SHORT REPORT

Retrospective Use of the Pictorial Fit-Frail Scale for Determination of Frailty Level in Hospitalized Older Adults with a Hip Fracture

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ABSTRACT

The Pictorial Fit-Frail Scale (PFFS) is a frailty tool consisting of visual images to comprehensively assess frailty across 14 domains that can be completed by health professionals, patients, or caregivers. The objective of this study was to explore the feasibility of using the PFFS retrospectively to determine a patient's frailty level using data from the hospital electronic health records (EHRs) of older adults admitted with an isolated hip fracture.

A random sample of 200 hip fracture patients admitted to a Level 1 Trauma Center hospital in New Brunswick was selected for review using the PFFS. The majority (94.5%) of hospital EHRs contained the clinical information needed to populate most of the 14 PFFS domains, allowing for determination of a frailty score. The mean raw PFFS frailty score was 9.7 (SD 6.6), consistent with moderate frailty. For all patients, a Frailty Index (FI) score was calculated, with the mean being 0.27 (SD 0.18), again consistent with moderate frailty. Comparing the PFFS score to the FI score, the percentage categorized as not frail or very mildly frail fell from 33.3% to 20.1%, and those considered severely frail rose from 30.7% to 34.9%.

The PFFS can be successfully used retrospectively with hospital EHRs to determine the frailty level of older patients. When converted to the FI score, there was an increase in the frequency and severity of frailty. This tool may provide a useful way to stratify older adults by frailty that can be helpful in evaluating health outcomes based on frailty levels.

Key words: Pictorial Fit-Frail Scale, frailty, older adults, hip fractures, electronic health records, retrospective review

INTRODUCTION

Frailty is a state of vulnerability that results in a decline in health and function. Frailty can lead to an increased risk of adverse health outcomes, higher rates of complications, and falls in older adults.[1,2] These falls can result in hip fractures, which are more likely to occur in frail older adults.[3] Currently, over 1.6 million Canadians over the age of 65 are living with frailty, and by 2030, this number is expected to rise to 2.5 million.[4] Research has shown that 21% of adults aged 65 or older hospitalized in New Brunswick were categorized as frail based on administrative data.[5] With an aging population, understanding frailty and how it impacts health outcomes is important.

Several tools exist to measure frailty, such as the Clinical Frailty Scale,[6] the Frailty Index,[7] and the Frailty Phenotype.[8,9] A scoping review of the literature demonstrated that determining frailty in hospitalized patients is often difficult.[10] Other frailty assessment tools have been used with electronic health records (EHRs), such as the electronic frailty index, which incorporates 36 health deficits to determine the frailty level of older adults from primary care EHRs in the United Kingdom.[11]

The Pictorial Fit-Frail Scale (PFFS) is a frailty tool consisting of visual images to assess frailty across 14 domains that can be completed by health professionals, patients, or caregivers.[12] This tool enables the assessment of older adults regardless of communication barriers, frailty severity, health literacy status, cognitive ability, or the lack of time and/or trained professionals.[12] The objective of this study was to explore the feasibility of using the PFFS in determining a patient's frailty level through a retrospective review of hospital EHRs for older adults admitted with a hip fracture.

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METHODS

A subset of 200 hip fracture patients was randomly selected from the entire sample of all (N=682) older adults (65 years or older) admitted to a New Brunswick hospital (designated as a Level 1 Trauma Center) with an isolated hip fracture between April 1st, 2015, and March 31st, 2019. This subset of 200 patients was informed from the feasibility, power, and sample size assessments of an ongoing frailty study from this population. Participants were sampled chronologically with every fourth patient being included in this frailty assessment. Therefore, this sample of 200 was a randomized sample of all isolated hip fracture patients admitted to one hospital over a four-year time frame and represents almost 30% (29.3%) of the entire sample of 682.

The information needed to complete the PFFS was accessed from the hospital's EHRs. To complete each of the PFFS domains, the research nurse, experienced in using the hospital's EHR, reviewed the charts to obtain information that best described the patient's usual health state or level of pre-admission function. The pertinent sections of the hospital's EHR included: the Nursing Admission Notes, the Nurses Focus Notes, the Physiotherapist Assessment, and the Physician Progress Notes. The nurse populated the PFFS domains following instructions on how to administer the PFFS.[13] Any questions arising during data collection from the EHR were answered by the study geriatrician.

The PFFS is a numerical scale with a total score range of 0 to 43 across 14 domains with the following point ranges: mood (0–3), number of medications (0–3), mobility (0–5), function (0–5), balance (0–3), social connections (0–4), daytime tiredness (0–4), memory and thinking (0–4), vision (0–2), hearing (0–2), pain (0–2), unintentional weight loss (0–2), aggression (0–2), and bladder control (0–2).[12] When no data about a domain were available, no points were assigned. Patients with missing data in four or more domains were excluded from the study.[13]

The raw PFFS scores were obtained by adding the scores from all 14 domains. Each score was then categorized into one of five frailty levels: not frail (0–3), very mildly frail (4–5), mildly frail (6–8), moderately frail (9–12), and severely frail (13 or greater).[12,14] This raw score was then converted into a Frailty Index (FI)[13] score to correct for those missing one to three domains. To calculate the FI score for all patients, the numerator was the sum of the scores in each of the domains and the denominator was the sum of the maximum score for the answered domains.[12,13] This was the recommended method by the original authors of the PFFS.[13] The FI scores were grouped into not frail (FI $\leq$0.1), mildly frail (0.1<FI$\leq$0.2), moderately frail (0.2<FI$\leq$0.3), and severely frail (FI>0.3).[15]

The study protocol was approved by the Research Ethics Board. Permission was received to use the Theou and Rockwood Pictorial Fit-Frail Scale Version 1.0.[12]

RESULTS

Of the 200 charts in this random sample, 11 were excluded. Ten had four or more missing domains, and one had not been admitted to the hospital. Therefore, the sample size of 189 older adults was used for analysis. Within the 189, one patient was admitted on two separate occasions for different hip fractures and was included twice in the patient count. The average age was 83.2 years, with 44.4% being 85 or older and 73.0% being female. The majority (73.0%) lived at home prior to admission (Table 1).

All patients had available data for the domains of bladder control, hearing, vision, memory and thinking, social connections, balance, function, mobility, and the number of medications. Data for the domains of mood, aggression, and unintentional weight loss was available more than 95% of the time. Of the 189 hip fracture patients, only 13 (6.9%) had complete data in all 14 domains. The majority (67.7%) were missing data in two domains, with the most common missing data being for the domains of daytime tiredness and pain (Figure 1).

TABLE 1.
Patient characteristics and frailty scores (n=189)

Age (years)	
Mean [SD]	83.2 [8.24]
Median [Min, Max]	83.0 [66.0, 101]
	No. of Patients (% of sample)
Less than 85 years of age	105 (55.6)
85 years of age and older	84 (44.4)
Sex	
Female	138 (73.0)
Male	51 (27.0)
Living Arrangements Prior to Hospital Admission	
Private Home/Apartment	138 (73.0)
Nursing Home	35 (18.5)
Residential Care Facility[a]	8 (4.2)
Hospital[b]	5 (2.6)
Assisted Living	3 (1.6)
Raw PFFS Score	*No. of patients (% of sample)*
Not Frail (0-3)	37 (19.5)
Very Mildly Frail (4-5)	26 (13.8)
Mildly Frail (6-8)	40 (21.1)
Moderately Frail (9-12)	28 (14.8)
Severely Frail (13 or greater)	58 (30.7)
Frailty Index Score	
Not Frail (FI$\leq$0.1)	38 (20.1)
Mildly Frail (0.1<FI$\leq$0.2)	44 (23.3)
Moderately Frail (0.2<FI$\leq$0.3)	38 (20.1)
Severely Frail (FI>0.3)	69 (36.5)

[a]Residential Care Facilities in New Brunswick are often referred to as Special Care Homes and provide 24-hour supervision and assistance with daily living but not nursing care.[16-18]

[b]Hospital bed was on an Alternative Level of Care or Chronic Care Unit.

Using raw PFFS scores, those categorized as severely frail comprised the largest single group of patients at 30.7% (n=58). When the not frail and very mildly frail categories were combined, they represented 33.3% (n=63) of the entire sample. The calculated FI scores showed that 34.9% (n=66) were classified as severely frail, and 20.1% (n=38) were not frail (Figure 2). The mean raw PFFS score was 9.7 (SD 6.6), consistent with moderate frailty. The mean FI score was 0.27 (SD 0.18), also consistent with moderate frailty.

DISCUSSION

This study demonstrated that it is possible to use the PFFS retrospectively to determine frailty levels of patients admitted with hip fractures. For most patients, the information needed to populate the PFFS was available in the hospital's EHR. The overall number of patients categorized as frail in this sample is higher than the previously reported 21% for New Brunswick; however, hip fracture patients are more likely to be older and more frail, so the findings would seem to align.[5]

While less than 10% of the charts had data available in the EHR for all 14 PFFS domains, the majority (n=189) met the criteria of having less than four domains with missing data so that an FI score could be calculated.[13] Using the FI score, the percentage of patients classified as mildly, moderately, and severely frail increased, and the percentage who were considered not frail decreased. Conversion of the PFFS score to an FI score allows for comparison across studies using the FI.

There are a few limitations to using the PFFS with hospital EHRs. A research assistant/nurse needs to be orientated on how to administer the PFFS and navigate the EHR. Different hospitals/clinics may vary in the availability of the clinical information needed and its location within the EHR. Most of the required information was found in the EHR's Nursing Admission Notes. The information collected for the PFFS was part of routinely collected data for clinical care and is, therefore, likely found in most institutions' EHRs, increasing generalizability to other centers. The domains of daytime tiredness and pain typically did not have information available. Daytime tiredness is not often collected as part of routine clinical data. Pain prior to admission may not have been reported as the focus of the admission to hospital is the current hip fracture and associated pain.

This study has demonstrated that health information from routine patient care can be used to populate the PFFS, determine a frailty level, and can be converted to a FI score. The PFFS can benefit researchers, health-care professionals, and administrators in evaluating frailty retrospectively for individual patients, which may be useful to stratify a patient population. This could allow for health outcomes to be explored by frailty status at an individual patient level, as opposed to more traditional measures such as age or comorbidities. Pursuing further validation work with the PFFS is required to better understand how it compares to other frailty tools, as well as to health outcomes such as mortality and falls.

CONCLUSION

This study has demonstrated that the Pictorial Fit-Frail Scale can be used retrospectively using information available in hospital EHRs. Most patients have enough data collected during usual patient care to populate the PFFS. Even with one to three of the 14 domains missing, a frailty level can still be determined.

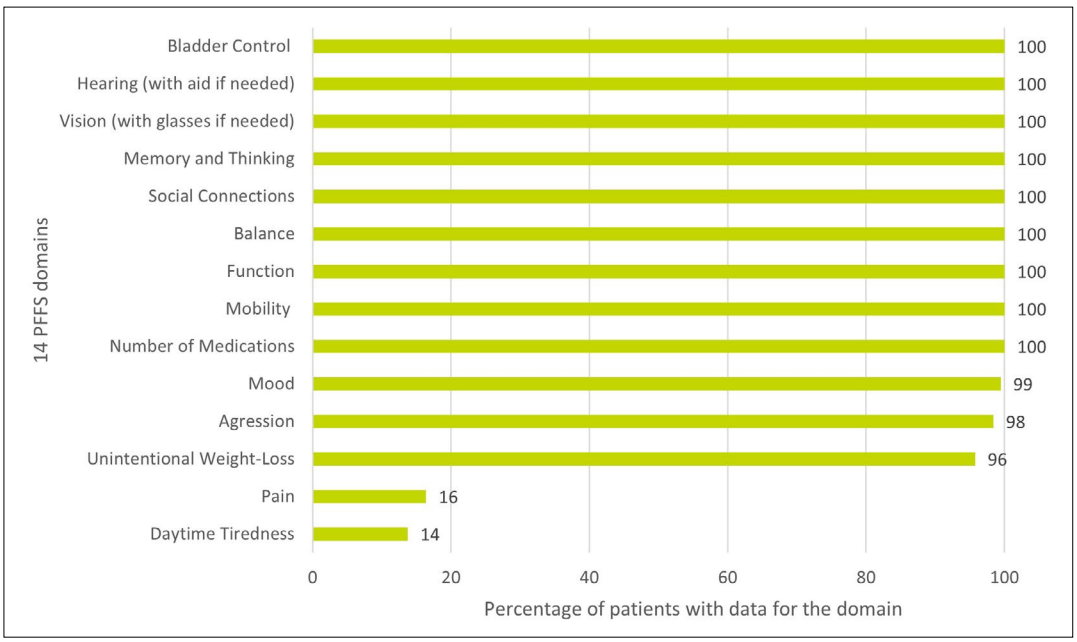
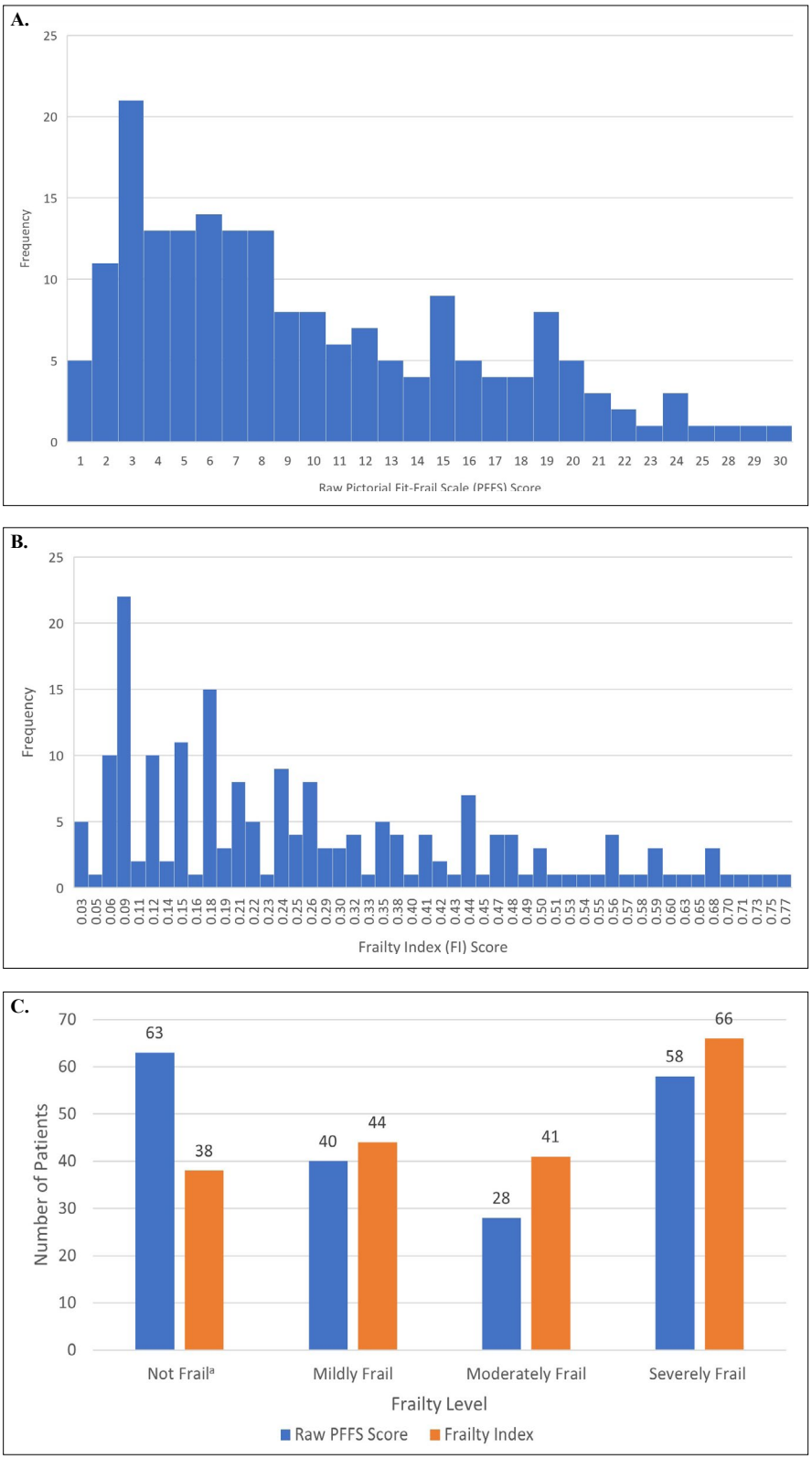


FIGURE 1. Percentage of patients with data for each of the 14 Pictorial Fit-Frail Scale (PFFS) domains (n=189)



[a]For the Raw Pictorial Fit-Frail Scale (PFFS) score, this section includes both the not frail and very mildly frail categories.

FIGURE 2. Pictorial Fit-Frail Scale (PFFS) and Frailty Index (FI) scores;
A: Distribution of raw Pictorial Fit-Frail Scale (PFFS) scores (n=189); B: Distribution of Frailty Index (FI) scores (n=189); C: Comparison of raw Pictorial-Fit Frail Scale (PFFS) scores and Frailty Index (FI) scores by frailty level distribution (n=189)

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Not applicable.

CONFLICT OF INTEREST DISCLOSURES

We have read and understood the *Canadian Geriatrics Journal*'s policy on disclosing conflicts of interest and declare no conflicts of interest.

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