ORIGINAL RESEARCH

Clinical Frailty Scale in an Acute Medicine Unit: a Simple Tool That Predicts Length of Stay

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DOI:http://dx.doi.org/10.5770/cgj.19.196

ABSTRACT

Background

Frailty is characterized by increased vulnerability to external stressors. When frail older adults are admitted to hospital, they are at increased risk of adverse events including falls, delirium, and disability. The Clinical Frailty Scale (CFS) is a practical and efficient tool for assessing frailty; however, its ability to predict outcomes has not been well studied within the acute medical service.

Objective

To examine the CFS in elderly patients admitted to the acute medical ward and its association with length of stay.

Design

Prospective cohort study in an acute care university hospital in London, Ontario, Canada, involving 75 patients over age 65, admitted to the general internal medicine clinical teaching units (CTU).

Measurements

Patient demographics were collected through chart review, and CFS score was assigned to each patient after brief clinician assessment. The CFS ranges from 1 (very fit) to 9 (terminally ill) based on descriptors and pictographs of activity and functional status. The CFS was collapsed into three categories: non-frail (CFS 1–4), mild-to-moderately frail (CFS 5–6), and severely frail (CFS 7–8). Outcomes of length of stay and 90-day readmission were gathered through the LHSC electronic patient record.

Results

Severe frailty was associated with longer lengths of stay (Mean = 12.6 ± 12.7 days) compared to mild-to-moderate frailty (mean = 11.2 ± 10.8 days), and non-frailty (mean = 4.1 ± 2.1 days, p = .014). This finding was significant after adjusting for age, sex, and number of medications. Participants with higher frailty scores showed higher readmission rates when compared with those with no frailty (31.2% for severely frail, vs. 34.2% for mild-to-moderately frail vs. 19% for non-frail) although there was no significant difference in the adjusted analysis.

Conclusion

The CFS helped identify patients that are more likely to have prolonged hospital stays on the acute medical ward. The CFS is an easy to use tool which can detect older adults at high risk of complicated course and longer stay. Objective early identification of seniors with frailty in acute care units can help to target interventions to prevent complications and to implement effective discharge planning in high risk older adults.

Key words: aging, frailty, Clinical Frailty Scale, length of stay, readmissions

INTRODUCTION

Patients over 65 account for approximately 14% of the population in Canada, however they occupy more than 40% of acute care beds.(1) Among this population, the frail elderly are at increased risk of the adverse events and complications during hospitalization. Frailty, distinct from co-morbidity and age, is a state of vulnerability predisposing certain individuals to increased risk of falls, delirium, disability, and mortality

during hospitalization, which consequently increases length of hospitalization stay.[2-5]

Frailty is prevalent in seniors ranging from 10%[6] of seniors in the community to 80% of seniors in long-term care settings.[7] On the acute medical service, frailty comprises between 50 to 80% of older adults.[8] Despite the prevalence and complications associated with frailty, few studies have determined the predictive ability of frailty status on length of stay on the acute general internal medicine ward, particularly with regard to easy-to-use tools for the non-specialized clinician. The few previous studies conducted in acute medical services have examined the value of complex scales, such as the frailty index,[9-10] which may require a comprehensive geriatric assessment and objective measures of strength and mobility. These tools may be cumbersome, impractical, or infeasible for older adults admitted in acute care settings.

The Clinical Frailty Scale (CFS), which uses clinical descriptors and pictographs, was developed to provide clinicians with an easily applicable tool to stratify older adults according to level of vulnerability. The CFS was validated in a sample of 2305 older participants from the Canadian Study of Health and Aging and was shown to be a strong predictor of institutionalization and mortality.[11-12] We have previously assessed the validity of the CFS in a sample of community-dwelling older adults and we found that it is a reliable tool. It is comparable to the Frailty Phenotype in identifying frailty status, with the advantage of being easy to administer without the requirement of complex objective measures such as handgrip or gait speed test.[12]

While there are a variety of different tools that can be used to assess frailty, we know that each tool serves a distinct purpose.[13] Previous studies used chart reviews to retrospectively explore the value of CFS for length of stay and other related health outcomes.[14,15] In line with these studies, we postulate that having an easy-to-apply tool can be a valuable and reliable instrument to predict length of stay to help general internists in discharge planning and optimizing health-care resource utilization. Therefore, the main purpose of this study was to determine the predictive ability of the CFS in acute care general medicine ward for length of stay. To the best of our knowledge, the predictive ability of the CFS for length of stay in acute care general medicine setting has not been prospectively explored.

METHODS

Study Population

Participants were already involved in an ongoing early mobilization for vulnerable elderly initiative (Move-On Project), aimed at increasing mobilization rates in older adults admitted to the clinical teaching units of the Department of Medicine at Victoria Hospital, London, Ontario. Inclusion criteria for the project were: being admitted to a CTU at Victoria Hospital, age 65 or older, with at least one chronic health condition, and requiring assistance with ambulation at baseline. Patients who were designated as palliative or who had an expected survival below seven days were excluded.

We chose the age cut-off of 65 and above to ensure a higher prevalence of frailty in our sample. Informed consent was obtained for each participant, and ethics approval was obtained from the University of Western Ontario Research Ethics Board.

Data Collection

Core medical and demographic data were collected from hospital records on all patients including age, sex, comorbidities, reason for admission, medications, social situation (from home or from Long Term Care), and number of falls in past 12 months. Functional status for activities of daily living (ADLs) and instrumental activities of daily living (IADLs) were assessed using the Katz and Lawton-Brody scales, respectively. Information was confirmed by a geriatrician with face-to-face assessments with the patients and family members.

The CFS scores were determined by a geriatrician trained in scoring with the CFS scale. Assessments took place within 48 hours of the admission, through chart review and face-to-face assessments with patients and families, to determine their baseline CFS prior to admission. The CFS was assigned from 1 (very fit) to 9 (terminally ill) (Figure 1).

Outcomes collected included length of stay, 90-day readmission rates, transfer to subacute medicine, long-term care placement, and death during hospital admission. Data were obtained from electronic medical records available for each participant in the LHSC PowerChart System by reviewing the patient visit list, discharge information, in-patient transfer, and death summary dictations up to 100 days following initial discharge. This was performed to ensure capturing patients who were admitted at the 90-day mark.

Statistical Analysis

Descriptive statistics, stratified by CFS frailty level, were evaluated using one-way ANOVA or Pearson chi-squared test where appropriate. CFS was collapsed according to three categories of frailty based on the CFS descriptions: CFS 1–4 non-frail, 5–6 mild-to-moderately frail, 7–8 severely frail. Patients with CFS 9 were excluded from the analysis because by definition they are terminally ill rather than frail. The mean length of stay between CFS categories was compared using one-way ANOVA and was adjusted for covariables using analysis of covariates.

Rates of 90-day readmission were compared among groups using cross-table analysis and Pearson chi-squared test. All statistical analyses were performed using PASW (version 18.0, SPSS Inc., Chicago, IL). Significance level was set at $p < .05$.

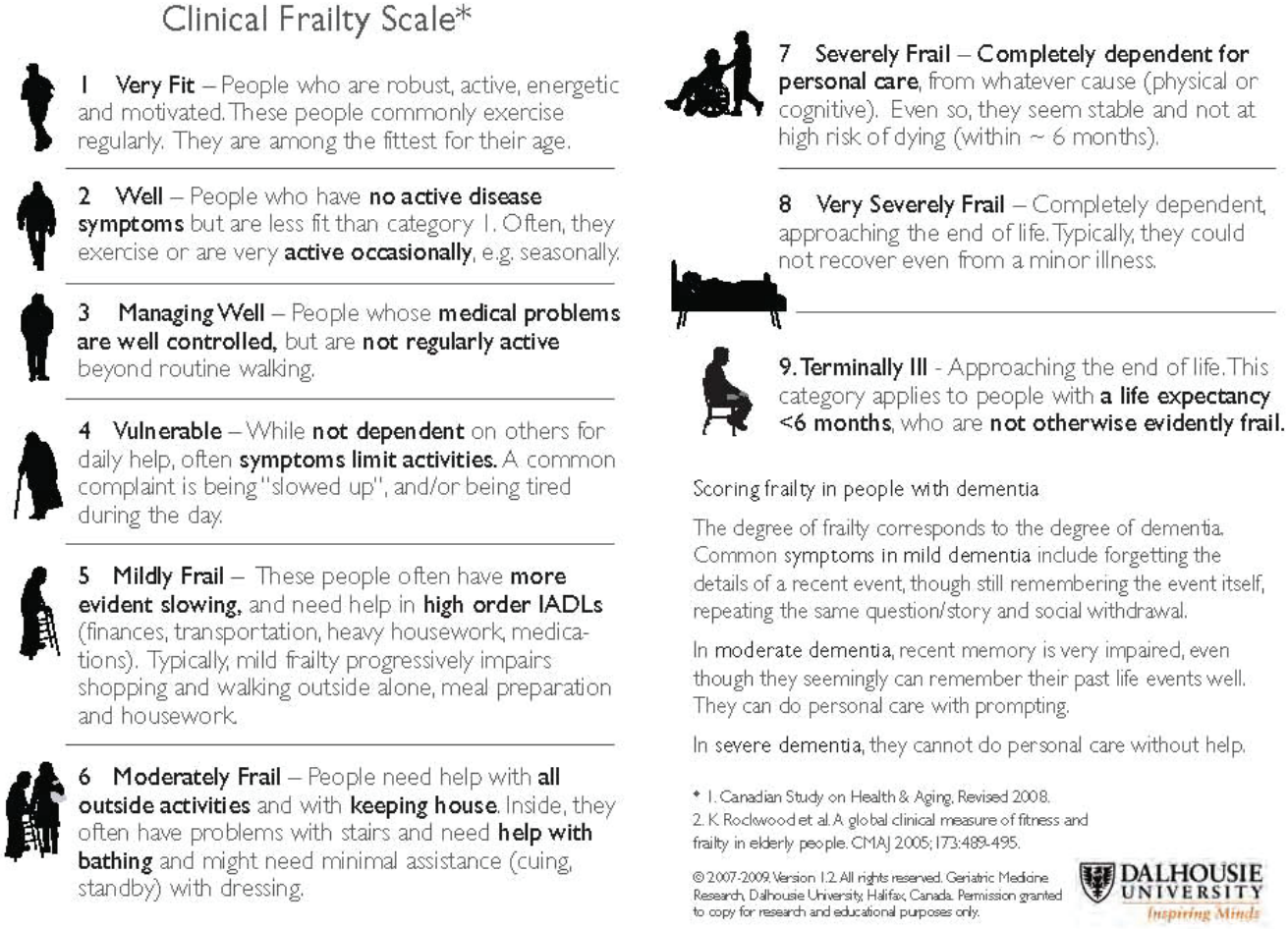

FIGURE 1. Clinical frailty scale

RESULTS

All participants were already involved in the early mobilization program and consented to be part of this study. From the original 77 participants, 2 were excluded—one due to missing data and the other as an extreme outlier (18.5 SDs away from the mean in length of stay variable). This resulted in 75 patients in the final analysis.

Demographic and clinical characteristics of all included study participants are shown in Table 1, stratified by CFS frailty category. Mean age was = 81.39 ± 8.76; range 65 to 98, and 64% were female. The CFS scores assigned ranged from 2 (well) to 8 (very severely frail), with a mean ± SD of the FS of 5.23 ± 1.58 and median CFS of 6. Collapsing the CFS categories resulted in 21 patients with CFS 1–4 (non-frail), 38 patients with CFS 5–6 (mild-to-moderately frail), and 16 patients with CFS 7–8 (severely frail).

Those in higher CFS strata had more co-morbidities and medications at baseline. They were also more likely to be female, require assistance or be dependent with IADLs and ADLs, and to come from a long-term care facility (LTC). Patients in higher frailty strata also tended to be older, but the difference was not statistically significant (Table 1).

The mean length of stay of the complete sample was 9.49 days (SD = 10.21, range 1 to 49). Table 2 examines the length of stay stratified by each individual CFS score. Although the association was not significant, patients with higher CFS scores had longer lengths of stay, except for those with CFS score 8. As shown in Table 3, severe frailty (CFS 7–8) was associated with longer lengths of stay (mean 12.56 days, SD = 12.73) compared to mild-to-moderate frailty (mean 11.16 days, SD = 10.83) and non-frailty (mean 4.1 days, SD = 2.1), $p = .014$. After adjusting for age and gender, the association was still significant ($p = .022$).

Among the three CFS categories, readmission rates were 19% for non-frail patients vs. 34.2% for mild-to-moderately frail patients vs. 31.2% for severely frail patients (p= 0.464). Other outcomes included death during admission (1 patient with CFS = 5) and placement in LTC (2 patients with CFS = 6 and 1 patient with CFS = 7), but these were infrequent.

TABLE 1.
Demographics and clinical characteristics according to frailty status at admission

Characteristic	*Frailty Groups*				*p Value*
	Total Sample (n=75)	*CFS 1–4 (non-frail) (n=21)*	*CFS 5–6 (mild-to-moderately frail) (n=38)*	*CFS 7–9 (severely frail) (n=16)*	
Age, mean (±SD)	81.39 (±8.8)	77.50 (±9.6)	82.50 (±8.6)	83.70 (±6.4)	*p*=.052
Females, n (%)	48 (64%)	9 (42.9%)	30 (78.9%)	11 (68.8%)	*p*= .037
No. of medications, mean (±SD)	6.2 (±3.4)	7.6 (±3.4)	9.0 (±3.1)	9.0 (±2.1)	*p*=.002
No. of comorbidities, mean (±SD)	6.2 (±2.1)	4.9 (±2.2)	6.6 (±1.8)	6.9 (±2.01)	*p*=.024
History of falls in past year n, (%)	29 (38.7%)	3 (14.3%)	18 (47.4%)	8 (50%)	*p*=.025
Baseline dependence or assistance for IADLs[a], n (%)	55 (73.3%)	5 (23.8%)	34 (89.5 %)	16 (100%)	*p*<.001
Baseline dependence or assistance of ADLs[a], n (%)	25 (45.4%)	0	11 (28.9%)	14 (87.5%)	*p*<.001
From LTC, n (%)	17 (22.7%)	0 (0%)	8 (21%)	9 (56.3%)	*p*<.001

[a]Dependency in ADL or IADLS was defined as having at least one deficit in the Katz and Lawton Brody scales, respectively.

DISCUSSION

Frailty status evaluated using the CFS predicted hospital length of stay. Our results are in line with previous studies which have found that frailty predicts length of stay in specific populations such as post-surgical patients,[16] patients on subacute medicine,[17] and patients with acute coronary syndrome undergoing percutaneous coronary intervention (PCI).[18-19] These studies have used a variety of frailty scales including the CFS; however, it is difficult to apply the results of these studies to the Acute Medical service where patients have a wide variety of acute medical problems.

On the Acute Medical service, frailty has been associated with higher mortality, complications, institutionalization, and length of stay.[9-10] However, the majority of these studies have utilized other frailty scales, such as the comprehensive geriatric assessment frailty index (FI-CGA). While comprehensive, the FI-CGA is time-consuming and generally requires multidisciplinary professionals, as well as specialized physicians in Geriatrics. One study conducted in the UK used the CFS to determine frailty patients in a specialized Acute Medical Unit, units specifically designed for rapid assessment and discharge from the unit within 48 hours.[20] The study dichotomized the outcome of frailty to short (< one day) and long stays > six days, and found that frailty by CFS does not predict short stays or long stays using the receiver operating curve.[21] Another study conducted in Edmonton, Canada, did explore frailty using the CSF on the acute general medicine wards, and found frailty was associated with increased mortality and readmissions post-discharge.[22] However, length of stay was not explored as an outcome. In Sydney, Australia, a larger study including more than 2,000 patients explored the CFS in patients admitted to their Geriatric unit for acute medical issues, including mostly geriatric-targeted issues such as delirium, deconditioning, and functional impairment.[23-24] In that study, frailty was found to predict in-hospital mortality, new nursing home placement, and length of stay. Conversely, our study examined elderly patients admitted to the acute general internal medicine ward using the CFS, and adds to these previous studies supporting the use of the CFS to predict outcomes on the general medicine ward.

TABLE 2.
Description of the Length of Stay stratified by individual CFS scoring

CFS	*N*	*Length of Stay (SD)*
1	0	N/A
2	5	3.80 (1.92)
3	11	4.27 (2.24)
4	5	4.20 (2.17)
5	12	8.67 (9.01)
6	26	12.31 (11.53)
7	15	12.87 (13.11)
8	1	8.0

CFS = clinical frailty scale, N = number of patients, SD = standard deviation.

Interestingly, the difference in length of stay between mild-to-moderately frail and severely frail patients (11.2 vs. 12.6) was small. Also, when examining each CFS in the severely frail category, patients with CFS 7 had a longer length of stay (12.9 days) compared to CFS 8 (8.0 days). We believe this may be because more severely frail patients (CFS 8) were bed-bound and likely to be discharged back to their nursing homes where their beds were kept on hold. Similarly,

TABLE 3.
Association between frailty category stratified as non-frail, moderately frail, and severe frail, and length of stay and readmission rates

Outcome Variable [mean(±SD)]	*CFS 1–4 non-frail (n=21)*	*Sample Stratified by Frailty Status*		*p Value*	
		CFS 5–6 moderate frail (n=38)	*CFS 7–9 severe frail (n=64)*	*Unadjusted*	*Adjusted*
Stay					
Length of stay	4.1 (±2.1)	11.2 (±10.8)	12.6 (±12.7)	**0.02**[a]	**0.014**[a]
Readmission					
Rate at 90 days, % (patients proportion)	19% (4/21)	34.2%(13/28)	31.2 % (5/16)	**0.02**[a]	0.464

[a]Linear regression modeling adjusted for age, sex, and comorbidities; significant values after adjusting.
CFS = Clinical Frailty Scale, SD = standard deviation.

more severely frail patients are less likely to be readmitted as their goals of care change when they are near end of life.

The difference in total number of days of 4.1 in non-frail patients and 12.6 days in severely frail patients is also clinically and economically significant, given the increased risk of nosocomial complications, such as decreased mobility associated with prolonged hospital stays, as well as health-care budget spent on extra days of hospital admission.

Some limitations of our study need to be outlined. The relatively small sample size of patients in this prospective cohort may preclude us from detecting stronger associations. The clinician assigning CFS scores was not blinded from the patient demographic characteristics, co-morbidities, medications, and functional status. Nevertheless, we believe that knowing this information provides an extra understanding for the assignment of the frailty score. The patients were admitted with a variety of conditions or presenting complaints, and we did not account for associations between reason for admission and length of stay. On the other hand, strengths of our study include a comprehensive evaluation of frailty status performed by a trained geriatrician in a homogenous sample of patients from the general internal medicine ward, where frailty is prevalent and relevant for important outcomes.

CONCLUSIONS

The CFS predicted length of stay in this prospective study. The CFS was easy to apply and time efficient, validating its clinical applicability in our setting. In addition, the CFS can help to understand the heterogeneity of aging[20] in an acute medical ward and, in this case, have a practical applicability to detect those older individuals at risk of length of stay in a general medical ward. Recognizing frailty severity early on during admission may allow general clinicians to stratify patients into their level of risk for frailty-related outcomes and plan treatments and interventions to ameliorate future complications, which may decrease length of stay. Target interventions, including early mobilization, can be applied in frailer populations when they are identified and, consequently, help decrease length of stay and improve adverse outcomes.[21]

ACKNOWLEDGEMENTS

Dr. Montero-Odasso's research program in mobility, cognition, and aging is supported by grants from the Canadian Institute of Health and Research (CIHR), the Canadian Consortium on Neurodegeneration in Aging (CCNA), the Drummond Foundation, the Physician Services Incorporated Foundation of Canada, the Ontario Ministry of Research and Innovation, and by Department of Medicine Program of Experimental Medicine from the University of Western Ontario. He is the first recipient of the Schulich Clinician-Scientist Award and holds the CIHR New Investigator Award (2011–2016). We are grateful to Anam Islam, MSc, for her valuable help in the analysis and manuscript editing. This study was supported by a peer reviewed grant from CIHR, the Institute of Aging and from the Program of Experimental Medicine (POEM) at the Department of Medicine, UWO.

CONFLICT OF INTEREST DISCLOSURES

The authors declare that no conflicts of interest exist.

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