



THE UNIVERSITY of NORTH CAROLINA
GREENSBORO

School of Nursing

Frailty Assessment in Hospitalized Older Adults using the Electronic Health Record

Lekan DA*, Wallace DC*, McCoy TP*, & Whitson H.**

*University of North Carolina at Greensboro, **Duke University

INTRODUCTION

Hospitalization is hazardous for older people. Many hospitalized older adults experience higher rates of surgical or treatment-related complications, falls, delirium, infection, pressure ulcers, and dehydration and frailty may be influential. The prevalence of frailty in medical inpatients ranges from 17.9-66.4% (Joosten et al., 2014; Oo et al., 2013; Pilotto et al., 2008; Wou et al., 2013). Consequences of frailty includes new and worsening morbidity, dependence, disability, early and multiple rehospitalizations, institutionalization, lower quality of life, and mortality.

Frailty assessment is a way to augment the accuracy of risk and disease-focused assessments to better identify patients who are more likely to “crash and burn” yet appear stable and capable of withstanding the stresses of procedures, treatments, and surgery.

PURPOSE

The purpose of this study was to: 1) characterize frailty in hospitalized older adults using clinical data from the electronic health record (EHR) with a frailty risk score derived using a biopsychosocial framework, and 2) determine associations between frailty and time to in-hospital mortality and 30-day rehospitalization.

BACKGROUND

Frailty is a clinical syndrome resulting from physiologic impairments and failed integrative responses to stressors in multiple interrelated systems and distinguished by reduced resilience and poor bounce-back from adverse health events. Frail older adults are more susceptible to the stresses of acute illness and hospitalization, at greater risk for complications from treatment and surgery, and experience worse outcomes than persons who are not frail (Afilalo et al., 2014; Basic & Shanley, 2015). Research indicates that frailty assessment is a consistent and significant predictor of deleterious outcomes in hospitalized older adults (Afilalo et al., 2014; Hilmer et al., 2009). Assessment tools are needed to identify frail patients and to guide clinical decision-making and care management and monitor treatment effects. Many existing instruments are time consuming and burdensome to implement in clinical practice; a tool is needed that does not utilize existing clinical data. The repository of clinical data in the patient electronic health record (EHR) can be used in frailty assessment and for risk stratification.

METHODS

Design: This retrospective, cross-sectional, correlational study.

Sample/Setting: The convenience sample included hospitalized adults ≥ 55 years admitted from June 1, 2010-August 31, 2011, to general medicine, cardiology, or orthopedics units at a 938-bed, not-for-profit, tertiary care hospital located in Southeastern U.S. and had data for 4 serum biomarkers: albumin, CRP, hemoglobin, and WBC.

Data Collection: Manual data abstraction from the EHR of PDF files of structured and unstructured information. Ethics: IRB approval of Duke University and University of North Carolina at Greensboro.

Frailty Risk Score: Frailty was operationalized by 16 risk factors which included fatigue, weakness, dyspnea, chronic pain, falls, vision disorders, smoking, urinary incontinence, nutrition (BMI, weight loss, poor appetite), social support, albumin, CRP, hemoglobin, WBC. Frailty risk factors were counted as “yes = 1”, “no = 0”, and a score was computed (0-16), where higher scores indicated increased frailty. Frailty Risk Scores were used to model time to in-hospital mortality and 30-day rehospitalization.

RESULTS

The sample included 278 patients, 55-98 years ($M=70.2$ years, $SD=10.3$) (Table 2). A majority were female (53%), Caucasian (64%), married (51%), living at home (54%). Thirteen patients (4.7%) died during hospitalization, 33 (11.9 %) were re-hospitalized within 30 days of discharge, and mean LOS was 9.92 days ($SD=9.58$, range =1-72). Estimated hazard ratios (HR) of Frailty Risk Score effects on time to in-hospital death for select percentiles of follow-up time (Figure 1) indicated that increased Frailty Risk Score is associated with increased risk of in-hospital death at ~ 3 days \leq LOS ≤ 7 days and then becomes non-significant until extreme LOS, where the association flips direction. At 3 days, each 1-point increase in the Frailty Score is associated with a 127% increase in the instantaneous risk of death (adj $HR=2.27$, 95% $CI=(1.40, 3.67)$). At 18 days the effect of frailty is null (adj $HR=0.89$, 95% $CI=(0.55, 1.46)$). Estimated cut-offs of Frailty Risk Scores based on decision trees from recursive partitioning indicate a cut score ≥ 10 is most salient for mortality if female, <80 years of age, and White.

Based on a cut score of 9, frailty prevalence was 68%. Compared to non-frail, frail patients were older ($M = 71.6$ years ± 10.5 vs $M = 67.2$ years ± 9.3), female (56% vs 47%), and non-White (39% vs 31%).

For rehospitalization, in multivariable logistic regression models, higher Frailty Risk Scores were marginally associated with increased odds of 30-day rehospitalization in patients who did not die in-hospital ($AOR=1.18$, 95% $CI=(0.98, 1.43)$, $p=0.086$). The ROC curve was significantly above 0.5 ($AUC=0.66$, 95% $CI = (0.57, 0.76)$, $p=0.003$) (Figure 2). A similar cut-off score of ≥ 9 based on decision tree from recursive partitioning is most salient for rehospitalization among those alive at discharge and White.

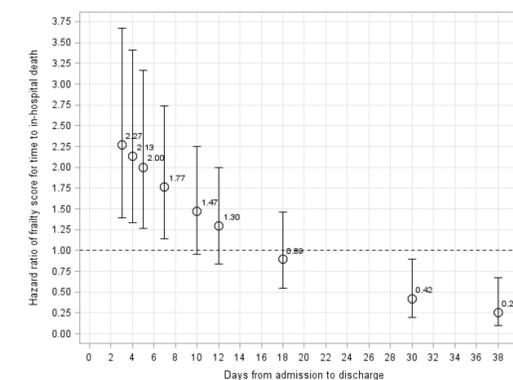


Figure 1. Hazard Ratios of the Frailty Risk Score from Extended Cox Modeling of Time to In-hospital Death

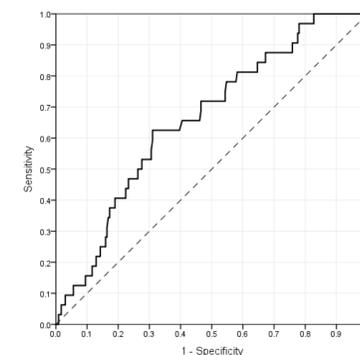


Figure 2. Receiver Operating Characteristic (ROC) Curve for 30-Day Rehospitalization

DISCUSSION

The highest mortality risk occurred during the first 3 hospital days, and these patients had higher Frailty Risk Scores. Greater awareness of the adverse impact of during hospitalization may alert clinicians to intensify monitoring and treatment. Weighted and unweighted Frailty Risk Scores yielded similar results which suggests there were no strong, individual drivers of frailty. This finding may facilitate adoption of this tool by clinicians since computing a frailty score does not involve complex computations. Further analyses of the Frailty Risk Score can assess for risk factor subgroups and outcomes in future research.

REFERENCES

- Afilalo, J, Alexander, KP, Mack, MJ, Maurer, MS, Green, P, Allen, LA, ...Forman, DE (2014). Frailty assessment in the cardiovascular care of older adults. *Journal of the American College of Cardiology*, 63(8), 747-762. doi: 10.1016/j.jacc.2013.09.070
- Basic, D, & Shanley, C (2015). Frailty in an older population: Using the clinical frailty scale to predict patient outcomes. *Journal of Aging & Health*, 27(4), 670-685. doi: 10.1177/0898264314558202
- Lekan, DA, Wallace, DC, McCoy, TP, Hu, J, Silva, S, & Whitson, H. Frailty assessment of hospitalized older adults using the electronic health record. *Biological Research for Nursing* (in press).
- Joosten, E, Demuyne, M, Detroyer, E, & Milisen, K (2014). Prevalence of frailty and its ability to predict in hospital delirium, falls, and 6-month mortality in hospitalized older patients. *BMC Geriatrics*, 14(1), 1-9. doi: 10.1186/1471-2318-14-1
- Oo, MT, Tencheva, A, Khalid, N, Chan, YP, & Ho, SF (2013). Assessing frailty in the acute medical admission of elderly patients. *The Journal of the Royal College of Physicians of Edinburgh*, 43(4), 301-308. doi: 10.4997/JRCPE.2013.404
- Pilotto, A, Ferrucci, L, Franceschi, M, D'Ambrosio, LP, Scarelli, C, Cascavilla, L, ... Leandro, G (2008). Development and validation of a multidimensional prognostic index for one-year mortality from comprehensive geriatric assessment in hospitalized older patients. *Rejuvenation Research*, 11(1), 151-161. doi: 10.1089/rej.2007.0569