Development of a Pre-Operative Risk Assessment Calculator for Periprosthetic Joint Infection within One-Year of TKA

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BACKGROUND

- Periprosthetic joint infection (PJI) is a devastating complication after total knee arthroplasty (TKA).
- Identification of high-risk patients is necessary to mitigate risk.

PURPOSE

- To develop a risk prediction model for PJI within 1-year of TKA.

METHODS

- Patients who underwent unilateral, elective TKA for primary osteoarthritis, inflammatory arthritis, or post-traumatic arthritis between 2015-2019 were identified within the PearlDiver database.
- Exclusion Criteria:
  - Conversion TKA
  - TKA for fracture, septic arthritis, or bone neoplasia
  - Follow up < 1-yr
- Bivariate analyses identified differences in patient specific and surgical characteristics between patients who underwent revision TKA for PJI within 1-year and a random control group of patients that did not.
- Statistically significant factors were then incorporated into a multivariable regression model
- β-coefficients were used to generate a composite score representing the probability of PJI at 90-days and 1-year.

Table 1. Patient characteristics included in multivariable regression

	PJI (n = 2,513)	No PJI (n = 562,272)		PJI (n = 2,513)	No PJI (n = 562,272)
Mean Age (yrs.)	64 + 9	65+10	**Comorbidities:**		
Male (%)	1,353 (53.8)	214,381 (38.1)	Arrhythmias	992 (39.5)	160,791 (28.6)
Indication for Surgery (%)			Blood Loss Anemia	1,690 (67.3)	213,746 (38.0)
Primary Osteoarthritis	2,494 (99.2)	560,524 (99.7)	Coronary Artery Disease	966 (38.4)	167,342 (29.8)
Post-Traumatic Arthritis	84 (3.3)	7,382 (1.3)	CHF	231 (9.2)	31,224 (5.6)
Inflammatory Arthritis	196 (7.8)	38,837 (6.9)	Coagulopathy	458 (18.2)	53,246 (9.5)
BMI Classification (kg/m²)			COPD	1,083 (43.1)	188,381 (33.5)
Underweight (≤ 18.5)	60 (2.4)	5,381 (1.0)	Deep Vein Thrombosis	179 (7.1)	19,099 (3.4)
Obese (> 30)	715 (28.5)	133,395 (23.7)	Diabetes Mellitus		
Social History:			*with Complications*	861 (34.3)	124,739 (22.2)
Alcohol Abuse	292 (11.6)	31,000 (5.5)	*without Complications*	1,142 (45.4)	192,234 (34.2)
Drug Abuse	427 (17.0)	44,060 (7.8)	Fluid Electrolyte Disorders	1,388 (55.2)	175,057 (31.1)
Tobacco Use	677 (26.9)	100,279 (17.8)	Liver Disease	591 (23.5)	98,144 (17.5)
			Renal Failure	257 (10.2)	34,782 (6.2)

BMI; Body Mass Classification, CHF; Congestive Heart Failure, COPD; Chronic Obstructive Pulmonary Disease

RESULTS

- 564,778 patients were included in this study
- Risk factors found to be significant factors for PJI and were included in multivariable regression model (Table 1)
- The areas under the curves were 0.737 (Fig 1) and 0.734 (Fig 2) at 90-days and 1-year, respectively
- This model was superior to models based on Charlson Comorbidity Index (CCI) and Elixhauser Index (ECI).

DISCUSSION

- We created a weighted composite score to predict patient's risk of PJI within one-year of primary, unilateral TKA.
- The model provides useful insights for surgeons seeking to mitigate the risk of PJI in TKA patients.