

# Total knee arthroplasty in a fast-track setting: reasons and risk factors for 90-day readmission

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## Introduction

Reducing readmission rates may efficiently reduce costs associated with total knee arthroplasty (TKA). Most studies related to readmission have been performed in the United States, and there is no clear consensus regarding acceptable baseline readmission rates. Furthermore, reports on the most common reasons for readmissions vary a lot, and the literature is conflicting regarding risk factors for readmission. We assessed the rates, reasons, and risk factors for 90-day readmissions after TKA in a European healthcare setting where insurance status has no influence on access to care.

## Methods

We used the Finnish Hospital Discharge Register (FHDR) to identify all primary elective TKA procedures performed in 2015 at a single high-volume arthroplasty center. We also used the FHDR to track readmissions to any hospital in the region within 90 days of primary discharge. We excluded planned readmissions and those readmissions clearly not attributable to the index procedure (e.g., contralateral joint replacements and cancer surgeries). We compared the remaining readmissions to a 1:4 control cohort of TKA patients with no relevant-cause readmission. Electronic medical records, pre-admission patient forms, laboratory results, and surgical reports provided extensive data on all patients. We calculated 30- and 90-day readmission rates, recorded reasons for readmission, and identified independent predictors of readmission using multivariable logistic regression analysis.

## Results

This study comprised 894 elective primary TKA procedures in 861 patients. During the first 90 days

after discharge, 116 readmissions (99 patients) occurred. The unplanned readmission rates were 6.5% at 30 days and 8.0% at 90 days. For readmission within 90 days, the most common reason was infection (29.6%). Other common reasons were knee pain (14.1%), gastrointestinal complications (8.5%), and hematoma (8.5%) (Table 1). The majority (67.6%) of the readmissions occurred for surgery-linked issues, and only 32.4% for medical reasons. All risk factors that were associated with a higher risk of readmission are presented in table 2. Multivariable logistic regression analysis revealed that the following factors proved significant independent preoperative predictors of readmission: asthma (95% CI 1.20-5.21,  $p = 0.015$ ), psychiatric disease (95% CI 1.26-8.11,  $p = 0.014$ ), preoperative tibiofemoral valgus angle (95% CI 1.04-6.89,  $p = 0.042$ ), and preoperative knee flexion  $< 110^\circ$  (95% CI 1.08-3.81,  $p = 0.027$ ).

## Discussion and conclusion

The readmission rates in our health-care setting were somewhat higher than those reported in the literature(1–5). This might be due to differences between the healthcare and insurance systems, and might also reflect differences in study design. In our study, we managed to track the patients for any readmission to any hospital in the region. This has commonly not been done in previous single-center studies.

Several comorbidities are known to increase the risk of readmission after TKA. Among the less known risk-increasing comorbidities are psychiatric disease. In line with previous findings (6,7), our results indicated that psychiatric disease independently increased the risk for readmission, highlighting a patient subgroup that should be given extra attention when undergoing TKA. It is unclear exactly how preoperative biomechanical characteristics influence the readmission risk

Table 1

<i>Ten Most Common Reasons for Unplanned 90-day Readmissions</i>		
<i>Reason</i>	<i>n</i>	<i>% of readmissions</i>
Infection	21	29.6 %
Knee pain	10	14.1 %
GI-related	6	8.5 %
Hematoma	6	8.5 %
Wound drainage	5	7.0 %
Cellulitis	4	5.6 %
Cardiovascular event	3	4.2 %
Periprosthetic fracture	3	4.2 %
Other fracture	3	4.2 %
Pneumonia	2	2.8 %
<b>Total no. of readmissions</b>	<b>71</b>	<b>100.0 %</b>

Table 2

<i>Univariate Logistic Regression Analysis, Risk Factors Associated with 90-day Readmission</i>				
<i>Risk Factor</i>	<i>OR</i>	<i>95% CI</i>		<i>P Value</i>
Number of drugs <sup>2</sup>	1.11	1.04	1.19	.003
Asthma	2.60	1.30	5.21	.007
Preoperative TF <sup>1</sup>				
angle <0° vs 5°–10°	1.16	0.51	2.65	.724
angle 0°–4° vs 5°–10°	1.18	0.46	3.04	.726
angle 11°–15° vs 5°–10°	2.94	1.19	7.27	.020
angle >15° vs 5°–10°	1.27	0.39	4.12	.687
Hypertension	2.10	1.14	3.87	.017
Psychiatric disease	2.97	1.30	6.81	.010
Epilepsy	5.36	1.17	24.62	.031
Preoperative knee flexion ≤110°	1.86	1.03	3.36	.040
Walking aid (cane vs no aids)	2.26	1.03	4.94	.041
Hospital length of stay (days) <sup>2</sup>	1.19	1.00	1.40	.046

for TKA patients. Our findings, that patients with a preoperative knee flexion of less than 110° degrees had a higher risk of readmission than patients with a larger range of motion, might have several explanations. Stiffer knees usually require more extensive soft tissue releases during the surgery, which may result in more postoperative pain and swelling. The knee flexion deficit might also be associated with a poorer preoperative or postoperative mobility level, which in turn might influence the risk of readmission. We also found that patients with a preoperative valgus deformity had a higher risk of readmission compared

to patients with a normal tibiofemoral angle, further highlighting the importance of taking all biomechanical variables into account when choosing patients and planning TKA surgeries.

To our knowledge, we are the first to report a finding that asthma independently increased the readmission risk after TKA. This finding might be due to the higher rate of chronic corticosteroid use in the asthmatic patients, as corticosteroids have been linked to a higher readmission risk (8). Further research is still needed to investigate whether the higher risk of readmission is caused by

asthma per se, or rather by the medication and comorbidities in the asthmatic patients.

The limitations of our study mostly reflect the retrospective study design. There is a slight inaccuracy to retrospectively categorize the main reason for re-admission, especially in cases when there is no clear ICD-10 diagnosis. Furthermore, it might be difficult to accurately determine the causality between a readmission and the index procedure.

The main strengths of our study are that we collected detailed and first-hand data on all patients, which is usually impossible in larger registry studies. Furthermore, we managed to track the patients' visits to all hospitals in the region, ensuring that all major complications and readmissions were in fact detected.

### **References**

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