

Frailty Index Associated with Post-operative Complications and Mortality after Lower Extremity Amputation: A VASQIP Analysis

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Introduction: Surgical frailty has been increasingly discussed due to the aging surgical population. This is especially true for our nation's Veterans. The Risk Analysis Index (RAI) is a validated frailty score, ranging from 0 to 81, that has been shown to predict short-term outcomes and long-term mortality in various subspecialties (e.g. urology) and procedures (e.g. AAA repair, CEA). We used this tool retrospectively in attempt to evaluate its predictive value in lower extremity amputations.

Methods: After obtaining IRB approval, Veteran Affairs Surgical Quality Improvement Program (VASQIP) data was queried for above and below knee amputation CPT codes (27590, 27591, 27592, 27594, 27596 and 27880, 27881, 27882, 27884, 27886). Pre-operative variables were used to calculate a RAI score. Patients were placed into 5 cohorts based on RAI score (≤ 15 , 16-25, 26-35, 36-45, ≥ 46). X2 test and ANOVA test were used compare cohorts. Forward logistic regression modeling was used to determine risks of each cohort.

Results: Between 1999 and 2018, 50083 patients underwent LEA. 98.8% of patients were male with an average age of 66 ± 10 years. The cohorts contained 2.6% (n=1281), 28.5% (n=14250), 36.8% (n=18437), 24.2% (n=12100), and 8.0% (n=4015) for RAI scores ≤ 15 , 16-25, 26-35, 36-45, and ≥ 46 respectively. Frailty was associated with increased rates of DVT, sepsis, cardiac arrest, MI, pneumonia, intubation >48 h, PE, reintubation, AKI, renal failure, overall complications, death, and increased length of stay (Table I). When risk adjusted, frailty was associated with up to 4 times as likely to have any complication and up to 38 times as likely to perish within 30 days (Table II).

Conclusions: Frailty as determined by Risk Analysis Index was associated with post-operative outcomes in a dose-dependent manner. Frailty was associated with higher rates of major cardiac (MI, cardiac arrest), pulmonary (pneumonia, failure to wean vent, reintubation), renal (renal insufficiency, renal failure), overall complications, and death. We recommend the use of this frailty index as a screening tool to guide discussions with patients undergoing lower extremity amputation.

Postoperative Outcome	All (n=50,083)	RAI score					p-value
		≤15 (n=1,281)	16-25 (n=14,250)	26-35 (n=18,437)	36-45 (n=12,100)	≥46 (n=4015)	
Cardiac (MI, cardiac arrest)	1,340 (2.7)	2 (0.2)	190 (1.3)	424 (2.3)	465 (3.8)	259 (6.5)	<0.001
Pulmonary (pneumonia, failure to wean, reintubation)	2,724 (5.4)	10 (0.8)	332 (2.3)	867 (4.7)	1,000 (8.3)	515 (12.8)	<0.001
Renal (renal insufficiency/failure)	780 (1.6)	11 (0.9)	162 (1.1)	319 (1.7)	208 (1.7)	80 (2.0)	<0.001
LOS (days)	11.0 ± 12.5	8.4 ± 11.2	9.8 ± 11.1	11.2 ± 12.3	11.8 ± 13.1	12.3 ± 14.2	< 0.001
Complication	9,314 (18.6)	130 (10.1)	1921 (13.5)	3,309 (17.9)	2,795 (23.1)	1,159 (28.9)	< 0.001
Death	5,581 (11.1)	15 (1.2)	510 (3.6)	1,564 (8.5)	2,177 (18.0)	1315 (32.8)	< 0.001

Table I: Postoperative complications after lower extremity amputations. Groups into organ systems.

Outcome	RAI	RAI 16-25	RAI 26-35	RAI 36-45	RAI ≥46
	≤15	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Death	Ref	3.1 (1.8-5.2)	7.6 (4.5-12.7)	17.7 (10.6-29.5)	37.8 (22.6-63.2)
Complication	Ref	1.4 (1.1-1.7)	1.9 (1.6-2.3)	2.6 (2.2-3.2)	3.6 (2.9-4.3)

Table II: Covariate Adjusted Odds Ratios for LEA Outcomes in VASQIP by RAI Frailty Score. Forward binary logistic regression was used to determine odds ratios. RAI, risk analysis index; OR, odds ratio; CI, confidence interval; Ref, reference.