The Sensitivity and Specificity of Frailty Indices in Predicting the Mortality and Complications following Lower-Limb Amputation

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INTRODUCTION: Frailty is a multidimensional syndrome characterized by a significant decline in functional reserve and function of multiple physiological systems. Few studies have evaluated if frail patients may be at a higher risk of post-amputation complications, readmission, and mortality. Several preoperative frailty indices are used to assess the level of frailty. However, the value, sensitivity, and specificity of these indices are not determined. We sought to synthesize the current literature to quantify the predictive value of frailty indices on mortality and complications following lower-limb amputation.

METHODS: This meta-analysis was conducted according to the PRISMA checklist and Cochrane Handbook for Systematic Reviews of Interventions. Several search databases (PubMed, MEDLINE via Ovid, web of science, and Google Scholar) were searched for the studies that used the frailty indices to predict the outcomes of lower-limb amputation. Our meta-analysis used both random and fixed-effect models to estimate the effect size and incidence probability. The Methodological Index for Nonrandomized Studies (MINORS) was used to assess the quality of the included studies.

RESULTS: Seven retrospective cohort studies, totaling 374,205 patients, were identified that investigated the post-amputation outcomes between frail and non-frail patients. Twenty-seven percent of patients were frail. Four frailty indices were used in the included studies; Risk Analysis Index (RAI), modified frailty Index-11, modified frailty index-5, and John Hopkins Clinical System (JHCS). The average age of the included patients across the studies was 64.4 +/-12.1 years. The percent of above- and below-knee amputations were 43.9% and 56.1%, respectively. 88.2% of the included patients were male. In terms of medical comorbidities, the percentage of patients who had diabetes, hypertension, congestive heart failure, COPD, and impaired function status were 65.2%, 27.9%, 16.02%, 9.8%, and 2.2%, respectively. As compared to non-frail patients, our meta-analysis showed that frail patients who underwent lower-limb amputation were at significant higher risk of overall postoperative complications [OR=1.79, p<0.00001], 30-day mortality [OR=2.19, p<0.0001], 30-day readmission [OR=1.84, p<0.00001], revision surgery [OR= 1.18, p=0.02], and longer length of hospital stay [MD=1.18, P<0.00001]. However, there was no significant difference between both groups in the rate of surgical wound complications [OR=0.99, p=0.96]. Risk Analysis Index (RAI) was the most sensitive frailty index in predicting overall postoperative complications, 30-day mortality, and revision surgery. However, mFI-11 was more sensitive to predict readmission rate. There was a slight decline in quality MINORS total score over the publication years (R= 0.0958).

DISCUSSION AND CONCLUSION:

Frail patients undergoing lower-limb amputation are at significant higher risk for postoperative complications, readmission, revision surgery, and 30-day mortality rate than non-frail patients. Risk Analysis Index and modified frailty index are the most sensitive prediction indices.