

Preoperative Metabolic and Nutritional Status Have Greater Association With Perioperative Complications Than Frailty Following Surgical Intervention for Proximal Humerus Fractures

Tyler K. Williamson, DO; Adam O. Aziz, BA; James B. Bluhm, BS; Casey McDonald, MD; Matthew T. Glazier, DO; Jake Checketts, DO; Anil Dutta, MD; Luke Verlinsky, MD

Purpose: Proximal humerus fractures (PHF) often occur in an elderly population at-risk for complications following surgery. Acute preoperative metabolic and nutritional (M+N) status may be better linked to these poor outcomes compared to more chronic physiologic assessment such as frailty. The purpose of this study is to compare the associations of an M+N index versus frailty with the outcomes of surgical intervention for PHFs.

Methods: The American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database was queried from 2015 to 2020 for patients undergoing surgical management of PHFs. Tiered frailty scores were calculated as defined by the revised Risk Analysis Index (RAI-rev). The M+N index was derived using backward stepwise logistic regression modeling to identify preoperative nutritional and metabolic lab values associated with development of any complication following surgery. Outcomes included 30-day mortality, readmission, length of stay, and complications. ANOVA and binary logistic regression were used to assess associations with odds ratio (OR) and 95% confidence interval (CI). Discriminatory accuracy was quantified by receiver operating characteristic curve analysis and C-statistics.

Results: A total of 6639 patients with PHFs underwent surgical intervention (60% ORIF, 30% rTSA). The generated M+N index was composed of the following variables significantly associated with complications: creatinine, albumin, hematocrit, international normalized ratios (INR), and sodium. The M+N index had superior predictability to RAI-rev for any complication (AUC: 0.749 vs 0.674), postoperative blood transfusion (AUC: 0.812 vs 0.704), length of stay greater than 3 days (0.901 vs 0.679) and reoperation (AUC: 0.656 vs 0.542), with each significant association also seen in a frail-only cohort. In a mixed effects model, M+N index factors and RAI-rev generated independent significant effects (both $p < .001$).

Conclusion: Although frailty assessment may play a role in evaluating surgical risk, preoperative metabolic and nutritional status may have greater association with perioperative complications and disposition following surgery for PHF. These values may also be more readily optimized in the inpatient setting and, therefore, future studies should focus on the effects of management strategies to alter metabolic and nutritional status to potentially mitigate perioperative risk.