

# Canadian Study of Health and Aging Clinical Frailty Scale: Does It Predict Adverse Outcomes among Geriatric Trauma Patients?

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- BACKGROUND:** The Canadian Study of Health and Aging Clinical Frailty Scale (CFS) and the laboratory Frailty Index (FI-lab) are validated tools based on clinical and laboratory data, respectively. Their utility as predictors of geriatric trauma outcomes is unknown. Our primary objective was to determine whether pre-admission CFS is associated with adverse discharge destination. Secondary objectives were to evaluate the relationships between CFS and in-hospital complications and between admission FI-lab and discharge destination.
- STUDY DESIGN:** We performed a 4-year (2011 to 2014) retrospective cohort study with patients 65 years and older admitted to a level I trauma center. Admission FI-lab was calculated using 23 variables collected within 48 hours of presentation. The primary outcome was discharge destination, either adverse (death or discharge to a long-term, chronic, or acute care facility) or favorable (home or rehabilitation). The secondary outcome was in-hospital complications. Multivariable logistic regression was used to evaluate the relationship between CFS or FI-lab and outcomes.
- RESULTS:** There were 266 patients included. Mean age was  $76.5 \pm 7.8$  years and median Injury Severity Score was 17 (interquartile range 13 to 24). There were 260 patients and 221 patients who had sufficient data to determine CFS and FI-lab scores, respectively. Pre-admission frailty as per the CFS (CFS 6 or 7) was independently associated with adverse discharge destination (odds ratio 5.1; 95% CI 2.0 to 13.2;  $p < 0.001$ ). Severe frailty on admission, as determined by the FI-lab (FI-lab  $> 0.4$ ), was not associated with adverse outcomes.
- CONCLUSIONS:** Pre-admission clinical frailty independently predicts adverse discharge destination in geriatric trauma patients. The CFS may be used to triage resources to mitigate adverse outcomes in this population. The FI-lab determined on admission for trauma may not be useful. (J Am Coll Surg 2017;■:1–8. © 2017 by the American College of Surgeons. Published by Elsevier Inc. All rights reserved.)

It is projected that 21% of the US population will be aged 65 years or older by 2050.<sup>1</sup> As a result, there will be a

rapid increase in the number of elderly injured every year. Individuals aged 65 years or older represented 15% of all major trauma hospitalizations in 2004; by 2014, this number rose to 28%.<sup>2,3</sup> It is estimated that the elderly will account for 39% of trauma admissions by 2050.<sup>4</sup> Older trauma patients have worse outcomes than younger patients, with higher mortality, higher complication rates, adverse discharge outcomes, and longer hospital stays.<sup>5-8</sup>

Development of adverse outcomes in the geriatric population cannot be explained solely by advanced age.<sup>9-11</sup> The increased vulnerability to adverse outcomes among older trauma patients is likely, in large part, due to frailty.<sup>12-15</sup> Frailty is a multidimensional state of loss of physiologic reserves including energy, physical ability,

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**Abbreviations and Acronyms**

CFS	= Clinical Frailty Scale
FI	= Frailty Index
FI-lab	= laboratory Frailty Index
GCS	= Glasgow Coma Scale
IQR	= interquartile range
ISS	= Injury Severity Score

cognition, and health that gives rise to vulnerability to poor health outcomes due to a decreased ability to withstand physiologic stress.<sup>13,16</sup> Frailty on admission, as determined by the 50-variable Frailty Index (FI) and an abbreviated 15-variable Trauma-Specific Frailty Index, has been shown to be associated with in-hospital complications and adverse discharge disposition in geriatric trauma patients.<sup>10,11</sup> However, these measures require many variables, several of which need to be derived from self-report by patients and their families.<sup>10,11,15</sup> A systematic review by McDonald and colleagues<sup>15</sup> evaluating these tools alongside other frailty clinical assessment tools concluded that there is a lack of objective, feasible, and useful measures to assess frailty in geriatric trauma patients.<sup>15</sup> There is a need to identify frailty tools that can easily be implemented and feasibly be used to guide management and decision-making in the geriatric trauma population.

The 7-point Clinical Frailty Scale (CFS) is a frailty tool derived using data from the Canadian Study of Health and Aging, a national 5-year prospective cohort study of elderly Canadians aged 65 years and older.<sup>13</sup> The CFS is a judgment-based scale that considers clinical data on a patient's cognition, mobility, function, and comorbidities.<sup>13</sup> This scale has been shown to have good criterion and construct validity, and shows associations with increasing risk of death and institutionalization.<sup>13</sup> In contrast to the CFS, the laboratory Frailty Index (FI-lab) is a more objective measure of frailty that is calculated using routine physical and laboratory tests.<sup>17</sup> It has been shown to predict mortality in older patients both in the long-term care setting and in the community.<sup>17-19</sup> The FI-lab has never been assessed in the trauma setting. Both the CFS and FI-lab may be easier to implement compared with the 50-variable FI and Trauma-Specific Frailty Index, but their utility as predictors of poor outcomes in geriatric trauma patients is unknown.

The primary objective of this study was to determine whether pre-admission CFS is an independent predictor of adverse discharge destination (death or discharge to long-term care, chronic care, or another acute care facility). Secondary objectives were to determine whether CFS is an independent predictor of in-hospital complications and

whether admission FI-lab is associated with adverse discharge destination.

**METHODS****Study design, population, and setting**

This is a retrospective cohort study of patients 65 years and older, admitted to the trauma service at our institution from January 2011 to December 2014. Our institution is an academic, level 1 trauma center with a proactive geriatric trauma consultation service, whereby all patients 65 years and older with a trauma team activation and admitted to the trauma service are seen by a geriatrician within 72 hours of admission for a comprehensive geriatric assessment. Patients who were not seen by the geriatric trauma consultation service were excluded from the study. Patients who died within 48 hours of admission or had a length of stay less than 3 days were also excluded because the consequences of frailty become more apparent for patients who have longer lengths of stay in-hospital. Patients with frailty are more vulnerable to hospital structures and processes of care, predisposing them to high rates of hospitalization-associated disability.<sup>20,21</sup> In contrast, outcomes in the first 48 hours tend to be determined by the extent of injury severity rather than a patient's baseline frailty status and the effect of their hospitalization. Institutional approval for the conduct of this study was obtained from the institution's Research Ethics Board.

**Data sources**

Demographic and outcomes data were retrieved from the institutional Trauma Registry Database. Demographic data included age, sex, comorbidities, Glasgow Coma Scale (GCS) on hospital presentation, Injury Severity Score (ISS), and mechanism of injury. Registry data are routinely reviewed by the Canadian Institute of Health Information and the National Trauma Data Bank in the US.<sup>22,23</sup> Both systems have data validators that are used to ensure accuracy of the registry database; in addition, internal monthly, quarterly, and annual data quality reviews are performed to ensure data accuracy and reliability. Paper and electronic medical records were abstracted for admission laboratory values, vital signs, and the CFS score. All data were abstracted on the basis of the study protocol guidelines by 1 of 2 designated study personnel.

**Clinical Frailty Scale**

The geriatrician determines the CFS score during the initial consultation, through history obtained from the patient, family, and/or other health care providers about

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