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# Detecting Prefrailty: Comparing Subjective Frailty Assessment and the Paulson–Lichtenberg Frailty Index

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**Abstract**

We examined the level of agreement between subjective frailty assessments (SFA) and frailty classifications derived from the validated Paulson–Lichtenberg Frailty Index (PLFI). Clinic patients ($n = 202$) were classified as healthy, prefrail, or frail first by screening using the PLFI and later by two geriatric nurses and two geriatricians according to SFA. Of the 202 participants (mean age = 76.7 ± 8.6), 52 (26%) were prefrail and 57 (28%) were frail based on the PLFI. Geriatrician SFA aligned with the PLFI in 43.0% of prefrail and 65.7% of frail cases. Nurse SFA aligned with the PLFI in 43.9% of prefrail and 17.0% of frail cases. There was slight-to-fair agreement between SFA and PLFI (geriatrician: Cohen's $\kappa = .23$; 95% confidence interval (CI) = [.11, .35], $p < .001$; nurse: Cohen's $\kappa = .20$; 95% CI = [.08, .33], $p = .001$). Clinician SFA did not align well with PLFI classifications.

**Keywords**

frailty, geriatrics, African Americans

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## Background

Frailty is conceptualized as a decline in resilience across physical, cognitive, or psychosocial domains of functioning. Approximately 35% to 50% of older adults are prefrail, an intermediate phase between robustness and frailty. Prefrail older adults are 2 to 3 times more likely to develop frailty within 3 to 7 years than nonfrail elders (Bandeen-Roche et al., 2015; Fried et al., 2001). Frail older adults are more likely to experience premature morbidity (as high as a 50% increase in relative risk), mortality, and institutionalization (Shamliyan et al., 2013). The progression from health to frailty is neither inevitable nor irreversible as evidence-based treatments to improve frailty exist (Theou et al., 2011). Specifically, increasing physical activity and improving dietary quality (e.g., increasing protein intake, nutrient supplementation) have been shown to improve frailty status (Apostolo et al., 2018). Such treatments are most effective, however, when applied to prefrail individuals versus those that have already become frail (Theou et al., 2011).

We are limited, however, in our ability to intervene at the prefrailty stage among populations most at risk, in part because we lack mechanisms to ensure systematic and widespread frailty screening (Walston et al., 2019). Validated screening tools are seldom used in everyday practice, in part because they are time-consuming to administer, require special equipment or training, or are otherwise difficult to integrate into the clinic flow. Clinicians often rely instead on subjective frailty assessment (SFA) when determining which patients to refer for additional services and supports. SFA represents a "gut instinct" based on the provider's tacit assessment of multiple facets of frailty (O'Neill et al., 2016). A handful of studies have examined the utility of SFA to screen for frailty. Those studies suggest that physicians can differentiate between frail and healthy individuals (O'Neill et al., 2016; Van Kempen et al., 2015). However, those studies do not provide insights into the validity of SFA as a tool to identify individuals at the intermediate, prefrail stage (O'Neill et al., 2016). In addition, those studies do not compare the validity of SFA among clinicians with differing levels of training (e.g., physicians vs. nurses).

The goal of the proposed study was to examine the degree of agreement among a validated frailty screening

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**Table 1.** Primary Care Clinicians' Characteristics.

| Practice classification | Gender | Age | Race | Total years in practice |
|---|---|---|---|---|
| Physician 1 | Male | 63 | Caucasian | 32 |
| Physician 2 | Female | 44 | Other | 12 |
| Registered Nurse 1 | Female | 57 | African American | 30 |
| Registered Nurse 2 | Female | N/A | African American | >30 |

*Note.* N/A= not applicable, participant refused to report.

questionnaire, the Paulson–Lichtenberg Frailty Index (PLFI) (Paulson & Lichtenberg, 2015), and geriatrician and geriatric nurse SFA for detecting health, prefrailty, and frailty among older African American patients recruited from a geriatric primary care clinic. We hypothesized that there would be good agreement (≥75%) between the PLFI and SFA in classifying older adults as frail versus healthy. There is no prior research to suggest what a "good" level of agreement is when comparing SFA with validated measures. Thus, we chose an arbitrary cut point of 75% or greater as indicating an acceptable level of agreement. Because prefrailty is an intermediate state between robustness and frailty and potentially less easy to identify, we hypothesized that there would be poor alignment (≤75%) between the PLFI and SFA in their classifications of prefrailty, versus frailty and robust individuals. Finally, to examine whether or not the validity of SFA differs by type of clinician, we compared the level of agreement between geriatrician and nurse SFA.

## Method

The study protocol was approved by the Wayne State University Institutional Review Board, and participants provided written informed consent prior to conducting study activities (#126216B3E). Frailty status data derived from the PLFI were obtained as part of a clinical trial. As part of the trial, older African Americans, ages 55 years and older were screened by trained research assistants for frailty during their regularly scheduled primary care clinic visit. The trial focused exclusively on African Americans because they are 2 to 4 times more likely to become frail compared with their European American counterparts. The clinic from which participants were recruited is a patient-centered medical home as well as a geriatric center of excellence. As such, we hypothesized that clinic physicians and nurses would be well acquainted with the concept of frailty. Nonetheless, we provided geriatricians and geriatric nurses a definition of physical frailty based on criteria set for by the Cardiovascular Health Study (Fried et al., 2001).

For this study, we did not assess predictive validity because we were unable to follow participants prospectively to determine the degree to which SFA ultimately predicted further frailty (e.g., transition from prefrail to frail) or early morbidity and mortality. Instead, we assessed convergent validity of SFA by comparing them with frailty classifications based on the PLFI (Paulson & Lichtenberg, 2015). The PLFI is a self-report, five-question screening measure designed to identify physical frailty and is based on the same five criteria proposed in the Cardiovascular Health Study. Those criteria include wasting, weakness, exhaustion, slowness, and low physical activity. Individuals meeting none of the five criteria are considered robust/healthy: one to two criteria = *prefrailty* and three or more criteria = *frailty*. The PLFI was validated among a sample of 8,844 participants drawn from the Health and Retirement Study and is predictive of hospitalizations, loss of independence, and mortality. Because the PLFI consists of only five self-report questions and takes approximately 30 s to administer, it can easily be integrated into primary care settings.

PLFI derived frailty classifications were obtained for 202 older African American clinic patients. Next, and within 3 months of the patient's visit to the clinic, two geriatricians and two geriatric nurses (Table 1) were asked to classify participants into one of the same categories (healthy, prefrail, or frail) based on SFA. Clinicians were only asked to classify patients in the data set for whom they were listed as the attending physician or the nurse assigned to the patients care. The two geriatricians classified 58 and 65 patients, respectively ($n = 123$), and each of the geriatric nurses classified 58 and 69 patients, respectively ($n = 127$). There was some overlap among clinician SFA with $n = 55$ patients being classified by two different clinicians because both clinicians were involved in the patient's care. Clinicians were blinded to the PLFI classifications. Clinicians could, however, use the patient's medical record to assist in their SFA.

### Analysis

Descriptive statistics were used to show the prevalence of PLFI indicators among different frailty classifications. Cohen's kappa (Cohen, 1960) tests were used to examine the level of agreement between PLFI and SFA. To examine if any of the individual frailty criteria could explain discordant or concordant classifications, we further ran a series of chi-square or Fisher's exact tests on each of the five criteria (wasting, weakness, exhaustion, slowness, and low physical activity). To compare SFA agreement between geriatricians and nurses, SFA of Geriatrician 1 and Nurse 1 were compared with a

**Table 2.** Prevalence of Single Indicators of Paulson–Lichtenberg Frailty Index.

| | Prefrail cases ($n$ = 52) | | Frail cases ($n$ = 58) | |
|---|---|---|---|---|
| Indicators | $n$ | % | $n$ | % |
| Wasting | 13 | 25.0 | 23 | 39.7 |
| Weakness | 25 | 48.1 | 48 | 82.8 |
| Slowness | 24 | 46.2 | 50 | 86.2 |
| Fatigue | 7 | 13.5 | 30 | 51.7 |
| Low physical activity | 8 | 15.4 | 37 | 63.8 |

subgroup of 55 patients to estimate Cohen's kappa. We further use an independent $t$-test was also conducted to compare the deviation of SFA from PLFI between physicians and nurses. We coded both SFA and PLFI frailty data as an ordinal variable (1 = *healthy*, 2 = *prefrail*, 3 = *frail*), and defined the deviation variable by subtracting clinicians' SFA scores from PLFI. A negative deviation score indicates an overrated frailty status (e.g., when the PLFI indicates healthy, but the clinician rated the patient as frail or prefrail), while a positive score indicated underrated frailty status.

## Results

Of the 202 participants (mean age = 76.7 ± 8.6), 53 (26%) were prefrail and 58 (28%) were frail, and 91 (46%) were healthy based on the PLFI. The prevalence of PLFI frailty status and single frailty criterion in prefrail and frail individuals are listed in Table 2. For the pool of older African Americans that each provider evaluated via SFA, geriatrician SFA ($n$ = 123) aligned with the PLFI in 34.9% of healthy, 43% of prefrail versus 65.7% of frail cases. Nurse SFA ($n$ = 127) aligned with the PLFI in 74.5% of healthy, 43.9% of prefrail versus 17% of frail cases. There was slight agreement between SFA and PLFI (geriatricians: Cohen's $\kappa$ = .23; 95% CI = [.11, .35], $p < .001$; nurses: Cohen's $\kappa$ = .20; 95% CI = [.08, .33], $p$ = .001). No specific PLFI indicators independently explained discordant classifications (numbers not reported). For the subgroup analysis, there was no difference between the physicians' and nurses' SFA (Cohen's $\kappa$ = .02; 95% CI = [−.12, .17], $p$ = .74). Finally, with the full sample, there was a significance difference on the deviation of SFA from PLFI between physicians and nurses (Table 3).

**Table 3.** The Deviation of SFA From PLFI Frailty Status Between Physicians and Nurses.

| Practice Classification | $M$ | $SD$ | $t$ | $p$ | 95% CI |
|---|---|---|---|---|---|
| Physicians | 0.3 | 0.9 | 5.7 | <.001 | [.4, .8] |
| Nurses | −0.2 | 0.8 | | | |

*Note.* SFA = subjective frailty assessments; PLFI = Paulson–Lichtenberg Frailty Index; CI = confidence interval.

## Discussion

The purpose of this study was to evaluate the degree to which SFA, and of prefrailty in particular, aligned with classifications derived from a brief, validated screening tool, the PLFI. Provider SFA and classifications derived from the PLFI aligned in approximately 43% of prefrail cases. The results support our hypothesis that there would be ≤75% agreement between SFA and PLFI for prefrail patients. Because we anticipated providers would have more difficulty identifying prefrailty, this result was not unexpected. We did, however, expect a greater level of agreement between SFA and the PLFI with regard to frail and healthy patients. Few studies have compared SFA and validated frailty measures, and those that have also found relatively low agreement between physician SFA and a validated frailty measure. For example, the study by Heaney et al. (2019) found that of 19 patients with heart failure evaluated by three surgeons, agreement among SFA and a modified Fried frailty phenotype was 50% to 68%. Most prior studies, however, have been conducted among surgeons, and in particular cardiologists, because the ability of frail elders to survive and recover from surgical treatments is an area of concern. We speculated that because geriatricians have more familiarity and training with both frailty and treating older adults, their ability to subjectively differentiate states of frailty and health would better align with a validated frailty screening measure. The low agreement between SFA and the PLFI among our sample suggests that SFA may not be a substitute for the use of validated frailty screening measures. Future research should therefore focus on identifying how best to integrate existing, validated frailty assessments into the clinic flow. Some of this work is underway. For example, Pajewski and colleagues (2019) created an electronic frailty assessment that was constructed from variables already existent in the medical record.

Although the goal of our study was not to compare geriatrician and nurse SFA, we also note that within our sample, there was a high degree of agreement between geriatrician and nurse SFA for classifying prefrail patients, but not when classifying patients as frail or healthy. Although prior studies have compared SFA among physicians of different specializations and found relatively high levels of agreement among SFA (O'Neill et al., 2016), no studies to our knowledge have compared the degree of agreement of SFA between physician and other nonphysician providers. It is interesting that nurse SFA aligned less in cases of detecting frailty. It is possible that nurses were not as able to detect prefrailty simply because they do not receive the same level of training in frailty and its assessment as do physician providers and are not as

involved in patient's cases in the same way. Our results may also suggest using the medical record may not be useful for detecting frailty when the frailty assessment is based on a five-factor physical frailty phenotype. If, for example, we had compared provider SFA with the Frailty Index (Rockwood, 2016) and emphasized a deficits approach (e.g., more deficits are associated with greater frailty), then perhaps accessing the medical record would have resulted in some advantage in detecting differing levels of frailty. Given that nonphysician providers (i.e., physician assistants or nurse practitioners) are increasingly providing care for older adults, future studies should seek to understand the degree to which their SFA align, or not, with those generated by physicians and what other factors (e.g., how frailty is conceptualized and measured) might influence concordance or lack thereof.

Finally, we examined the data to determine if any of the five individual frailty criteria explained discordance between SFA and the PLFI, but no single indicator (e.g., wasting, weakness, slowness, fatigue, and low physical activity) explained discordance among frailty classifications. We found the most prevalent single indicator among prefrail cases was weakness (48.1%), which aligns with prior studies (Fernandez-Garrido et al., 2014).

### *Limitations*

There are a number of limitations to our study including the fact that SFA was collected retrospectively. Second, we selected a small number of clinicians from a single clinic site. Finally, we compared providers' SFA with a self-report frailty screening instrument. As the PLFI does not include objective performance measures, there is always a possibility that older African Americans underreported on some criteria. That may also explain why only 26% of our sample was prefrail based on the PLFI, compared with national estimates of 50% based on the Cardiovascular Health Study criterion.

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## Author Contributions

H.F. contributed to study concept and design, acquisition of subjects and/or data, analysis and interpretation of data, and preparation of manuscript. Y.-L.H. contributed to data, analysis and interpretation of data, and preparation of manuscript. P.P. contributed to acquisition of subjects and/or data and preparation of manuscript.

## Declaration of Conflicting Interests

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## Institutional Review Board Approval

The study was approved by the Wayne State University Institutional Review Board (#126216B3E).

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