The Variable Impact of Frailty on Adult Spine Deformity Patients Based on Varying Definitions: Are we speaking the same language?

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INTRODUCTION: Numerous definitions and classifications for frailty exist. There is no consensus on the superiority of any, and the varying associations on postoperative outcomes.

METHODS: Patients with fusions from thoracic spine-to-pelvis were included. ASD diagnosed as: SVA > 5cm, PI-LL>10, or PT>20. Four frailty indices were used for comparison: Miller et al index (ASD-FI), Passias et al index (mASD-FI), FRAIL scale & 5-Factor frailty index (mFI-5). Patients were stratified into non-frail (NF), frail (F), and severely frail (SF) categories. ANOVA, and regression analyses assessed associations between indices and outcomes, factoring differences in baseline disability ad deformity severity.

RESULTS: 864 patients included (Age 61.3 years, BMI 28.1 kg/m2, CCI 1.93). Across all indices, increasing frailty status was associated with increasingly severe deformity (by PI-LL and T1PA) at baseline. F and SF status in any index was generally associated with higher complication rates, compared with NF status. Complication breakdown: 65% any complication, 24%major, 34% minor, 24% intraoperative, 16% mechanical, 3% neurological and 22% reoperation. Perioperatively, increasing frailty scores in all 4 indices correlated with increasing SICU time and length of hospital stay, with no significant differences in predictive ability between indices. F/SF status in all but mFI-5 was significantly predictive for SICU admission, with FRAIL scale demonstrating the highest odds (OR 1.33, 1.14 – 1.57, p<0.001). Within 90 days, the ASD-FI had the strongest predictive ability for any complications (OR 1.19, 1.05-1.35, p=0.006), including major complications (OR 1.47, 1.21-1.77, p<0.001) and reoperations (OR 1.24, 1.04-1.54, p=0.046). By 2 years, the mASD-FI demonstrated 1.5x the predictive odds than any other index for mechanical complications (OR 1.47, 1.27 – 1.70, p<0.001) and reoperations (OR 1.44, 1.22 – 1.69, p<0.001). Only FRAIL scale and mFI-5 correlated F/SF status with not achieving the minimum clinically important difference in ODI & SRS-22, with FRAIL scale predicting this 1.3x stronger than mFI5 (OR 1.31, 1.09-1.58, p=0.005). SF status was generally associated with the highest complication rates, translating to higher cost/QALY at two years. This was seen most strongly with the mASD-FI, which predicted F/SF patients having the highest additional costs per QALY at 2 years ($571,099 p<0.001). Examining each index overall, the Miller FI correlated strongest with 90-day complications, the mASD-FI with QALY outcomes, the mFI5 with mechanical complication development, and the FRAIL scale with SICU admission.

DISCUSSION AND CONCLUSION: Frailty is defined variably in our current literature and therefore translates to variable risk stratification and postoperative outcomes. These findings may enhance the surgical planning process. Efforts towards developing a unified frailty schema will contribute to streamlining the ability to better correlate frailty severity with postoperative outcomes.