30-Day Readmissions Following Total Knee Arthroplasty (TKA): Findings from a Comprehensive 5-Year Analysis of the Frequency, Causes, and Patterns of TKA Readmissions

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INTRODUCTION:

Considering the advent of value-based orthopaedic care and the growing adoption of outpatient total knee arthroplasties (TKAs), it is paramount to continually assess readmissions as an important metric for quality of surgical care. Furthermore, with the incorporation of 30-day readmissions into reimbursement models, more research is warranted to investigate the frequency, causes, and patterns of 30-day inpatient readmissions, with the overall objective of lowering readmissions in this patient population. Therefore, this study aimed to: 1) determine the overall 30-day TKA readmission rate; 2) report the timing of readmission by weeks post-discharge; 3) identify the most frequent causes of 30-day readmissions (i.e., medical- or orthopaedic-related); and 4) develop a 30-day readmission risk calculator for TKA patients.

METHODS:

A consecutive cohort of all primary TKAs performed from 2016-2020 at a large tertiary academic center were followed using a validated, institutional prospective data collection system (n=6,574 patients). This system flags readmissions that occur within 30 days within dozens of hospitals, rehabilitation centers, and health care facilities in an integrated health care system. All flagged readmissions were thoroughly chart reviewed for verification, as well as to determine the primary cause of readmission (medical or orthopaedic related). The number of weeks after discharge when patients were readmitted was determined from medical records. Days 22-30 post-discharge were categorized together as “Week 4+”. A 30-day readmission risk calculator was developed with the following patient baseline data: demographics, comorbidities, laboratory values, medications, substance use history, hospitalization history, emergency room visit history, and health literacy. The calculator estimated the patient-specific risk of 30-day readmission based on findings from a multivariate binary logistic regression of the cohort. Receiver operating characteristic (ROC) analysis was performed to evaluate the efficacy of the calculator in predicting readmissions. ROC curve analysis allowed for both 1) a visualization of the overall performance of the calculator at predicting readmissions by determining the area under the curve (AUC); and 2) selecting an ideal cutoff for the readmission risk calculator by identifying a score that yielded the greatest combination of sensitivity and specificity in predicting readmissions.

RESULTS:

Overall, the 30-day readmission rate was 3.3% (219 out of 6,574 patients). Inpatient readmission occurred most commonly during the 1st week post-discharge (n=100; 45.7%), while the 3rd week post-discharge had the lowest proportion of readmissions (n=29; 13.2%) (**Figure 1**). Medical readmissions (n=158; 72.1%) were more frequent than orthopaedic readmissions (n=61; 27.9%). The most frequent medical causes of 30-day readmissions were deep vein thrombosis (n=22) and pneumonia (n=9) or gastrointestinal bleeding (n=9) (**Figure 2**). The most frequent orthopaedic causes of 30-day readmissions were cellulitis of the incision site (n=20) and periprosthetic joint infection (n=17) (**Figure 3**). The least frequent orthopaedic causes of 30-day readmissions were wound complications (n=3) and periprosthetic fractures (n=2) (**Figure 3**). ROC analysis of the 30-day readmission risk calculator revealed an AUC of 0.727, indicating acceptable performance (**Figure 4)**. The optimal cutoff for the risk score was determined to be 14, as this maximized the sum of sensitivity and specificity in predicting readmissions (Sensitivity: 0.63; Specificity: 0.75; Accuracy: 0.74) (**Figure 4**).

DISCUSSION AND CONCLUSION:

Overall, 1 of 30 patients who undergo TKA are expected to be readmitted within 30-days of discharge. Enhanced and targeted medical care should be emphasized during the first week post-discharge considering the higher rates of medical-related complications in this period. While orthopaedic-related complications warranting readmissions were rare, they were commonly due to surgical site infections or acute periprosthetic joint infections; highlighting the importance of continued vigilance during the early postoperative period for complications, and the need for innovation that may continue to lower the infection burden in TKA. Our institutional 30-day readmission risk calculator performed acceptably and may contribute to high-value patient-centered care, and personalized approaches to mitigating the risk of readmission. However, future research endeavors are needed to identify additional drivers of inpatient readmission. Additionally, orthopaedic surgeons should be cognizant of the limitations of these calculators and their current inability to predict all readmissions.

Figure 1. Histogram of number of days post-discharge when patient was readmitted

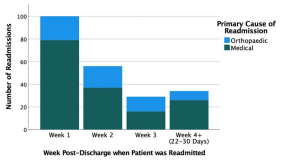

Figure 2. Most common medical causes of 30-day readmissions

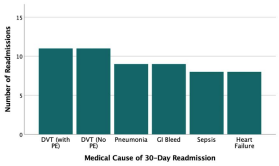

Figure 3. Most common orthopaedic causes of 30-day readmissions

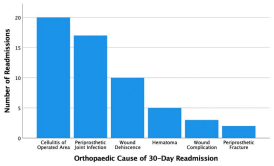

Figure 4. ROC curve of the 30-day readmission risk calculator efficacy at predicting 30-day readmissions following total knee arthroplasty