Comparing the predictive accuracy of frailty instruments applied to preoperative electronic health data for adult patients undergoing non-cardiac surgery: a retrospective cohort study.

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Background: Frailty before surgery is associated with increased risk of post-operative mortality, complications, and healthcare resource utilization.[1] Despite multiple guideline recommendations, routine preoperative frailty assessment is under-performed.[2] Automation of preoperative frailty assessment using electronic health data could improve adherence to guideline-based care if an accurate instrument is identified. Our aim was to measure and compare predictive accuracy of frailty instruments operationalizable in electronic data for prognosticating outcomes and resource use in older adults undergoing surgery.

Methods/Results: We conducted a retrospective cohort study utilizing linked healthcare administration data for adults >65 undergoing elective non-cardiac surgery or emergency general surgery (EGS) from 2012-2018. Four frailty instruments were compared: Frailty Index (FI), Hospital Frailty Risk Score (HFRS), Risk Analysis Index-Administrative (RAI), and ACG Frailty-defining diagnoses indicator (ACG). We estimated and compared the added predictive performance of each instrument beyond the baseline model (age, sex, American Society of Anesthesiologists' score, procedural risk) using discrimination, calibration, explained variance, net reclassification index (NRI) and Brier score for binary outcomes, and using explained variance, root mean squared error and mean absolute prediction error for continuous outcomes. The primary outcome was 30-day mortality. Secondary outcomes included 365-day mortality, non-home discharge, days alive at home, hospital length of stay, and 30- and 365-day health systems cost. We identified 171,576 elective surgery and 121,095 EGS patients who met inclusion criteria, of which 1,370 (0.8%) and 11,422 (9.4%) died at 30-days, respectively. Compared to the baseline model predicting mortality at 30-days for the elective cohort (area under curve [AUC], 0.85; R^2, 0.08), addition of HFRS lead to greater improvement in discrimination (AUC, 0.87), explained variance (R^2, 0.09), and net reclassification (NRI, 0.65)

than FI, RAI or ACG. Compared to the baseline model predicting death at 30-days among EGS patients (AUC, 0.68, R^2, 0.08), addition of RAI demonstrated greater improvement in discrimination (AUC, 0.74), explained variance (R^2, 0.10), and net reclassification (NRI, 0.53) than FI, HFRS, or ACG. Brier scores and calibration curves did not differ appreciably between models in either cohort.

Conclusions: All four frailty instruments improved baseline model performance for predicting postoperative outcomes and resource use. The HFRS and RAI showed the greatest improvement amongst all measures of predictive performance for 30-day mortality within elective and EGS cohorts, respectively. Clinicians and health system planners may consider these findings in guiding selection of the most prognostically accurate instrument for development of automated preoperative frailty assessment.

References:

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2. *BMC Anesthesiol*. 2017;17(1):1-8. doi:10.1186/s12871-017-0390-7