SHARE FRAILTY INSTRUMENT (SHARE-FI) IN THE EMERGENCY DEPARTMENT

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Major: Biology/Pre-Medicine

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Abstract

Objectives: Frailty is a geriatric syndrome that results in an increased vulnerability to acute illness and injury. The aims of this study were to assess the feasibility of the modified SHARE Frailty Instrument (SHARE-FI) and determine the prevalence of frailty in older emergency department (ED) patients and assess outcomes.

Methods: This cross-sectional prevalence study was conducted in an urban hospital in patients over 65 years. Frailty was calculated using the SHARE-FI formula, which included grip strength and survey answers. Demographic information and responses to an activities of daily living (ADL) questionnaire were obtained. A follow-up call was made at 30-days.

Results: Thirty-three subjects were enrolled. The average age was 79 years. The instrument was completed in an average of 6.5 minutes. Using the SHARE-FI calculator, 55% of subjects were frail compared with 27% who were pre-frail and 18% who were non-frail. Frail subjects were more likely to be admitted to the hospital and were more dependent on help to perform ADLs. Forty-four percent of pre-frail and frail subjects had a negative outcome at follow-up.

Conclusions: SHARE-FI is a feasible tool to assess frailty in the ED which may be clinically useful and important in the treatment of older patients.
**Introduction**

Frailty is a geriatric syndrome that results in an increased vulnerability to acute illness and injury, along with a decrease in functional reserve across several physiological systems.\(^1\)\(^2\) Because frail older patients have a decreased ability to maintain homeostasis, they are faced with a higher susceptibility to physiological stressors.\(^1\)\(^2\) As a result, when confronted with an acute illness and/or injury, frail elderly patients may have a poorer response as compared with non-frail older patients. Investigators have developed operational definitions for the geriatric syndrome of frailty. Measurements from the Study of Osteoporotic Fractures (SOF) criteria\(^3\) or Fried’s criteria\(^4\) reveal that patients who are classified as pre-frail and frail have an increased vulnerability to adverse health outcomes that include: instrumental activities of daily living disability, falls, overnight hospitalization, nonspine fractures, emergency department (ED) visits, and death.\(^5\)\(^6\) Upon evaluation of the predictive value of the individual elements of Fried’s criteria, Rothman and colleagues concluded that long-term nursing home stays, chronic disability, and death were linked with patients positive for slow gait speed, weight loss, and/or low physical activities, but not in patients with exhaustion or muscle weakness.\(^7\) The only factor of significant association with falls resulting in injury was slow gait speed.\(^7\) To further develop the set of criteria identifying subdimensions of frailty, Sarkisian and colleagues included cognitive impairment, subjective weakness (assessed using the Hopkins Symptom Checklist question “During the past week, how much have you been distressed by weakness in parts of your body?”), anorexia (assessed using the Hopkins Symptom Checklist question “During the past week, how much have you been distressed by poor appetite?”), and inflammation (elevated IL-16 and C-reactive protein (CRP) values) in addition to Fried’s criteria.\(^8\)
Based upon these clinical manifestations to identify frail patients, it is estimated that 10-25% of the general population of people aged at least 65 years or older are frail, and 30-40% of those aged 85 and older are frail.\(^1\) Frailty is likely to be more prevalent in older patients visiting the ED than the general community-dwelling population as frail individuals are faced with an increased use of healthcare and risk of adverse health outcomes.\(^5,6\) These inferences come from the MOBILIZE Boston study by Kiely and colleagues, whose results revealed that those with an ED visit were more likely to be frail or pre-frail than those without an ED visit (Figure 1).\(^6\)

The recently developed frailty instrument, SHARE Frailty Instrument (SHARE-FI), derived from a large, population-based European cohort study, provides potential advancements in the assessment of frailty in older ED patients.\(^9\) Pre-frail and frail male and females as measured by SHARE-FI had a higher mortality than non-frail subjects. Since SHARE-FI shortens the subjective questions, specifically in activity level measurement, and does not include gait speed measurement, it may provide some benefits for ED use over Fried’s operational definition.\(^9\) Our study sought to explore the following objectives: assess the feasibility of the use of the modified SHARE Frailty Instrument in the ED setting; determine the prevalence of frailty in older ED patients based on the modified SHARE Frailty Instrument; assess the 30-day outcomes of older ED patients; and determine the association between frailty as determined by the SHARE Frailty Instrument and functional decline and poor outcomes in older ED patients.
Figure 1: Frailty Status in Those with and without an ED Visit

Table taken from Kiely et al.⁶

Methods

Study Design

We conducted a cross-sectional prevalence study consisting of elderly patients from the ED. The study was approved by the Summa Health System Institutional Review Board.

Study Setting

Subjects were enrolled in the Emergency Department at Summa Health System Akron City Hospital. Of the 77,000 visits per year to this urban community teaching hospital, about 24% are patients over the age of 65.
**Study Subjects**

All ED patients aged 65 and older were included in our study. Subjects were excluded from the study if their ED doctor believed study participation was medically contraindicated, the patient lived in an extended care facility (ECF) or a skilled nursing facility, could not understand or speak the English language unless a proxy was present, or had already partaken in the study.

**Enrollment**

The enrollment hours for the study were from 7:00 a.m. until 10:00 p.m., seven days a week. Subjects were approached for study participation after initial ED evaluation and treatment but prior to discharge from the Emergency Department or admission to the hospital. Eligible patients were approached by trained study team members. Signed informed consent was obtained by the patient or proxy prior to any study procedures.

**Data Analysis and Sample Size**

Data were entered into a Microsoft Access® database and analyzed using Microsoft Excel® and STATA® statistical software. Data are reported as the means and proportions with 95% confidence intervals (CI). Informal assessment of feasibility was determined based on the number of refusals and/or exclusions, while formal assessment of feasibility was analyzed based on the total time to collect the study data. The association between decline and frailty was analyzed using 95% confidence intervals for the difference between proportions; exclusion of 0 signifies significance at an alpha of 0.05. Using the initial patient activities of daily living (ADL) scores, the median ADL value and the interquartile range were determined.
Measurements

Patients were evaluated by the SHARE-FI questionnaire. The questionnaire, which was developed by a European population based study, consisting of various questions that seek to evaluate the frailty of older ED patients, had been minimally altered by changing the wording of the questions to make the sentences more closely resemble that of American English instead of the original British English.

**Weakness:** To measure grip strength, we used the Jamar® hydraulic hand held dynamometer, model 5030J1, set at level 2. Two measurements were taken from both the right and left hands unless there was a limitation to the use of a hand due to an injury or IV placement in the hand. The highest measurement was used in the SHARE-FI equation.

**Exhaustion:** A patient who answered yes to the question “In the last month, have you had too little energy to do the things you wanted to do?” was defined as having exhaustion.

**Weight loss:** A patient who answered as having a “Decreased desire for food” to the question “What has your appetite been like?” or responded with “Less” to the question “So, have you been eating more or less than usual?” was defined as having weight loss.

**Slowness:** A patient who answered yes to either of the questions “Because of a health problem, do you have difficulty [expected to last more than three months] walking 100
yards (300 feet)” or “… climbing one flight of stairs without resting?” was defined as having slowness.

**Low Activity:** A patient’s activity level was evaluated based on the response to the question “How often do you engage in activities that require low or moderate level of energy such as gardening, cleaning the car, or taking a walk?” where such a variable is ordinal in that: 1 = ”More than once a week”; 2 = ”Once a week”; 3 = “One to three times a month”; and 4 = “Hardly ever or never.”

Using the five SHARE frailty variables, DFactor scores (DFS) were determined using the SHARE-FI formula. Based on the DFS value, the subject could then be categorized as non-frail, pre-frail, or frail.

**Frailty was calculated using the SHARE-FI formula and frailty categories**:\(^{9,10}\):

*For females:*

\[
DFS \text{ (females)} = (2.077707 * \text{Fatigue} - 0.757295) * 0.4088 + (3.341539 * \text{Loss of appetite} - 0.332289) * 0.3325 + (0.132827 * \text{Grip strength} - 3.534515) * -0.4910 + (2.627085 * \text{Functional difficulties} - 0.461808) * 0.6012 + (0.918866 * \text{Physical activity} - 1.523633) * 0.4818
\]
For males:

\[
DFS \text{ (males)} = (2.280336 \times \text{Fatigue} - 0.592393) \times 0.3762 + (4.058274 \times \text{Loss of appetite} - 0.263501) \times 0.3130 + (0.092326 \times \text{Grip strength} - 3.986646) \times -0.4653 + (3.098226 \times \text{Functional difficulties} - 0.365971) \times 0.6146 + (1.005942 \times \text{Physical activity} - 1.571803) \times 0.4680
\]

Frailty cutoffs for female:

- If predicted DFS < 0.3151361243, NON-FRAIL
- If predicted DFS < 2.1301121973, PRE-FRAIL
- If predicted DFS < 6, FRAIL

Frailty cutoffs for males:

- If predicted DFS < 1.211878526, NON-FRAIL
- If predicted DFS < 3.0052612772, PRE-FRAIL
- If predicted DFS < 7, FRAIL

We also obtained basic demographic information (age, gender, race), height, and weight (to calculate BMI). Based on an altered version of the Older Americans Resources and Services Activities of Daily Living (ADL) Scale, an Activities of Daily Living Questionnaire was administered to patients, which measures eight mobility related ADLs.\(^\text{11}\)
After thirty days (+/- 5 days), a follow-up phone call was made to patients to determine health outcomes and changes in the mobility related activities of daily living. Negative health outcomes consisted of death, repeat ED visits, subsequent hospitalizations, admission to a skilled nursing home, and incidence of falls. The activities of daily living scale was repeated during the call.

**Results**

Over an eight-week period (June 10-August 4, 2011), 134 patients were screened. Of the 90 potentially eligible patients, 33 were enrolled, 23 refused participation, and 34 were missed (due to the patient being out of the department for tests or discharge from the ED). Summa research personnel are continuing to enroll more subjects in this on-going study. The mean age of enrolled subjects was 79 ± 5.9 years (Table 1). Sixty-one percent (20/33, 95% CI 42-77%) were female, 85% were Caucasian (28/33, 95% CI 68-95%), and 15% were African-American (5/33, 95% CI 5-32%). The mean time for assessment of frailty and activities of daily living score was 6.5 ± 2.5 minutes.

The majority of subjects participating in the study were frail (55%, 18/33, 95% CI 36-72%); 27% (9/33, 95% CI 13-46%) were pre-frail, while only 18% (6/33, 95% CI 7-35%) were non-frail (Figure 2). An average frailty score (DFS) of 2.9 ± 2.4 (pre-frail) for men was determined, along with a 2.3 ± 1.2 (frail) for women. Of the subjects who were admitted to the hospital upon their initial ED visit (61%, 20/33, 95% CI 42-77%), 65% (13/20, 95% CI 41-85%) were classified as frail based on the SHARE-FI calculator, while only 20% (4/20, 95% CI 6-44%) of these subjects were non-frail.
According to the activities of daily living questionnaire, the average ADL score at enrollment was $14 \pm 3.2$. The median initial ADL score was 16 (interquartile range 13-16) (Figure 3).

For the assessment of ADLs and outcomes thirty days after the ED visit, two subjects were lost to follow-up, and one subject had died by the time of the follow-up call. The average follow-up ADL score was $13 \pm 3.8$. In comparing ADL scores at enrollment with follow-up ADL scores, the majority of patients displayed no change in their scores (43%, 13/30, 95% CI 25-63%); 37% of subjects (11/30, 95% CI 20-56%) showed a decrease in ADL score, while only 20% (6/30, 95% CI 8-39%) had an increase in ADL score (Figure 4).

Sixty-five percent (20/31, 95% CI 45-81%) of subjects with a follow-up had at least one negative outcome (Figure 5). Three percent of the subjects (1/31, 95% CI 0-17%) died, 6% (2/31, 95% CI 1-21%) had a return ED visit, 32% (10/31, 95% CI 17-51%) were hospitalized, 10% (3/31, 95% CI 2-26%) were admitted to an ECF, 13% (4/31, 95% CI 4-30%) experienced a fall, and 37% (11/30, 95% CI 20-56%) displayed a decline in their follow-up ADL score. Overall, 44% (11/25) of subjects with any frailty (pre-frail or frail) had a decline in function (subjects either experienced a decrease in ADL score or died) at thirty days compared to 17% (1/6) of non-frail subjects, which was a 27% difference (95% CI -8% to 63%). This is not statistically significant due to the small sample size but is a clinically important finding.
Table 1: Study Patients’ Demographic Information

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<tr>
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Figure 2: Calculated SHARE-FI Score Distribution at Enrollment

SHARE-FI Calculations at Enrollment

Frailty Category

Percent (%)

Non-frail | Pre-frail | Frail |
<table>
<thead>
<tr>
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</table>
Figure 3: Activities of Daily Living (ADL) Score Distribution at Enrollment

![ADL Score Distribution at Enrollment](image)

Figure 4: Grouping of Patient Comparison of ADL Scores Before and After Enrollment

![ADL Change After Enrollment](image)
Figure 5: Distribution of Patient Negative Outcome Status Type

Distribution of Patient Negative Outcomes

<table>
<thead>
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<td>Any Negative Outcome</td>
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<td>Death</td>
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<tr>
<td>Return ED Visit</td>
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<tr>
<td>Hospitalization</td>
<td>10</td>
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<tr>
<td>ECP</td>
<td>3</td>
</tr>
<tr>
<td>Fall</td>
<td>4</td>
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<tr>
<td>Negative Change in ADL</td>
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</table>
**Discussion**

Using SHARE-FI to assess frailty is feasible, as not only does the use of such an instrument require minimal time to determine a patient’s frailty status (average time of 6.5 minutes), but non-clinical personnel can use this straightforward tool without requiring physician or nurse assistance. Patients have minimal physically straining involvement in the evaluation of their frailty; they merely answer verbal questions (for those unable to answer for themselves, a proxy can answer such questions), and the only potential way of causing discomfort to the patient is via the hand grip test (which is a very minimal risk and no instances were noted by this researcher while enrolling subjects).

Based on the data in this study, the majority of those aged 65 and older who visit the ED are frail according to SHARE-FI calculations. Upon completing the 30-day follow-up calls, it was found that more than half of the subjects experienced one or more negative outcomes. The one subject who died had been classified as frail based on the initial ED SHARE-FI assessment. Additionally, all three of the subjects admitted to an ECF were determined to be frail by SHARE-FI, along with the four subjects who experienced falls after their initial ED visit. Furthermore, the data indicate pre-frail and frail patients are more likely to have a decline in function at thirty days which, while not statistically significant in this study, may be important to the clinical management of the pre-frail and frail patients after discharge from the ED or hospital. The results support findings from the Study of Osteoporotic Fractures (SOF) criteria and Fried’s criteria where it was determined that frail and pre-frail patients face a higher vulnerability of experiencing negative health outcomes.
Frail elderly patients visiting the ED constitute a vast proportion of the ED patient population. More than half of our enrolled study patients were classified as frail using SHARE-FI. Such frail patients have an increased vulnerability to physiological stressors due to their difficulty in maintaining homeostasis. Consequently, frail older patients may respond poorly to acute illness and injury, which are common reasons for ED visits in this age group. Hence, we support the assessment of frailty in these elderly ED patients due to the implications it may have in determining which patients are potentially at risk for adverse health outcomes following their ED visit. It is recommended that older ED patients be screened for frailty status as we believe it would help to devise the appropriate arrangement for outpatient care along with proper follow-up care for the ED presented problem along with the identified frailty syndrome. Future research that provides a more detailed view of the implications of being classified as frail is a crucial step to take to further enhance this study. Longitudinal studies looking at a longer period (greater than 30 days) of patients’ outcomes following their initial ED visit are needed to develop a more detailed relationship between frailty status and health outcomes. Additional research may also include studies that assess the relationship of a frail patient to acute illness.

One limitation of our study is the exclusion of a hand when administering the hand grip strength test via the dynamometer. Reasons for omission of either the left or right hand included the following: IV placement in the hand since we did not want to cause additional stress to a limb with an IV; an injury in the hand (reason for visiting the ED); or the physician refused to allow the patient to use a particular hand. Additionally, some interesting follow-up data was collected as some patients who had a middle to low ADL score upon initial ED evaluation had quite an increased ADL score at the 30-day follow-up. Some of these increases were noted not only for
non-frail patients, which is more understandable to see such results, but also for frail individuals. Some explanations for this include the patient not clearly understanding the questions being asked, different people answering the questions (patients could answer at enrollment and then proxies at 30-day follow-up and vice-versa), and altered mental status of the patient when answering questions, thus inaccurate responses could have been recorded. Lastly, in addition to the relatively small sample size of our study due to data collection from a single hospital, this study did not explore the possibility of a diagnosis of frailty being due to an acute illness.

**Conclusion**

Frailty is a common geriatric syndrome affecting many elderly patients who visit the ED. Being aware of this condition is important as it may be helpful in recommending appropriate treatment procedures and follow-up care for frail patients aged at least 65 who visit the ED. Due to its ease of use, SHARE-FI may be administered to elderly ED patients to diagnose frailty status. The minimal time to evaluate the patient combined with the user friendliness of this instrument allows it to be easily implemented into the geriatric ED evaluation. Our findings may help clinicians be aware of frailty-related issues and lead to interventions to minimize morbidity, repeat ED visits, hospitalizations, falls, and decline in ADLs following initial ED consultation.

**Acknowledgements**

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References


