Frailty is a Better Marker than Age in Predicting Postoperative Mortality and Complications Following Pelvis and Lower Extremity Trauma

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Purpose: "Frailty" has been described as a physiologic marker of decline of multiple organ systems and identifies patients who are more susceptible to complications following the external stress of trauma. Multiple medical and surgical specialties have shown higher complication rates in frail patients, including increased mortality and need for long-term care. This purpose of this study was to evaluate frailty as an independent predictor of postoperative complications in elderly patients with pelvis and lower extremity trauma.

Methods: The American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database from 2005-2014 was queried for patients 60 years and older who underwent surgery for pelvis, acetabular, and lower extremity trauma. A previously described modified frailty index (MFI) was utilized. In this, the presence of 11 variables are summated, including diabetes, congestive heart failure, hypertension, myocardial infarction, cerebrovascular accident with and without neurological deficit, peripheral vascular disease, functional status, COPD (chronic obstructive pulmonary disease) or pneumonia, prior percutaneous coronary intervention, cardiac surgery or angina, and history of impaired sensorium. The MFI score was then calculated for each patient, resulting in a fractional index. From prior studies, the threshold between fit and frail has been reported at 0.25, with 0.4 as the threshold for dependence on activities of daily living. We classified patients into non-frail (0-0.24), moderately frail (0.25-0.4), and severely frail (>0.4). Multivariate logistic regression was performed to determine the primary outcome of association between MFI score and age with 30-day mortality, and univariate analysis was performed for secondary outcome measures (all occurrence of adverse events, cardiac, pulmonary, hematologic, renal, reoperation, adverse discharge disposition) with odds ratios and P values reported. Linear regressions were performed to analyze lengths of hospital and ICU stays relative to MFI scores. Significance was established at $P < 0.05$.

Results: This study included 32,535 patients over age 60, with injuries of the pelvis and acetabulum (0.9%), hip (73.2%), femur (4.1%), knee (7.4%), tibia (1.8%), and ankle (12.5%). Based on the MFI thresholds, 86.5% were non-frail, 11.4% were moderately frail, and 0.93% were severely frail. There was a stronger association between MFI score and 30-day mortality (odds ratio [OR] for MFI: 10.45, 95% CI: 5.98-18.28) as compared to age and 30-day mortality (OR for age: 1.05, 95% CI: 1.04-1.06; $P < 0.001$). As MFI score increased, 30-day mortality increased from 1.9% in an MFI score of 0 to 40.0% for MFI score 0.64 and above ($P < 0.001$) (Figure 1). Higher rates of postoperative complications were observed as MFI scores increased, including any occurrence excluding mortality (OR: 1.21, 95% CI: 1.18-1.23, $P < 0.001$), cardiac (OR: 1.61, 95% CI: 1.51-1.72, $P < 0.001$), pulmonary (OR: 1.4, 95% CI: 1.33-1.48, $P < 0.001$), and renal complications (OR: 1.609, 95% CI: 1.39-1.87, $P < 0.001$). Frail patients also had increasing odds of adverse hospital discharge disposition with increasing MFI score (OR: 1.64, 95% CI: 1.59-1.70, $P < 0.001$). Length of hospital stay increased from 5.38 days (±6.0 days) to 16 days (±9.0 days; $P < 0.001$) while length of ICU stay increased

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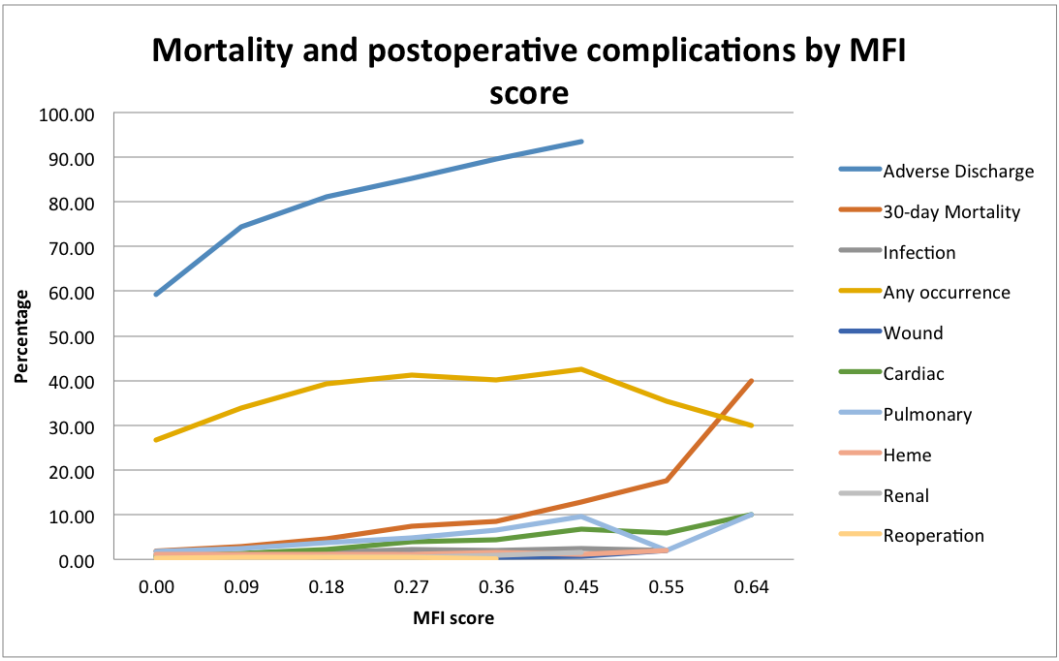
from 4.0 days (±4.3 days) to 10.14 days (±6.2 days; P = 0.0035) between MFI score 0 and 0.64. Hematologic complications (OR: 1.06, 95% CI: 0.97-1.17, P = 0.23) and reoperations (OR: 1.10, 95% CI: 0.93-1.29, P = 0.28) were not associated with frailty.



Conclusion: Frailty is a stronger predictor of 30-day mortality than age in elderly patients with pelvis, acetabular, and lower extremity trauma. Given the strength of association between frailty and postoperative complications, evaluation of patients based on a modified frailty index can provide an effective and robust risk assessment tool to more appropriately counsel patients and direct interdisciplinary care.