as it is convenient for both GPs and patients while avoiding the problem of non-response.

Finding a valid and simple instrument to identify frail older adults in primary care and implementing such instruments is just a first step. The identification of frailty should be followed by a comprehensive assessment and targeted interventions to modify frailty or to prevent adverse health outcomes [25].

A limitation of our study is that the analyses are based on data from just one primary care practice in the Netherlands. The sample contained an above average number of higher educated older adults. For the diagnostic analyses, this sample is not a restriction, but the presented prevalence rates may not reflect the actual frailty prevalence of the Dutch older population. Next, our study among 102 older adults gives a first indication of the diagnostic accuracy of simple instruments. In future studies, the preferences of different groups of users and feasibility in a real-life setting should be taken into account, as patients may prefer different instruments than medical doctors. Finally, frailty detected by some of the simple instruments used in this study is associated with adverse outcomes (e.g. [26, 27]), but for others (e.g. PRISMA-7) a longitudinal study should be conducted to investigate whether they predict adverse health trajectories.

Key points

- This is the first study to compare several frailty instruments in primary care.
- Five simple frailty instruments were compared with Fried's frailty criteria and a multidisciplinary expert panel.
- The frailty prevalence rates in this sample ranged from 11.6 to 36.4%.
- The PRISMA-7 questionnaire was the best out of five simple instruments to determine frailty in primary care.

Acknowledgements

The authors wish to thank the Osira Group for providing nurses to perform the assessments.

Conflicts of interest

None declared.

Funding

This study is funded by The Netherlands Organization for Health Research and Development (ZonMw): Dutch National Care for the Elderly Program grant number 311080201.

Supplementary data

Supplementary data mentioned in the text is available to subscribers in *Age and Ageing* online.

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Received 21 May 2012; accepted in revised form 23 August 2012