Incidence and Risk Factors for 30-day Readmission After Below-Knee Amputation

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INTRODUCTION: Below-knee amputation (BKA) is a commonly performed orthopaedic procedure for a variety of indications, often in high-risk populations. There is a lack of large studies investigating readmission rates and characteristics of these patients. The purpose of this study was to utilize a large national database to determine the incidence of and risk factors for unplanned readmission following primary BKA.

METHODS: The American College of Surgeons' National Surgical Quality Improvement Program database. was queried to identify primary BKA cases between January 1st, 2015 and December 31st, 2017. Baseline demographics, surgical indications, and various 30-day outcome measures were assessed. Patients with an unplanned 30-day readmission were identified. Univariate and multivariate analyses using Chi-squared tests and binary logistic regression, respectively were used to identify independent risk factors for unplanned readmission following primary BKA.

RESULTS: 7,030 patients were identified and included in the final cohort. 1,037 patients had an unplanned 30-day readmission, yielding an incidence of 14.8%. 618 (8.8%) patients had a reoperation, and 287 (4.1%) patients died within 30 days of surgery. Medical and surgical complication rates were 25.5% and 29.0%, respectively (Table 2). Risk factors for unplanned readmission included female sex, age 70 or older, ASA Class 3+, vascular condition requiring BKA, hemodialysis, having COPD, CHF, hypertension, renal failure, bleeding disorders (Table 3). Multivariate analysis identified the following independent risk factors for unplanned readmission: Caucasian ethnicity, age >70 years, hemodialysis, bleeding disorder, and undergoing BKA for a vascular condition (Table 4).

DISCUSSION AND CONCLUSION:

Primary BKA remains a common orthopaedic procedure associated with substantial mortality and morbidity. The incidence of 30-day readmission after primary BKA was 14.8%. Specific patient and surgical variables are predictive of 30-day readmission. These factors can be used for risk stratification and discharge planning to minimize the risk of hospital readmission.

Table 2. 30-day complications

	# patients (%)
Readmission	1037 (14.8%)
Reoperation	618 (8.8%)
Non-home discharge	5405 (76.9%)
Mortality	287 (4.1%)
Surgical Complications	
Overall	2039 (29.0%)
Superficial surgical site infection	267 (3.8%)
Deep surgical site infection	88 (1.3%)
Dehiscence	158 (2.2%)
Bleeding	1526 (21.7%)
Medical Complications	
Overall	1794 (25.5%)
Pneumonia	246 (3.5%)
Reintubation	162 (2.3%)
Pulmonary embolism	20 (0.3%)
Failure to wean ventilator	136 (1.9%)
Renal insufficiency	77 (1.1%)
Renal failure	87 (1.2%)
Urinary tract infection	179 (2.5%)
Cerebrovascular accident	47 (0.7%)
Cardiac arrest	120 (1.7%)
Myocardial infarction	113 (1.6%)
Deep venous thromboembolism	48 (0.7%)
Systemic sepsis	422 (6.0%)
Septic shock	137 (1.9%)

Table 3. Univariate Analysis

	No Readmission [n = 5,993]	Readmission [n = 1,037]	P
Sex			
Male	4181 (69.8%)	348 (33.6%)	**0.032**
Female	1812 (30.2%)	689 (66.4%)	
Age (years)			
18-39	284 (4.7%)	34 (3.3%)	**0.037**
40-49	550 (9.2%)	81 (7.8%)	0.155
50-59	1248 (20.8%)	189 (18.2%)	0.055
60-69	1621 (27.0%)	277 (26.7%)	0.822
70-79	1100 (18.4%)	237 (22.9%)	**<0.001**
80+	644 (10.7%)	133 (12.8%)	**0.049**
Ethnicity			
White/Caucasian	3248 (54.2%)	595 (57.4%)	0.057
Black	1459 (24.3%)	255 (24.6%)	0.865
Hispanic	397 (6.6%)	70 (6.8%)	0.881
Asian	82 (1.4%)	13 (1.3%)	0.768
Other	93 (1.6%)	14 (1.4%)	0.624
Not Reported	714 (11.9%)	90 (8.7%)	0.003
BMI (kg/m²)			
Underweight	371 (6.2%)	48 (4.6%)	**0.049**
Normal	1655 (27.6%)	314 (30.3%)	0.078
Overweight	1721 (28.7%)	294 (28.4%)	0.810
Obese Class I	1112 (18.6%)	194 (18.7%)	0.907
Obese Class II	632 (10.5%)	91 (8.8%)	0.083
Obese Class III	502 (8.4%)	96 (9.3%)	0.348
Comorbidities			
Diabetes	4248 (70.9%)	731 (70.5%)	0.118
Smoking	1704 (28.4%)	294 (28.4%)	0.957
COPD	574 (9.6%)	124 (12.0%)	**0.018**
Ascites	30 (0.5%)	7 (0.7%)	0.473
Congestive Heart Failure	442 (7.4%)	96 (9.3%)	**0.035**
Hypertension	4695 (78.3%)	849 (81.9%)	**0.010**
Renal Failure	298 (5.0%)	68 (6.6%)	**0.034**
Dialysis	1147 (19.1%)	271 (26.1%)	**<0.001**
Chronic Steroid Use	403 (6.7%)	85 (8.2%)	0.085
Bleeding Disorder	1284 (21.4%)	291 (28.1%)	**<0.001**
Pre-surgery blood transfusion	599 (10.0%)	99 (9.5%)	0.656
ASA Class			
Class 1 (No disturbance)	8 (0.1%)	0 (0.0%)	0.239
Class 2 (Mild disturbance)	228 (3.8%)	27 (2.6%)	0.056
Class 3 (Severe disturbance)	3435 (57.3%)	546 (52.7%)	**0.005**
Class 4+ (Life threatening)	2295 (38.3%)	459 (44.3%)	**<0.001**
Surgical Indications			
Diabetes/Infection	2969 (49.5%)	466 (44.9%)	**0.006**
Vascular	1826 (30.5%)	401 (38.7%)	**<0.001**
Tumor/Cancer	42 (0.7%)	3 (0.3%)	0.143
Other	1156 (19.3%)	167 (16.1%)	**0.015**

Table 4. Multivariate Logistic Regression – Risk Factors for Unplanned Readmission

	R.R. [95% C.I.]
Ethnicity	
White	1.232 [1.074 – 1.413]
Age (years)	
70-79	1.306 [1.108 – 1.539]
80+	1.272 [1.033 – 1.566]
Comorbidities	
Dialysis	1.568 [1.338 – 1.836]
Bleeding Disorder	1.309 [1.125 – 1.523]
Surgical Indications	
Vascular	1.347 [1.170 – 1.550]