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Original research

The Impact of Femoral Nerve Anesthesia on Short-Term Clinical Outcomes and Opioid Claims After Total Knee Arthroplasty

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ABSTRACT

Background: The impact of femoral nerve blocks (FNBs) during primary total knee arthroplasty (TKA) on clinical outcomes and pain management remains unclear. The present research investigates the impact that continuous and single-shot FNBs during TKA have on postoperative opioid claims and short-term clinical outcomes.

Methods: An administrative claims database was queried to identify patients who underwent primary TKA with a continuous FNB, single-shot FNB, or no FNB. More than 300,000 patients were analyzed from the database. Rates of opioid claims were compared via achi-square analysis. Incidence of postoperative complications was compared with multivariable logistic regression.

Results: Patients receiving a FNB had a significantly higher risk of falls both at 6 months (odds ratio [OR], 1.30) and 1 year postoperatively (OR, 1.25), as well as readmissions within 90 days (OR, 1.18) compared with patients without FNBs. The FNB cohort exhibited a higher risk of deep vein thrombosis (OR, 1.57), myocardial infarction (OR, 1.79), and cerebrovascular accident (OR, 1.20) during the inpatient stay. Relative to single-shot FNBs, continuous FNBs were associated with a higher risk of readmissions within 90 days and systemic complications, although the risk varied by age, sex, and Charlson Comorbidity Index score. More patients without FNBs filed opioid claims within 1 year postoperatively, but the average total morphine milligram equivalents prescribed was comparable to patients who received FNBs.

Conclusions: FNBs during TKA place patients at a significantly higher risk of falls, readmissions, and systemic complications in the short term. The risk of readmission and systemic complications was higher for continuous FNBs. More patients without FNBs filed opioid claims postoperatively than patients who received FNBs.

Introduction

Total knee arthroplasty (TKA) is one of the most common orthopaedic procedures performed to alleviate pain in patients suffering from arthritis in the knee joint [1,2]. It is highly successful with 82% survivorship at 25 years [3], and its utilization is projected to grow 85% from 2015 to 2030 [4]. A major barrier to recovery after TKA is postoperative pain, which limits early physical therapy participation, worsens immediate quality of life, and lengthens hospital stay (length of stay [LOS]) [5-7]. Conventional methods used for postoperative pain control after TKA include opioid patient-controlled analgesia pumps, neuraxial anesthesia [8], regional nerve blocks, local infiltration analgesia [9], and multimodal pain protocols [6].

Although patients who receive regional nerve blocks such as femoral nerve blocks (FNBs) and adductor canal blocks (ACBs) during TKA report better pain control and have shortened LOS than similar cohorts that receive epidural analgesia and opioid patient-controlled analgesia management [10], patients with FNBs often have decreased quadriceps strength and an increased risk of falls postoperatively [11]. Although both FNBs and ACBs can improve postoperative pain scores, Jægar et al [12] reported patients undergoing TKA with a continuous ACB for pain control were able to ambulate earlier than patients with FNB due to preserved quadriceps strength from the motor branch of the femoral nerve being spared [13]. In addition, Tan et al [10] demonstrated ACBs were

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associated with a shortened postoperative LOS compared with FNBs. Although the FNB is effective in modulating postoperative pain, data on the efficacy of FNBs by the method of administration are less robust. The continuous-infusion FNB has been shown to be more effective in improving immediate Visual Analog Scale pain scores and opioid consumption than single-shot administration during hospital stays; however, there was no significant difference in the LOS or long-term functional recovery [14]. In a randomized control trial, Dixit et al [15] also found the single-shot FNB was comparable to the continuous FNB in terms of pain control, opioid consumption, LOS, and physical therapy outcomes.

With mixed data regarding pain management efficacy and complications postoperatively, as well as a lack of large-scale data analysis, the present research aimed to use a nationwide database to quantify the impact that single-shot FNBs and continuous FNBs during TKA have beyond the immediate postoperative period.

Methods

A retrospective cohort study using deidentified patient records was conducted using the PearlDiver database (PearlDiver, Inc., Fort Wayne, IN, USA), a commercially available nationwide claims database that contains data of approximately 122 million patients from various provider groups around the country. Patient cohorts, procedures, demographic information, comorbidities, and other clinical data are available in the database and can be obtained using the Current Procedural Terminology (CPT) and International Classification of Diseases, Ninth Revision and Tenth Revision codes. If the output of any query yields a patient cohort with a nonzero number less than 11, the database reports the cohort size as '−1' to protect against the identification of individual patients. When this occurred in the present study, the cohort was arbitrarily assigned a size of 5 patients (median between 1 and 10). Institutional review board exemption was granted for this study as the provided data were deidentified and compliant with the Health Insurance Portability and Accountability Act.

TKA was defined by CPT-27447. Only primary TKAs performed between 2010 and 2017 Q2 were included to ensure a minimum 1-year follow-up in the database for all included patients. Patients with a preoperative history of rheumatoid arthritis or an active diagnosis of femur and/or tibia fractures, pathologic fractures, infection, malignancy, age less than 19 years, or sciatic nerve block during the index TKA were excluded from the analysis. In addition, patients with a preoperative history of opioid use within 1 year before the index TKA (as defined by prescription drug claims containing the Uniform System of Classification [USC] codes USC-02211, USC-02212, USC-02214, USC-02221, USC-02222, USC-02231, or USC-02232) were excluded. These are connected to the National Drug Codes on patients' charging records.

Patients who underwent TKA were subdivided into 3 groups for comparison: patients who received a continuous FNB (CPT-64448), a single injection of anesthesia in the femoral nerve (CPT-64447), or neither type of FNB during the index procedure. Only patients with an isolated continuous block or an isolated single-shot block were included (ie, patients with both types during the index TKA were excluded). The full list of criteria used to define each cohort and all inclusion/exclusion criteria can be found in Appendix Table A1.

Demographic data and pre-existing clinical characteristics were queried directly from the database and included age, sex, body mass index (BMI), Charlson Comorbidity Index (CCI), and major comorbidities such as diabetes mellitus (DM), hypertension (HTN), and tobacco use. Rates of opioid claims were queried using the aforementioned USC codes. Two proportions of patients were compared: (1) patients with at least one opioid claim in the first 6 months postoperatively and (2) patients with at least one opioid claim in the first 6 months and at least one subsequent claim between 6 months and 1 year postoperatively. The average amount of total opioid claims filed and the average cumulative morphine milligram equivalents (MME) prescribed on those filed claims were calculated directly in the database for both time periods. For opioid claims measurements, patients who underwent additional procedures (using CPT codes for general anesthesia as a proxy) within 1 year after the index TKA were excluded to control for confounders that may inflate opioid consumption (Appendix Table A1).

Rates of local joint complications were compared across the 3 cohorts at 6 months and 1 year postoperatively. These complications included prosthetic joint infection (PJI), manipulation under anesthesia, and revision TKA. PJI was defined by a combination of diagnosis and procedural codes that indicated a surgical intervention for a deep joint infection to exclude superficial wound complications that would not necessitate surgical intervention. Rates of falls were also compared at 6 months and 1 year, and rates of inpatient readmissions were compared at 90 days after TKA. Incidences of systemic complications were compared during the inpatient stay and in the acute 30-day postoperative period. Systemic complications queried included deep vein thrombosis (DVT), pulmonary embolism (PE), myocardial infarction (MI), acute renal failure, and cerebrovascular accidents (CVAs). The codes used to define local joint complications and systemic complications are available in Appendix Tables A2 and A3, respectively.

Study population

After the application of exclusion criteria, 366,472 primary TKAs performed between 2010 and Q2 of 2017 in the PearlDiver database were included in the analysis. Of this total, 22,532 (6.1%) patients had a continuous FNB, 40,851 (11.1%) had a single-shot FNB, and 303,089 (82.7%) had no FNB (Fig. 1).

The FNB cohort had greater proportions of patients aged 19-64 years (43.2% vs 35.7%, $P < .001$) and with a BMI 40 or higher (53.5% vs 50.1%, $P < .001$) than the no-FNB cohort (Table 1). The FNB cohort also had a higher average burden of pre-existing comorbidities (CCI: 1.19 vs 1.01, $P < .001$) and included larger proportions of patients with DM (16.1% vs 11.7%, $P < .001$), HTN (72.8% vs 66.9%, $P < .001$), and tobacco use (14.4% vs 11.5%, $P < .001$). Conversely, the no-FNB cohort had greater proportions of patients aged 65-74 years (50.2% vs 44.1%, $P < .001$) and patients older than 75 years (14.1% vs 12.7%, $P < .001$). The no-FNB cohort also had a larger proportion of patients with a BMI less than 30 (4.3% vs 3.3%, $P < .001$) and patients with a BMI between 30 and 40 (45.6% vs 43.2%, $P < .001$).

Among patients who received a FNB (Table 1), a greater proportion of patients who received a continuous FNB were in the 65-74 year age group than patients who received a single-shot FNB (46.2% vs 42.9%, $P < .001$). The continuous FNB cohort also had a higher average burden of comorbidities (CCI: 1.27 vs 1.14, $P < .001$) and a larger proportion of patients with DM (16.8% vs 15.7%, $P < .001$). Conversely, the single-shot FNB cohort had greater proportions of patients aged 19-64 years (43.9% vs 41.7%, $P < .001$), patients older than 75 years (13.1% vs 12.1%, $P < .001$), and patients with HTN (72.9% vs 72.5%, $P = .003$).

Statistical analysis

Statistical analyses were performed using R statistical software (R Project for Statistical Computing, Vienna, Austria) integrated with the PearlDiver software with an α level set to 0.05. Two separate analyses were conducted for comparing demographic data, opioid claims data, and incidence of postoperative complications: (1) patients who received either type of FNB vs patients who received neither and (2) patients who received a continuous FNB vs

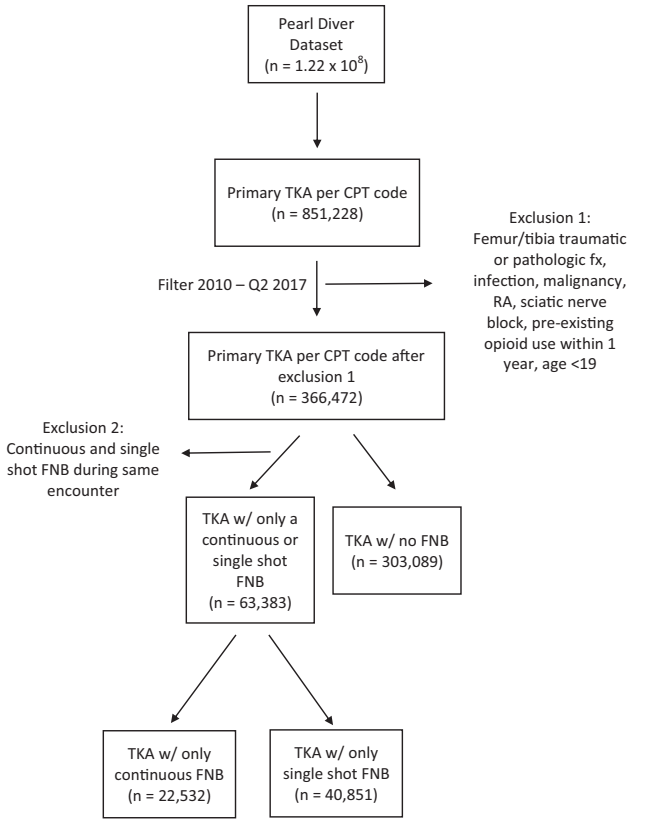

Figure 1. Flow diagram of patients included in the study. Fx, fracture; RA, rheumatoid arthritis.

single-shot FNB. Demographic data, clinical characteristics, and opioids claims data were compared using chi-square analysis for categorical variables and Welch's *t*-test for continuous variables. Multivariable logistic regression was used to calculate odds ratios (ORs) with corresponding 95% confidence intervals (CIs) adjusting for potential confounders including patient age, sex, CCI score, BMI, DM, and tobacco use for the rates of postoperative complications. To further ensure the main analysis was not confounded by baseline demographic differences between patient cohorts, subgroup analyses were performed via multivariable regression by stratifying each postoperative complication by age group, sex, and degree of pre-existing comorbidities (CCI 0-1 vs CCI >1).

Results

Patients who received either a continuous or single-shot FNB were more likely to experience falls at 6 months (1.8% vs 1.4%; OR, 1.30; 95% CI, 1.21-1.38) and 1 year (3.3% vs 2.5%; OR, 1.25; 95% CI, 1.19-1.32) postoperatively than patients who did not receive FNBs and had a greater likelihood of readmission (9.7% vs 7.8%; OR, 1.18; 95% CI, 1.15-1.23) within 90 days (Table 2). Patients with FNBs also exhibited higher rates of systemic complications (Table 3), including DVT both during inpatient stay (0.5% vs 0.3%; OR, 1.57; 95% CI, 1.38-1.79) and at 30 days postoperatively (2.9% vs 2.1%; OR, 1.37; 95% CI, 1.30-1.45), PE (1.1% vs 0.9%; OR, 1.11; 95% CI, 1.02-1.21) and acute renal failure (1.8% vs 1.5%; OR, 1.13; 95% CI, 1.05-1.21) at 30 days, MI both during the inpatient stay (0.2% vs 0.1%; OR, 1.79; 95% CI, 1.43-2.23) and at 30 days (0.4% vs 0.3%; OR, 1.25; 95% CI, 1.08-1.43), and CVA both during inpatient stay (0.4% vs 0.3%; OR, 1.29; 95% CI, 1.12-1.47) and at 30 days (0.9% vs 0.7%; OR, 1.20; 95% CI, 1.09-1.31). At 6 months postoperatively, a greater proportion of patients who did not receive a FNB had filed at least one opioid claim (40.9% vs 47.6%, $P < .001$), and both the average total claims filed (3.03 vs 3.09, $P < .001$) and the average cumulative MME prescribed on those claims (1317 vs 1350, $P = .03$) were significantly greater than those of patients who received a FNB. In addition, a greater proportion of patients who did not receive a FNB filed at least one opioid claim in both the first 6 postoperative months and the next 6 months (7.1% vs 10.5%, $P < .001$), although the average amount of total claims filed and average cumulative MME prescribed on the filed claims for this cohort were comparable with patients who received a FNB.

Within the FNB cohort, patients who received a continuous FNB were more likely to experience a DVT both during the inpatient stay (0.6% vs 0.4%; OR, 1.49; 95% CI, 1.19-1.87) and in the acute 30-day postoperative period (3.5% vs 2.7%; OR, 1.31; 95% CI, 1.19-1.44) relative to patients who received a single-shot FNB (Table 4). In addition, continuous FNB was associated with higher rates of MI at 30 days (0.2% vs 0.1%; OR, 1.52; 95% CI, 1.04-2.11) and inpatient readmissions at 90 days postoperatively (11.5% vs 8.7%; OR 1.35; 95% CI, 1.28-1.42) (Table 5). All other complications were comparable between the 2 FNB cohorts. Opioid claims data were also comparable between the 2 FNB subgroups at both time intervals.

The FNB vs no-FNB subgroup analysis results largely aligned with the results of the broader multivariable logistic regressions with a few notable deviations (Appendix Table B1). Regardless of demographic differences, complications that remained significantly more likely for patients who received a FNB across all subgroups included the following: inpatient readmissions within 90 days, DVT during the inpatient stay and at 30 days, MI during the inpatient stay, CVA at 30 days, and postoperative falls at both 6 months and 1 year. CVA during the inpatient stay was disproportionately demonstrated in patients aged 65-74 years and patients with a CCI >1. In addition, patients aged 65-74 years, female patients, and patients with CCI 0-1 who received a FNB disproportionately exhibited PE at 30 days postoperatively. In addition, at 30 days postoperatively, the increased risk of MI was only significant in patients older than 75 years, male patients, and patients with CCI 0-1.

The subgroup analysis for continuous vs single-shot FNB showed notable variance in postoperative complication risk between different demographic subgroups (Appendix Table B2). Patients who received continuous FNBs and were aged 65-74 years had a significantly higher risk of revision TKA at 6 months, whereas patients aged 19-64 years had a significantly lower risk of revision TKA at 1 year. In addition, the significantly higher risk of DVT during the inpatient stay was observed only in patients aged 19-64 years and patients with CCI 0-1. The increased risk of MI during the inpatient stay was demonstrated only in patients aged 65-74 years, male patients, and patients with CCI >1 who received a continuous FNB. At 30 days, a greater risk of MI was demonstrated in patients who received a continuous FNB with an age of 65-74 years and patients with CCI >1. Finally, patients aged 75 years and older who received a continuous FNB were not significantly more likely to have an inpatient readmission within 90 days postoperatively, although the significantly increased risk was still observed in patients younger than 75 years.

Discussion

The present study illustrates the challenges of managing postoperative pain with a FNB during primary TKA and the significant risk of postoperative complications. Patients who received either type of FNB exhibited higher rates of postoperative falls, inpatient readmissions, and numerous systemic complications than patients who did not receive FNBs. Conversely, a greater proportion of

Table 1
Demographic and clinical characteristics of patients with continuous femoral nerve block vs single-shot femoral nerve block vs no femoral nerve block.

Comparison of demographic and clinical characteristics						
	Continuous FNB (n = 22,532)	Single-shot FNB (n = 40,851)	Either FNB (n = 63,383)	No FNB (n = 303,089)	FNB vs No FNB *P* value	Continuous FNB vs single-shot FNB *P* value
Gender (%)						
Female	13,572 (60.2)	24,650 (60.3)	38,222 (60.3)	182,354 (60.2)	.52	.80
Age (%)						
19-64	9407 (41.7)	17,952 (43.9)	27,359 (43.2)	108,078 (35.7)	<.001	<.001
65-74	10,405 (46.2)	17,539 (42.9)	27,944 (44.1)	152,198 (50.2)	<.001	<.001
75+	2720 (12.1)	5360 (13.1)	8080 (12.7)	42,813 (14.1)	<.001	<.001
BMI (%)[a]						
BMI <30	66 (3.1)	134 (3.4)	200 (3.3)	879 (4.3)	<.001	.54
BMI 30-40	916 (43.6)	1673 (42.9)	2589 (43.2)	9280 (45.6)	<.001	.64
BMI 40+	1120 (53.3)	2089 (53.6)	3209 (53.5)	10,192 (50.1)	<.001	.80
Patients with opioid claims (%)[b]						
Postoperative 6 mo	9309 (41.3)	16,623 (40.7)	25,932 (40.9)	144,241 (47.6)	<.001	.13
6 months-1 y	1648 (7.3)	2860 (7.0)	4508 (7.1)	31,753 (10.5)	<.001	.14
Average opioid claims (range)[c]						
Postoperative 6 mo	3.02 (1-26)	3.03 (1-23)	3.03 (1-26)	3.09 (1-41)	<.001	.78
6 months-1 y	6.39 (2-38)	6.42 (2-52)	6.41 (2-52)	6.54 (2-67)	.08	.84
Mean Cumulative MME prescribed (range)[d]						
Postoperative 6 mo	1324 (15-84,720)	1314 (9-188,100)	1317 (9-188,100)	1350 (4-117,750)	.03	.71
6 months-1 y	3440 (113-167,840)	3635 (35-382,500)	3563 (35-382,500)	3505 (60-221,550)	.70	.48
Major comorbidities (%)						
Diabetes	3788 (16.8)	6421 (15.7)	10,209 (16.1)	35,473 (11.7)	<.001	<.001
Hypertension	16,346 (72.5)	29,796 (72.9)	46,142 (72.8)	202,902 (66.9)	<.001	.003
Tobacco use	3206 (14.2)	5936 (14.5)	9142 (14.4)	34,880 (11.5)	<.001	.052
CCI, Mean ± SD	1.27 ± 1.78	1.14 ± 1.69	1.19 ± 1.73	1.01 ± 1.57	<.001	<.001

[a] BMI data were available for 9.3% of continuous FNB cases, 9.5% of single-shot FNB cases, and 6.7% of no FNB cases.
[b] Proportion of patients with at least one opioid claim (a) in the first 6 postoperative months and (b) with at least one additional claim in the next 6 mo. All opioid data were measured for a subset of each patient cohort without additional surgeries within 1 y of the index procedure.
[c] Average number of total prescription drug claims for an opioid drug.
[d] Average cumulative MME prescribed on all opioid claims filed by patients.

patients who did not receive FNBs filed opioid claims postoperatively, although the average total claims filed and the average cumulative MME prescribed on those claims were comparable. Within the FNB cohort, the continuous FNB was associated with higher rates of inpatient readmissions, DVT, and MI postoperatively than single-shot FNBs. However, these risks varied by patients' age and comorbidity burden.

There are several limitations to this study. The American Society of Anesthesiologists physical status classification is an important predictor of clinical outcomes but is not available within PearlDiver. However, this study assessed pre-existing comorbidity status in the form of CCI, which could be used to assess preanesthesia medical comorbidities. In addition, although the method of anesthesia delivery is a known contributor to postoperative complications, patients in this study could not be stratified according to the type of anesthesia received (eg, general vs epidural) during TKA due to anesthesia being coded and billed by the duration and not by the method of delivery. Although it is possible to assess the rates of prescription filling via prescription drug claims, it is not possible to quantify actual opioid consumption through analysis of claims data. Consequently, true opioid consumption may be overestimated or underestimated. This is an important limitation as prior literature has reported considerable rates of opioid diversion after surgical procedures [16]. Furthermore, the use and influence of other local

Table 2
Local complications of patients with femoral nerve block vs no femoral nerve block.

Local complications	FNB		No FNB		OR	95% CI
	N	%	n	%		
6 mo						
PJI	389	0.6%	1748	0.6%	0.99	0.88-1.10
Revision TKA	478	0.8%	2212	0.7%	0.98	0.88-1.08
MUA	2501	3.9%	11,140	3.7%	1.01	0.97-1.06
Falls	1151	1.8%	4105	1.4%	1.30	1.21-1.38
Readmissions[a]	6133	9.7%	23,534	7.8%	1.18	1.15-1.23
1 y						
PJI	521	0.82%	2320	0.77%	1.00	0.90-1.10
Revision TKA	798	1.3%	3677	1.2%	0.98	0.90-1.05
MUA	2655	4.2%	11,734	3.9%	1.02	0.98-1.06
Falls	2064	3.3%	7660	2.5%	1.25	1.19-1.32

TKA FNB study—FNB vs. no FNB.
Total TKA with FNB: 63,383.
Total TKA with no FNB: 303,089.
[a] Readmissions only at 90 d after discharge.

Table 3
Systemic complications of patients with continuous femoral nerve block vs single-shot femoral nerve block.

Systemic complications	FNB		No FNB		OR	95% CI
	n	%	n	%		
Inpatient						
DVT	306	0.5%	887	0.3%	1.57	1.38-1.79
PE	190	0.3%	748	0.2%	1.14	0.97-1.34
ARF	706	1.1%	2827	0.9%	1.09	0.99-1.18
MI	110	0.2%	276	0.1%	1.79	1.43-2.23
CVA	275	0.4%	975	0.3%	1.29	1.12-1.47
30 d						
DVT	1869	2.9%	6388	2.1%	1.37	1.30-1.45
PE	679	1.1%	2862	0.9%	1.11	1.02-1.21
ARF	1112	1.8%	4466	1.5%	1.13	1.05-1.21
MI	264	0.4%	990	0.3%	1.25	1.08-1.43
CVA	577	0.9%	2256	0.7%	1.20	1.09-1.31

ARF, acute renal failure; MI, myocardial infarction.
TKA FNB study—FNB vs. No FNB.
Total TKA with FNB: 63,383.
Total TKA with no FNB: 303,089.

Table 4
Systemic complications of patients with continuous femoral nerve block vs single-shot femoral nerve block.

Systemic complications	Continuous FNB		Single-shot FNB		OR	95% CI
	N	%	N	%		
Inpatient						
DVT	138	0.6%	168	0.4%	1.49	1.19-1.87
PE	65	0.3%	125	0.3%	0.94	0.69-1.26
ARF	267	1.2%	439	1.1%	1.07	0.92-1.25
MI	52	0.2%	58	0.1%	1.52	1.04-2.11
CVA	110	0.5%	165	0.4%	1.14	0.89-1.45
30 d						
DVT	786	3.5%	1083	2.7%	1.31	1.19-1.44
PE	229	1.0%	450	1.1%	0.91	0.78-1.07
ARF	397	1.8%	715	1.8%	0.96	0.85-1.09
MI	110	0.5%	154	0.4%	1.24	0.97-1.58
CVA	208	0.9%	369	0.9%	0.96	0.81-1.15

ARF, acute renal failure.
TKA FNB study—continuous FNB vs single-shot FNB.
Total TKA with continuous FNB: 22,532.
Total TKA with single-shot FNB: 40,851.

analgesic infiltrations during TKA, over-the-counter pain medications (eg, NSAIDs), and multimodal pain management protocols on postoperative pain management and opioid utilization are unknown. In addition, the complexity of medical billing requiring manual input of diagnostic and procedural codes creates the possibility of coding bias. However, these errors are inherent with any database study using administrative claims information, and a study by the Centers for Medicare and Medicaid Services demonstrated that such instances make up only 1.0% of overall payments [17]. Moreover, owing to the near proximity of different types of regional nerve blocks and their close relation to the knee, all regional blocks in this study were classified under one CPT code for the single-shot injection and one CPT code for the continuous infusion. In addition, clinical data including, but not limited to, the duration of surgery, blood loss, surgical approach, postoperative pain levels, and implant information could not be queried from the database. This prevents identification and quantification of potentially relevant confounders. Furthermore, the nature of claims database restricts the identification of comorbidities and complications to the binary presence or absence of the factor. Although confounders were reduced with the use of multivariable logistic regression, other confounders could have influenced the data.

Table 5
Local complications of patients with continuous femoral nerve block vs single-shot femoral nerve block.

Local complications	Continuous FNB		Single-shot FNB		OR	95% CI
	n	%	n	%		
6 mo						
PJI	141	0.6%	248	0.6%	1.02	0.83-1.26
Revision TKA	168	0.7%	310	0.8%	0.98	0.81-1.18
MUA	845	3.8%	1656	4.1%	0.94	0.86-1.02
Falls	401	1.78%	750	1.84%	0.95	0.84-1.07
Readmissions[a]	2587	11.5%	3546	8.7%	1.35	1.28-1.42
1 y						
PJI	186	0.83%	335	0.82%	1.00	0.84-1.20
Revision TKA	268	1.2%	530	1.3%	0.92	0.79-1.06
MUA	900	4.0%	1755	4.3%	0.94	0.87-1.02
Falls	718	3.2%	1346	3.3%	0.94	0.86-1.03

TKA FNB study—continuous FNB vs. single-shot FNB.
Total TKA with continuous FNB: 22,532.
Total TKA with single-shot FNB: 40,851.
[a] Readmissions only at 90 d after discharge.

Finally, with the exhaustive list of possible pre-existing comorbidities patients undergoing TKA can have, this study was not all inclusive and only accounted for major pre-existing comorbidities. Improvements on this study could include exploration of the role of other pre-existing comorbidities on the outcomes of TKA performed with nerve blocks.

Analysis of demographic data demonstrated that a greater proportion of patients receiving a FNB had pre-existing comorbidities such as DM, tobacco use, and HTN compared with patients who did not receive a FNB. Although patients aged 19-65 years comprised a greater proportion of the total FNB cohort, patients older than 65 years comprised a greater proportion of the total cohort that did not receive a FNB. This age split may suggest that surgeons are hesitant to perform regional nerve blocks on older patients. Fisher et al reported worsening postoperative TKA pain/stiffness outcomes in younger obese patients, which could represent a higher analgesia demand in this patient population [18]. This possible greater analgesia demand may help explain why more young, obese patients in this study received a single-shot FNB. In addition, patients who received a continuous FNB had a higher average CCI score than those who received a single-shot FNB. Given these stark demographic differences between the patient cohorts, patient selection and coordination between orthopaedic surgeons and other health-care providers is vital to optimize patients with medical comorbidities who underwent TKA to improve outcomes [9,19-21].

Although prior studies have shown FNBs to be effective in postoperative pain control [7], the present study demonstrated similar amounts of opioid claims and average cumulative prescribed MME for patients who received a FNB vs no FNB. However, a greater proportion of patients who did not receive FNBs filed opioid claims in the first 6 months postoperatively. In addition, a greater proportion of patients who did not receive a FNB had at least one opioid claim in the first 6 postoperative months and subsequently at least one claim between 6 months and 1 year. This result suggests the usage of FNBs during TKA does not affect the number of opioid claims made or the average cumulative prescribed MME in the short term, which aligns with the results of previous studies [6]. However, the influence of possible confounders such as other local intraoperative analgesia and postoperative multimodal pain management is unknown. Future studies investigating optimal analgesia strategies are warranted to combat the rising opioid epidemic [22,23].

This study further demonstrated patients receiving FNB with TKA significantly increased the risk of developing numerous postoperative complications, including falls, inpatient readmissions, and nearly every systemic complication queried. In a similar study, Memtsoudis et al [24] used a nonspecific CPT code and did not report any increased risk of falls associated with a peripheral nerve block vs no block. However, the present study improves on the prior study by stratifying patients according to the nerve block methodology and type (ie, continuous FNB vs single-shot FNB). In patients who receive a FNB, the increased fall risk may be secondary to compromised muscle response capacity and somatosensory inputs such as proprioception [25,26]. The significantly increased risk of falls at 6 months and 1 year in patients who received FNB during TKA is important to note as falls not only place the integrity of the prosthesis at risk but also can lead to dislocations, periprosthetic fractures, hardware loosening, and PJI if the integrity of the skin is compromised [27]. Furthermore, the increased risk of falls is likely contributory to the significantly higher risk of readmissions. This finding is consequential as readmissions increase the odds risk of nosocomial infections, which have been shown to increase PJI by hematogenous dissemination [28]. Finally, subgroup analysis for FNB vs no FNB demonstrated

only a small subset of patients were at a significantly greater risk of certain systemic complications such as CVA, PE, and MI. This suggests FNBs may not be an independent risk factor for these complications in all patients and that confounders including age, gender, and comorbidities may play a role in their development.

This study also found a significantly higher risk of DVT, MI, and readmissions within 90 days after TKA for patients who received a continuous nerve blocks compared with a single-shot nerve block. However, subgroup analysis showed the increased risks of each of these complications were only observed in particular subsets of patients, which suggests continuous FNBs may not be an independent or universal risk factor for all patients. Previous studies have failed to demonstrate a higher risk of DVTs associated with continuous FNBs than with single-shot FNBs [13,29]. Although the present study did not find a significant increase in the risk of PJI for patients receiving a regional nerve block, which was similarly seen by Kopp et al [30], there may be other factors that indirectly influence the risk of infections such as antibiotic timing, the type of anticoagulant prophylaxis, the use of a drain, and postoperative blood transfusion [31]. Furthermore, other surgical and post-surgical factors including, but not limited to, operative time, surgery-induced hypercoagulability, intraoperative arrhythmias, anesthesia induction, DVT prophylaxis regimen, stasis, and bed rest may contribute to the risk of systematic complications that patients who underwent TKA may experience [32].

Strengths of this study include the use of a large national patient database consisting of medical records from 122 million patients, thus generating external validity when extrapolating the data to the general population. In addition, the subgroup analysis largely aligned with the initial analysis further providing validity to the results of this study. Finally, to the authors' knowledge, this is one of the first studies to compare rates of short-term postoperative opiate claims between FNB cohorts specifically for TKA.

Conclusion

Surgeons and their teams should be aware of the significant risk of falls, readmissions, and systemic complications after primary TKA for patients who receive a FNB in comparison with patients that do not. Although rates of postoperative opioid claims were higher for patients that did not receive a FNB, total opioid claims and average cumulative MME prescribed were comparable at 1 year. Continuous FNBs have a higher odds risks of systemic complications and readmissions than single-shot FNBs.

Conflict of Interests

F.L. Sanchez receives royalties from Medacta and Signature Orthopaedics, is a paid consultant for Medacta, Biocomposites, and Link, and is a member for the AAOS Knee Content Committee; all other authors declare no potential conflicts of interest.

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Appendix Table A1
Codes used to define TKA and FNB:

Primary TKA code	CPT-27447		
Single-shot FNB code	CPT-64447		
Continuous FNB code	CPT-64448		
Opioid claim codes			
USC-02211	USC-02214	USC-02222	USC-02232
USC-02212	USC-02221	USC-02231	
Exclusion codes			
ICD-9-P-0080	ICD-10-D-M84551A	ICD-10-D-S72415A	ICD-10-D-S72452A
ICD-10-P-0SPC0JZ	ICD-10-D-M84552A	ICD-10-D-S72415B	ICD-10-D-S72452B
ICD-10-P-0SPD0JZ	ICD-10-D-M84553A	ICD-10-D-S72416A	ICD-10-D-S72452C
ICD-9-D-73310	ICD-10-D-M84651A	ICD-10-D-S72421A	ICD-10-D-S72453A
ICD-9-D-73315	ICD-10-D-M84652A	ICD-10-D-S72421B	ICD-10-D-S72453B
ICD-9-D-73316	ICD-10-D-M84653A	ICD-10-D-S72422A	ICD-10-D-S72454A
ICD-9-D-82300	ICD-10-D-M84461A	ICD-10-D-S72422B	ICD-10-D-S72454B
ICD-9-D-82302	ICD-10-D-M84462A	ICD-10-D-S72423A	ICD-10-D-S72455A
ICD-9-D-82310	ICD-10-D-M84469A	ICD-10-D-S72424A	ICD-10-D-S72456A
ICD-9-D-82312	ICD-10-D-M84561A	ICD-10-D-S72425A	ICD-10-D-S72456B
ICD-9-D-82380	ICD-10-D-M84562A	ICD-10-D-S72426A	ICD-10-D-S72461A
ICD-9-D-82382	ICD-10-D-M84569A	ICD-10-D-S72431A	ICD-10-D-S72461B
ICD-9-D-82390	ICD-10-D-M84661A	ICD-10-D-S72431B	ICD-10-D-S72461C
ICD-9-D-82392	ICD-10-D-M84662A	ICD-10-D-S72431C	ICD-10-D-S72462A
ICD-9-D-82100	ICD-10-D-M84669A	ICD-10-D-S72432A	ICD-10-D-S72462B
ICD-9-D-82110	ICD-10-D-S72401A	ICD-10-D-S72432B	ICD-10-D-S72462C
ICD-9-D-82120	ICD-10-D-S72401B	ICD-10-D-S72432C	ICD-10-D-S72463A
ICD-9-D-82123	ICD-10-D-S72401C	ICD-10-D-S72433A	ICD-10-D-S72463B
ICD-9-D-82129	ICD-10-D-S72402A	ICD-10-D-S72434A	ICD-10-D-S72464A
ICD-9-D-82130	ICD-10-D-S72402B	ICD-10-D-S72435A	ICD-10-D-S72465A
ICD-9-D-82133	ICD-10-D-S72402C	ICD-10-D-S72436A	ICD-10-D-S72465B
ICD-9-D-82139	ICD-10-D-S72409A	ICD-10-D-S72441A	ICD-10-D-S72466A
ICD-10-D-M80051A	ICD-10-D-S72409B	ICD-10-D-S72441B	ICD-10-D-S72471A
ICD-10-D-M80052A	ICD-10-D-S72409C	ICD-10-D-S72442A	ICD-10-D-S72472A
ICD-10-D-M80059A	ICD-10-D-S72411A	ICD-10-D-S72443A	ICD-10-D-S72491A
ICD-10-D-M80851A	ICD-10-D-S72411B	ICD-10-D-S72444A	ICD-10-D-S72491B
ICD-10-D-M80852A	ICD-10-D-S72412A	ICD-10-D-S72445A	ICD-10-D-S72491C
ICD-10-D-M80859A	ICD-10-D-S72412B	ICD-10-D-S72446A	ICD-10-D-S72492A
ICD-10-D-M84451A	ICD-10-D-S72413A	ICD-10-D-S72451A	ICD-10-D-S72492B
ICD-10-D-M84452A	ICD-10-D-S72413B	ICD-10-D-S72451B	ICD-10-D-S72492C
ICD-10-D-84453A	ICD-10-D-S72414A	ICD-10-D-S72451C	ICD-10-D-S72499A
Additional procedures (general anesthesia) codes	CPT-00634	CPT-01200	CPT-01832
	CPT-00635	CPT-01202	CPT-01840
CPT-00100	CPT-00640	CPT-01210	CPT-01842
CPT-00102	CPT-00670	CPT-01212	CPT-01844
CPT-00103	CPT-00700	CPT-01214	CPT-01850
CPT-00104	CPT-00702	CPT-01215	CPT-01852
CPT-00120	CPT-00730	CPT-01220	CPT-01860
CPT-00124	CPT-00740	CPT-01230	CPT-01905
CPT-00126	CPT-00750	CPT-01232	CPT-01916
CPT-00140	CPT-00752	CPT-01234	CPT-01920
CPT-00142	CPT-00754	CPT-01250	CPT-01922
CPT-00144	CPT-00756	CPT-01260	CPT-01924
CPT-00145	CPT-00770	CPT-01270	CPT-01925
CPT-00147	CPT-00790	CPT-01272	CPT-01926
CPT-00148	CPT-00792	CPT-01274	CPT-01930
CPT-00160	CPT-00794	CPT-01320	CPT-01931
CPT-00162	CPT-00796	CPT-01340	CPT-01932
CPT-00164	CPT-00797	CPT-01360	CPT-01933
CPT-00170	CPT-00800	CPT-01380	CPT-01935
CPT-00172	CPT-00802	CPT-01382	CPT-01936
CPT-00174	CPT-00810	CPT-01390	CPT-01951
CPT-00176	CPT-00820	CPT-01392	CPT-01952
CPT-00190	CPT-00830	CPT-01400	CPT-01953
CPT-00192	CPT-00832	CPT-01402	CPT-01958
CPT-00210	CPT-00834	CPT-01404	CPT-01960
CPT-00212	CPT-00836	CPT-01420	CPT-01961
CPT-00214	CPT-00840	CPT-01430	CPT-01962
CPT-00215	CPT-00842	CPT-01432	CPT-01963
CPT-00216	CPT-00844	CPT-01440	CPT-01965
CPT-00218	CPT-00846	CPT-01442	CPT-01966
CPT-00220	CPT-00848	CPT-01444	CPT-01967
CPT-00222	CPT-00851	CPT-01462	CPT-01968
CPT-00300	CPT-00860	CPT-01464	CPT-01969
CPT-00320	CPT-00862	CPT-01470	CPT-01991
CPT-00322	CPT-00864	CPT-01472	CPT-01992
CPT-00326	CPT-00865	CPT-01474	CPT-01999
CPT-00350	CPT-00866	CPT-01480	CPT-20693
CPT-00352	CPT-00868	CPT-01482	CPT-20694

Appendix Table A1 (*continued*)

CPT-00400	CPT-00870	CPT-01484	CPT-22505
CPT-00402	CPT-00872	CPT-01486	CPT-23655
CPT-00404	CPT-00873	CPT-01490	CPT-23700
CPT-00406	CPT-00880	CPT-01500	CPT-24300
CPT-00410	CPT-00882	CPT-01502	CPT-24605
CPT-00450	CPT-00902	CPT-01520	CPT-25259
CPT-00452	CPT-00904	CPT-01522	CPT-26340
CPT-00454	CPT-00906	CPT-01610	CPT-26675
CPT-00470	CPT-00908	CPT-01620	CPT-26705
CPT-00472	CPT-00630	CPT-01170	CPT-01780
CPT-00474	CPT-00632	CPT-01173	CPT-01782
CPT-00500	CPT-00910	CPT-01180	CPT-01810
CPT-00520	CPT-00912	CPT-01190	CPT-01820
CPT-00522	CPT-00914	CPT-01622	CPT-01829
CPT-00524	CPT-00916	CPT-01630	CPT-01830
CPT-00528	CPT-00918	CPT-01632	CPT-26775
CPT-00529	CPT-00920	CPT-01634	CPT-27095
CPT-00530	CPT-00921	CPT-01636	CPT-27194
CPT-00532	CPT-00922	CPT-01638	CPT-27252
CPT-00534	CPT-00924	CPT-01650	CPT-27257
CPT-00537	CPT-00926	CPT-01652	CPT-27266
CPT-00539	CPT-00928	CPT-01654	CPT-27275
CPT-00540	CPT-00930	CPT-01656	CPT-27552
CPT-00541	CPT-00932	CPT-01670	CPT-27562
CPT-00542	CPT-00934	CPT-01680	CPT-27570
CPT-00546	CPT-00936	CPT-01682	CPT-27606
CPT-00548	CPT-00938	CPT-01710	CPT-27831
CPT-00550	CPT-00940	CPT-01712	CPT-27842
CPT-00560	CPT-00942	CPT-01714	CPT-27860
CPT-00561	CPT-00944	CPT-01716	CPT-28545
CPT-00562	CPT-00948	CPT-01730	CPT-28575
CPT-00563	CPT-00950	CPT-01732	CPT-28605
CPT-00566	CPT-00952	CPT-01740	CPT-28635
CPT-00580	CPT-0102T	CPT-01742	CPT-28665
CPT-00600	CPT-01112	CPT-01744	CPT-30310
CPT-00604	CPT-01120	CPT-01756	CPT-45915
CPT-00620	CPT-01130	CPT-01758	CPT-45990
CPT-00622	CPT-01140	CPT-01760	CPT-46045
CPT-00625	CPT-01150	CPT-01770	CPT-67808
CPT-00626	CPT-01160	CPT-01772	CPT-69205
Sciatic Nerve Block codes	CPT-64445	CPT-64446	

Appendix Table A2
Codes used to evaluate for knee joint complications.

Prosthetic joint infection codes			
ICD-9-D-71100	ICD-10-D-M00161	ICD-10-D-M86162	ICD-10-D-M86051
ICD-9-D-71106	ICD-10-D-M00162	ICD-10-D-M86169	ICD-10-D-M8608
ICD-9-D-71108	ICD-10-D-M00169	ICD-10-D-M8618	ICD-10-D-T8450XA
ICD-9-D-71190	ICD-10-D-M0020	ICD-10-D-M8620	ICD-10-D-T8459XA
ICD-9-D-71196	ICD-10-D-M00261	ICD-10-D-M86251	ICD-10-D-T814XXA
ICD-9-D-71198	ICD-10-D-M00262	ICD-10-D-M86252	CPT-20005
ICD-9-D-73000	ICD-10-D-M00269	ICD-10-D-M86259	CPT-27301
ICD-9-D-73006	ICD-10-D-M0080	ICD-10-D-M86261	CPT-11981
ICD-9-D-73008	ICD-10-D-M00861	ICD-10-D-M86262	CPT-27488
ICD-9-D-73090	ICD-10-D-M00862	ICD-10-D-M86269	CPT-27310
ICD-9-D-73096	ICD-10-D-M00869	ICD-10-D-M8628	ICD-9-P-8006
ICD-9-D-73098	ICD-10-D-M01X0	ICD-10-D-M868X6	ICD-9-P-0084
ICD-9-D-99666	ICD-10-D-M01X61	ICD-10-D-M868X8	ICD-10-P-0SHC08Z
ICD-9-D-99667	ICD-10-D-M01X62	ICD-10-D-M868X9	ICD-10-P-0SHD08Z
ICD-9-D-99859	ICD-10-D-M01X69	ICD-10-D-M868X5	ICD-10-P-0SPC09Z
ICD-10-D-M009	ICD-10-D-M869	ICD-10-D-M8600	ICD-10-P-0SPD09Z
ICD-10-D-M00061	ICD-10-D-M8610	ICD-10-D-M86052	ICD-10-P-0SPC0JZ
ICD-10-D-M00062	ICD-10-D-M86151	ICD-10-D-M86059	ICD-10-P-0SPD0JZ
ICD-10-D-M00069	ICD-10-D-M86152	ICD-10-D-M86061	ICD-10-P-0S9C0ZZ
ICD-10-D-M0000	ICD-10-D-M86159	ICD-10-D-M86062	ICD-10-P-0S9D0ZZ
ICD-10-D-M0010	ICD-10-D-M86161	ICD-10-D-M86069	
Falls codes			
ICD-9-D-E8889	ICD-9-D-E8846	ICD-10-D-W109XXA	ICD-10-D-W08XXXA
ICD-9-D-E8859	ICD-9-D-E8845	ICD-10-D-W06XXXA	ICD-10-D-W1831XA
ICD-9-D-E8888	ICD-9-D-E8869	ICD-10-D-W108XXA	ICD-10-D-W1812XA
ICD-9-D-E8809	ICD-9-D-E9879	ICD-10-D-W0110XA	ICD-10-D-V00811A
ICD-9-D-E8881	ICD-9-D-E9870	ICD-10-D-W1789XA	ICD-10-D-V00831A
ICD-9-D-E8849	ICD-9-D-E9872	ICD-10-D-W07XXXA	ICD-10-D-W052XXA
ICD-9-D-E8844	ICD-10-D-W19XXXA	ICD-10-D-W182XXA	ICD-10-D-V00141A
ICD-9-D-E8842	ICD-10-D-W010XXA	ICD-10-D-W050XXA	ICD-10-D-W051XXA
ICD-9-D-E8801	ICD-10-D-W1830XA	ICD-10-D-W01190A	ICD-10-D-W16212A
ICD-9-D-E8880	ICD-10-D-W1839XA	ICD-10-D-W101XXA	ICD-10-D-V00181A
ICD-9-D-E8843	ICD-10-D-W01198A	ICD-10-D-W1811XA	
Manipulation under anesthesia codes	CPT-27570		
Revision TKA codes	CPT-27487		

Appendix Table A3
Codes used to evaluate for systemic complications.

Acute renal failure codes			
ICD-9-D-5846	ICD-9-D-5800	ICD-10-D-N171	ICD-10-D-N002
ICD-9-D-5847	ICD-9-D-5804	ICD-10-D-N172	ICD-10-D-N003
ICD-9-D-586	ICD-9-D-58081	ICD-10-D-N178	ICD-10-D-N004
ICD-9-D-5845	ICD-9-D-58089	ICD-10-D-N179	ICD-10-D-N005
ICD-9-D-5848	ICD-9-D-5809	ICD-10-D-N19	ICD-10-D-N007
ICD-9-D-5849	ICD-10-D-N170	ICD-10-D-N990	
Cerebrovascular event codes			
ICD-9-D-430	ICD-10-D-I610	ICD-10-D-I6320	ICD-10-D-I63442
ICD-9-D-431	ICD-10-D-I611	ICD-10-D-I6329	ICD-10-D-I63443
ICD-9-D-4320	ICD-10-D-I612	ICD-10-D-I658	ICD-10-D-I63449
ICD-9-D-4321	ICD-10-D-I613	ICD-10-D-I659	ICD-10-D-I6349
ICD-9-D-4329	ICD-10-D-I614	ICD-10-D-I6501	ICD-10-D-I6350
ICD-9-D-4359	ICD-10-D-I615	ICD-10-D-I6502	ICD-10-D-I63511
ICD-9-D-4358	ICD-10-D-I616	ICD-10-D-I6503	ICD-10-D-I63512
ICD-9-D-43300	ICD-10-D-I618	ICD-10-D-I6509	ICD-10-D-I63513
ICD-9-D-43301	ICD-10-D-I619	ICD-10-D-I6521	ICD-10-D-I63519
ICD-9-D-43310	ICD-10-D-I6200	ICD-10-D-I6522	ICD-10-D-I63521
ICD-9-D-43311	ICD-10-D-I6201	ICD-10-D-I6523	ICD-10-D-I63522
ICD-9-D-43320	ICD-10-D-I6202	ICD-10-D-I6529	ICD-10-D-I63523
ICD-9-D-43321	ICD-10-D-I6203	ICD-10-D-G458	ICD-10-D-I63529
ICD-9-D-43330	ICD-10-D-I629	ICD-10-D-G459	ICD-10-D-I63531
ICD-9-D-43331	ICD-10-D-I6302	ICD-10-D-I6330	ICD-10-D-I63532
ICD-9-D-43380	ICD-10-D-I6312	ICD-10-D-I63311	ICD-10-D-I63533
ICD-9-D-43381	ICD-10-D-I6322	ICD-10-D-I63312	ICD-10-D-I63539
ICD-9-D-43390	ICD-10-D-I651	ICD-10-D-I63313	ICD-10-D-I63541
ICD-9-D-43391	ICD-10-D-I63031	ICD-10-D-I63319	ICD-10-D-I63542
ICD-9-D-43400	ICD-10-D-I63032	ICD-10-D-I63321	ICD-10-D-I63543
ICD-9-D-43401	ICD-10-D-I63033	ICD-10-D-I63322	ICD-10-D-I63549
ICD-9-D-43410	ICD-10-D-I63039	ICD-10-D-I63323	ICD-10-D-I6359
ICD-9-D-43411	ICD-10-D-I63131	ICD-10-D-I63329	ICD-10-D-I636
ICD-9-D-43490	ICD-10-D-I63132	ICD-10-D-I63331	ICD-10-D-I638
ICD-9-D-43491	ICD-10-D-I63133	ICD-10-D-I63332	ICD-10-D-I639
ICD-10-D-I6000	ICD-10-D-I63139	ICD-10-D-I63333	ICD-10-D-I6601
ICD-10-D-I6001	ICD-10-D-I63231	ICD-10-D-I63339	ICD-10-D-I6602
ICD-10-D-I6002	ICD-10-D-I63232	ICD-10-D-I63341	ICD-10-D-I6603
ICD-10-D-I6010	ICD-10-D-I63233	ICD-10-D-I63342	ICD-10-D-I6609
ICD-10-D-I6011	ICD-10-D-I63239	ICD-10-D-I63343	ICD-10-D-I6611
ICD-10-D-I6012	ICD-10-D-I63011	ICD-10-D-I63349	ICD-10-D-I6612
ICD-10-D-I602	ICD-10-D-I63012	ICD-10-D-I6339	ICD-10-D-I6613
ICD-10-D-I6020	ICD-10-D-I63013	ICD-10-D-I6340	ICD-10-D-I6619
ICD-10-D-I6021	ICD-10-D-I63019	ICD-10-D-I63411	ICD-10-D-I6621
ICD-10-D-I6022	ICD-10-D-I63111	ICD-10-D-I63412	ICD-10-D-I6622
ICD-10-D-I6030	ICD-10-D-I63112	ICD-10-D-I63413	ICD-10-D-I6623
ICD-10-D-I6031	ICD-10-D-I63113	ICD-10-D-I63419	ICD-10-D-I6629
ICD-10-D-I6032	ICD-10-D-I63119	ICD-10-D-I63421	ICD-10-D-I668
ICD-10-D-I604	ICD-10-D-I63211	ICD-10-D-I63422	ICD-10-D-I669
ICD-10-D-I6050	ICD-10-D-I63212	ICD-10-D-I63423	
ICD-10-D-I6051	ICD-10-D-I63213	ICD-10-D-I63429	
ICD-10-D-I6052	ICD-10-D-I63219	ICD-10-D-I63431	
ICD-10-D-I606	ICD-10-D-I6300	ICD-10-D-I63432	
ICD-10-D-I607	ICD-10-D-I6309	ICD-10-D-I63433	
ICD-10-D-I608	ICD-10-D-I6310	ICD-10-D-I63439	
ICD-10-D-I609	ICD-10-D-I6319	ICD-10-D-I63441	
Deep vein thrombosis codes			
ICD-9-D-45340	ICD-10-D-I82403	ICD-10-D-I824Z9	ICD-10-D-I825Z1
ICD-9-D-45341	ICD-10-D-I82409	ICD-10-D-I82501	ICD-10-D-I825Z2
ICD-9-D-45342	ICD-10-D-I82491	ICD-10-D-I82502	ICD-10-D-I825Z3
ICD-9-D-45111	ICD-10-D-I82492	ICD-10-D-I82503	ICD-10-D-I825Z9
ICD-9-D-45119	ICD-10-D-I82493	ICD-10-D-I82509	
ICD-9-D-45389	ICD-10-D-I82499	ICD-10-D-I82591	
ICD-9-D-4539	ICD-10-D-I824Y1	ICD-10-D-I82592	
ICD-9-D-4512	ICD-10-D-I824Y2	ICD-10-D-I82593	
ICD-9-D-45350	ICD-10-D-I824Y3	ICD-10-D-I82599	
ICD-9-D-45351	ICD-10-D-I824Y9	ICD-10-D-I825Y1	
ICD-9-D-45352	ICD-10-D-I824Z1	ICD-10-D-I825Y2	
ICD-10-D-I82401	ICD-10-D-I824Z2	ICD-10-D-I825Y3	
ICD-10-D-I82402	ICD-10-D-I824Z3	ICD-10-D-I825Y9	
Myocardial infarction codes			
ICD-9-D-41000	ICD-9-D-41041	ICD-9-D-41072	ICD-10-D-I2121
ICD-9-D-41001	ICD-9-D-41042	ICD-9-D-41060	ICD-10-D-I229

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Appendix Table A3 (*continued*)

Acute renal failure codes			
ICD-9-D-41002	ICD-9-D-41050	ICD-9-D-41061	ICD-10-D-I2101
ICD-9-D-41010	ICD-9-D-41051	ICD-9-D-41062	ICD-10-D-I221
ICD-9-D-41011	ICD-9-D-41052	ICD-10-D-I214	ICD-10-D-I220
ICD-9-D-41012	ICD-9-D-41080	ICD-10-D-I213	ICD-10-D-I228
ICD-9-D-41020	ICD-9-D-41081	ICD-10-D-I2119	
ICD-9-D-41021	ICD-9-D-41082	ICD-10-D-I2109	
ICD-9-D-41022	ICD-9-D-41090	ICD-10-D-I2129	
ICD-9-D-41030	ICD-9-D-41091	ICD-10-D-I240	
ICD-9-D-41031	ICD-9-D-41092	ICD-10-D-I2111	
ICD-9-D-41032	ICD-9-D-41070	ICD-10-D-I2102	
ICD-9-D-41040	ICD-9-D-41071	ICD-10-D-I222	
Pulmonary embolism codes			
ICD-9-D-41511	ICD-9-D-41519	ICD-10-D-I2609	ICD-10-D-I2782
ICD-9-D-41513	ICD-9-D-4162	ICD-10-D-I2699	

Appendix Table B1
Subgroup analysis for femoral nerve block vs no femoral nerve block.

Subgroup analysis for femoral nerve block vs no femoral nerve block		Femoral nerve block		No femoral nerve block		OR	95% CI
Local complication	Subgroup	n	%	N	%		
6 mo							
Prosthetic joint infection	Age 19-65 y	187	0.7%	747	0.7%	0.94	0.79-1.10
	Age 65-74 y	163	0.6%	792	0.5%	1.07	0.90-1.26
	Age 75+ y	39	0.5%	209	0.5%	0.92	0.65-1.29
	Women	168	0.4%	807	0.4%	0.91	0.77-1.07
	Men	221	0.9%	941	0.8%	1.05	0.91-1.22
	CCI 0-1	256	0.6%	1179	0.5%	1.04	0.90-1.19
	CCI >1	133	0.7%	569	0.8%	0.92	0.76-1.11
Revision total knee arthroplasty	Age 19-65 y	234	0.9%	932	0.9%	0.95	0.82-1.10
	Age 65-74 y	187	0.7%	985	0.6%	1.00	0.85-1.17
	Age 75+ y	57	0.7%	295	0.7%	0.99	0.74-1.31
	Women	249	0.7%	1134	0.6%	0.99	0.86-1.13
	Men	229	0.9%	1078	0.9%	0.97	0.83-1.11
	CCI 0-1	314	0.7%	1583	0.7%	0.96	0.84-1.08
	CCI >1	164	0.9%	629	0.9%	1.04	0.87-1.23
Manipulation under anesthesia	Age 19-65 y	1611	5.9%	6310	5.8%	1.01	0.96-1.07
	Age 65-74 y	755	2.7%	4156	2.7%	0.99	0.92-1.08
	Age 75+ y	135	1.7%	674	1.6%	1.06	0.87-1.27
	Women	1572	4.1%	6976	3.8%	1.01	0.95-1.07
	Men	929	3.7%	4164	3.4%	1.01	0.94-1.09
	CCI 0-1	1960	4.3%	8890	3.9%	1.03	0.98-1.09
	CCI >1	541	3.0%	2250	3.0%	0.93	0.85-1.02
Falls	Age 19-65 y	397	1.5%	1133	1.0%	1.30	1.15-1.45
	Age 65-74 y	514	1.8%	2017	1.3%	1.31	1.19-1.44
	Age 75+ y	240	3.0%	955	2.2%	1.26	1.09-1.46
	Women	779	2.0%	2683	1.5%	1.34	1.23-1.45
	Men	372	1.5%	1422	1.2%	1.22	1.09-1.37
	CCI 0-1	662	1.5%	2531	1.1%	1.33	1.22-1.45
	CCI >1	489	2.7%	1574	2.1%	1.28	1.15-1.42
Readmissions[a]	Age 19-65 y	2762	10.1%	8493	7.9%	1.25	1.19-1.31
	Age 65-74 y	2720	9.7%	12,174	8.0%	1.15	1.10-1.20
	Age 75+ y	651	8.1%	2867	6.7%	1.12	1.02-1.23
	Women	3829	10.0%	13,986	7.7%	1.25	1.20-1.30
	Men	2304	9.2%	9548	7.9%	1.10	1.05-1.16
	CCI 0-1	3851	8.5%	14,943	6.5%	1.27	1.22-1.32
	CCI >1	2282	12.7%	8591	11.6%	1.08	1.03-1.14
1 y							
Prosthetic joint infection	Age 19-65 y	259	0.9%	1016	0.9%	0.96	0.83-1.09
	Age 65-74 y	209	0.7%	1036	0.7%	1.04	0.90-1.21
	Age 75+ y	53	0.7%	268	0.6%	0.99	0.73-1.32
	Women	221	0.6%	1087	0.6%	0.89	0.77-1.02
	Men	300	1.2%	1233	1.0%	1.09	0.96-1.24
	CCI 0-1	344	0.8%	1585	0.7%	1.03	0.91-1.16
	CCI >1	177	1.0%	735	1.0%	0.95	0.80-1.12
Revision total knee arthroplasty	Age 19-65 y	410	1.5%	1666	1.5%	0.94	0.85-1.05
	Age 65-74 y	307	1.1%	1586	1.0%	1.02	0.90-1.15
	Age 75+ y	81	1.0%	425	1.0%	0.99	0.77-1.24
	Women	411	1.1%	1944	1.1%	0.94	0.85-1.05
	Men	387	1.5%	1733	1.4%	1.01	0.90-1.13
	CCI 0-1	547	1.2%	2663	1.2%	0.98	0.89-1.07
	CCI >1	251	1.4%	1014	1.4%	0.98	0.85-1.12
Manipulation under anesthesia	Age 19-65 y	1705	6.2%	6618	6.1%	1.02	0.97-1.08
	Age 65-74 y	807	2.9%	4408	2.9%	1.00	0.93-1.08
	Age 75+ y	143	1.8%	708	1.7%	1.07	0.88-1.27
	Women	1687	4.4%	7354	4.0%	1.03	0.97-1.09
	Men	968	3.8%	4380	3.6%	1.00	0.93-1.08
	CCI 0-1	2073	4.6%	9338	4.1%	1.04	0.99-1.09
	CCI >1	582	3.3%	2396	3.2%	0.94	0.86-1.03
Falls	Age 19-65 y	704	2.6%	2106	1.9%	1.25	1.14-1.36
	Age 65-74 y	922	3.3%	3750	2.5%	1.27	1.18-1.37
	Age 75+ y	438	5.4%	1804	4.2%	1.22	1.10-1.36
	Women	1430	3.7%	5105	2.8%	1.3	1.22-1.38
	Men	634	2.5%	2555	2.1%	1.16	1.06-1.27
	CCI 0-1	1199	2.6%	4748	2.1%	1.29	1.21-1.38
	CCI >1	865	4.8%	2912	3.9%	1.23	1.13-1.32
Systemic complication							
Inpatient							
Deep vein thrombosis	Age 19-65 y	148	0.5%	331	0.3%	1.74	1.43-2.11
	Age 65-74 y	121	0.4%	460	0.3%	1.34	1.09-1.64
	Age 75+ y	37	0.5%	96	0.2%	1.90	1.28-2.75

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Appendix Table B1 (*continued*)

Subgroup analysis for femoral nerve block vs no femoral nerve block		Femoral nerve block		No femoral nerve block		OR	95% CI
Local complication	Subgroup	n	%	N	%		
	Women	167	0.4%	504	0.3%	1.50	1.26-1.79
	Men	139	0.6%	383	0.3%	1.66	1.36-2.01
	CCI 0-1	200	0.4%	579	0.3%	1.69	1.43-1.98
	CCI >1	106	0.6%	308	0.4%	1.4	1.12-1.74
Pulmonary embolism	Age 19-65 y	83	0.3%	285	0.3%	1.10	0.85-1.39
	Age 65-74 y	85	0.3%	351	0.2%	1.24	0.97-1.56
	Age 75+ y	22	0.3%	112	0.3%	0.99	0.61-1.53
	Women	123	0.3%	481	0.3%	1.14	0.93-1.39
	Men	67	0.3%	267	0.2%	1.14	0.87-1.49
	CCI 0-1	124	0.3%	473	0.2%	1.28	1.04-1.55
	CCI >1	66	0.4%	275	0.4%	0.96	0.73-1.25
Acute renal failure	Age 19-65 y	245	0.9%	787	0.7%	1.13	0.97-1.30
	Age 65-74 y	319	1.1%	1521	1.0%	0.99	0.88-1.12
	Age 75+ y	142	1.8%	519	1.2%	1.30	1.07-1.56
	Women	335	0.9%	1330	0.7%	1.07	0.95-1.21
	Men	371	1.5%	1497	1.2%	1.10	0.98-1.23
	CCI 0-1	272	0.6%	1158	0.5%	1.14	0.99-1.30
	CCI >1	434	2.4%	1669	2.3%	1.07	0.96-1.19
Myocardial infarction	Age 19-65 y	26	0.1%	53	0.05%	1.81	1.13-2.89
	Age 65-74 y	61	0.2%	166	0.1%	1.75	1.29-2.34
	Age 75+ y	23	0.3%	57	0.1%	1.87	1.13-3.01
	Women	43	0.1%	130	0.1%	1.44	1.00-2.02
	Men	67	0.3%	146	0.1%	2.10	1.56-2.80
	CCI 0-1	35	0.1%	60	0.0%	3.09	2.01-4.67
	CCI >1	75	0.4%	216	0.3%	1.48	1.13-1.91
Cerebrovascular accident	Age 19-65 y	51	0.2%	165	0.2%	1.13	0.81-1.53
	Age 65-74 y	156	0.6%	558	0.4%	1.35	1.12-1.61
	Age 75+ y	68	0.8%	252	0.6%	1.28	0.97-1.67
	Women	155	0.4%	536	0.3%	1.31	1.09-1.56
	Men	120	0.5%	439	0.4%	1.26	1.02-1.54
	CCI 0-1	84	0.2%	359	0.2%	1.25	0.98-1.57
	CCI >1	191	1.1%	616	0.8%	1.33	1.12-1.56
30 d							
Deep vein thrombosis	Age 19-65 y	782	2.9%	2137	2.0%	1.43	1.31-1.55
	Age 65-74 y	877	3.1%	3339	2.2%	1.39	1.29-1.50
	Age 75+ y	210	2.6%	912	2.1%	1.17	1.00-1.36
	Women	1069	2.8%	3650	2.0%	1.37	1.28-1.47
	Men	800	3.2%	2738	2.3%	1.38	1.27-1.49
	CCI 0-1	1216	2.7%	4299	1.9%	1.43	1.34-1.52
	CCI >1	653	3.6%	2089	2.8%	1.3	1.18-1.42
Pulmonary embolism	Age 19-65 y	263	1.0%	953	0.9%	1.06	0.92-1.22
	Age 65-74 y	324	1.2%	1490	1.0%	1.15	1.02-1.30
	Age 75+ y	92	1.1%	419	1.0%	1.13	0.90-1.41
	Women	408	1.1%	1707	0.9%	1.11	1.00-1.25
	Men	271	1.1%	1155	1.0%	1.11	0.97-1.26
	CCI 0-1	462	1.0%	1964	0.9%	1.19	1.07-1.32
	CCI >1	217	1.2%	898	1.2%	0.98	0.85-1.14
Acute renal failure	Age 19-65 y	318	1.2%	1094	1.0%	1.07	0.94-1.22
	Age 65-74 y	559	2.0%	2447	1.6%	1.12	1.02-1.23
	Age 75+ y	235	2.9%	925	2.2%	1.24	1.07-1.43
	Women	519	1.4%	2080	1.1%	1.10	1.00-1.21
	Men	593	2.4%	2386	2.0%	1.15	1.05-1.26
	CCI 0-1	456	1.0%	2051	0.9%	1.14	1.03-1.26
	CCI >1	656	3.7%	2415	3.3%	1.14	1.05-1.25
Myocardial infarction	Age 19-65 y	62	0.2%	194	0.2%	1.18	0.88-1.57
	Age 65-74 y	134	0.5%	576	0.4%	1.17	0.97-1.41
	Age 75+ y	68	0.8%	220	0.5%	1.50	1.13-1.96
	Women	123	0.3%	487	0.3%	1.16	0.94-1.41
	Men	141	0.6%	503	0.4%	1.33	1.10-1.60
	CCI 0-1	115	0.3%	456	0.2%	1.34	1.09-1.64
	CCI >1	149	0.8%	534	0.7%	1.19	0.99-1.42
Cerebrovascular accident	Age 19-65 y	122	0.4%	393	0.4%	1.14	0.93-1.40
	Age 65-74 y	310	1.1%	1307	0.9%	1.19	1.04-1.34
	Age 75+ y	145	1.8%	556	1.3%	1.29	1.07-1.55
	Women	319	0.8%	1253	0.7%	1.18	1.04-1.34
	Men	258	1.0%	1003	0.8%	1.22	1.06-1.40
	CCI 0-1	257	0.6%	1097	0.5%	1.28	1.11-1.47
	CCI >1	320	1.8%	1159	1.6%	1.18	1.04-1.33

[a] Readmissions only at 90 d after discharge.

Appendix Table B2
Subgroup analysis for continuous femoral nerve block vs single-shot femoral nerve block.

Subgroup analysis for continuous femoral nerve block vs single-shot femoral nerve block		Continuous femoral nerve block		Single-shot femoral nerve block		OR	95% CI
Local complication	Subgroup	n	%	n	%		
6 mo							
Prosthetic joint infection	Age 19-65 y	58	0.6%	129	0.7%	0.85	0.62-1.15
	Age 65-74 y	68	0.7%	95	0.5%	1.21	0.88-1.65
	Age 75+ y	15	0.6%	24	0.4%	1.17	0.60-2.21
	Women	58	0.4%	110	0.4%	0.95	0.69-1.30
	Men	83	0.9%	138	0.9%	1.08	0.82-1.42
	CCI 0-1	85	0.5%	171	0.6%	0.94	0.72-1.21
	CCI >1	56	0.8%	77	0.7%	1.21	0.85-1.71
Revision total knee arthroplasty	Age 19-65 y	65	0.7%	169	0.9%	0.73	0.54-0.97
	Age 65-74 y	84	0.8%	103	0.6%	1.38	1.03-1.85
	Age 75+ y	19	0.7%	38	0.7%	0.95	0.53-1.63
	Women	88	0.6%	161	0.7%	0.99	0.76-1.28
	Men	80	0.9%	149	0.9%	0.97	0.73-1.27
	CCI 0-1	106	0.7%	208	0.7%	0.96	0.78-1.22
	CCI >1	62	0.9%	102	0.9%	1.02	0.74-1.39
Manipulation under anesthesia	Age 19-65 y	532	5.7%	1142	6.4%	0.94	0.85-1.05
	Age 65-74 y	264	2.5%	491	2.8%	0.9	0.77-1.05
	Age 75+ y	49	1.8%	86	1.6%	1.1	0.77-1.56
	Women	529	3.9%	1043	4.2%	0.94	0.84-1.04
	Men	316	3.5%	613	3.8%	0.94	0.82-1.08
	CCI 0-1	638	4.1%	1322	4.4%	0.91	0.83-1.01
	CCI >1	207	3.0%	334	3.0%	1.03	0.87-1.23
Falls	Age 19-65 y	141	1.5%	256	1.4%	1.05	0.85-1.29
	Age 65-74 y	186	1.8%	328	1.9%	0.94	0.78-1.12
	Age 75+ y	74	2.7%	166	3.1%	0.83	0.62-1.09
	Women	278	2.0%	501	2.0%	0.98	0.85-1.15
	Men	123	1.4%	249	1.5%	0.87	0.70-1.08
	CCI 0-1	207	1.3%	455	1.5%	0.86	0.72-1.01
	CCI >1	194	2.9%	295	2.7%	1.08	0.90-1.30
Readmissions[b]	Age 19-65 y	1147	12.2%	1615	9.0%	1.41	1.30-1.53
	Age 65-74 y	1194	11.5%	1526	8.7%	1.35	1.24-1.46
	Age 75+ y	246	9.0%	405	7.6%	1.13	0.95-1.33
	Women	1616	11.9%	2213	9.0%	1.35	1.27-1.45
	Men	971	10.8%	1333	8.2%	1.34	1.23-1.46
	CCI 0-1	1596	10.1%	2255	7.6%	1.38	1.29-1.47
	CCI >1	991	14.6%	1291	11.6%	1.31	1.20-1.43
1 y							
Prosthetic joint infection	Age 19-65 y	81	0.9%	178	1.0%	0.86	0.66-1.14
	Age 65-74 y	84	0.8%	125	0.7%	1.15	0.87-1.15
	Age 75+ y	21	0.8%	32	0.6%	1.23	0.70-2.13
	Women	73	0.5%	148	0.6%	0.89	0.67-1.17
	Men	113	1.3%	187	1.2%	1.1	0.86-1.39
	CCI 0-1	114	0.7%	230	0.8%	0.94	0.75-1.17
	CCI >1	72	1.1%	105	0.9%	1.14	0.84-1.54
Revision total knee arthroplasty	Age 19-65 y	121	1.3%	289	1.6%	0.79	0.64-0.98
	Age 65-74 y	121	1.2%	186	1.1%	1.1	0.87-1.38
	Age 75+ y	26	1.0%	55	1.0%	0.91	0.56-1.44
	Women	133	1.0%	278	1.1%	0.86	0.70-1.06
	Men	135	1.5%	252	1.6%	0.97	0.78-1.19
	CCI 0-1	173	1.1%	374	1.3%	0.87	0.73-1.05
	CCI >1	95	1.4%	156	1.4%	1.02	0.78-1.31
Manipulation under anesthesia	Age 19-65 y	563	6.0%	1611	9.0%	0.94	0.85-1.05
	Age 65-74 y	283	2.7%	524	3.0%	0.91	0.78-1.05
	Age 75+ y	54	2.0%	89	1.7%	1.17	0.83-1.64
	Women	565	4.2%	1122	4.6%	0.93	0.84-1.03
	Men	335	3.7%	633	3.9%	0.97	0.84-1.11
	CCI 0-1	678	4.3%	1395	4.7%	0.92	0.84-1.01
	CCI >1	222	3.3%	360	3.2%	1.03	0.87-1.22
Falls	Age 19-65 y	232	2.5%	472	2.6%	0.93	0.79-1.09
	Age 65-74 y	343	3.3%	579	3.3%	0.98	0.85-1.12
	Age 75+ y	143	5.3%	295	5.5%	0.9	0.73-1.11
	Women	502	3.7%	928	3.8%	0.96	0.86-1.07
	Men	216	2.4%	418	2.6%	0.91	0.77-1.07
	CCI 0-1	378	2.4%	821	2.8%	0.86	0.76-0.98
	CCI >1	340	5.0%	525	4.7%	1.06	0.92-1.22
Systemic complication							
Deep vein thrombosis	Age 19-65 y	71	0.8%	77	0.4%	1.77	1.28-2.44
	Age 65-74 y	52	0.5%	69	0.4%	1.27	0.88-1.81
	Age 75+ y	15	0.6%	22	0.4%	1.25	0.63-2.41
	Women	77	0.6%	90	0.4%	1.57	1.15-2.13
	Men	61	0.7%	78	0.5%	1.41	1.01-1.97

(*continued on next page*)

Appendix Table B2 (*continued*)

Subgroup analysis for continuous femoral nerve block vs single-shot femoral nerve block		Continuous femoral nerve block		Single-shot femoral nerve block		OR	95% CI
Local complication	Subgroup	n	%	n	%		
	CCI 0-1	92	0.6%	108	0.4%	1.64	1.24-2.16
	CCI >1	46	0.7%	60	0.5%	1.26	0.85-1.85
Pulmonary embolism	Age 19-65 y	25	0.3%	58	0.3%	0.82	0.50-1.29
	Age 65-74 y	35	0.3%	50	0.3%	1.18	0.76-1.81
	Age 75+ y	5	0.2%	17	0.3%	0.56	0.18-1.43
	Women	48	0.4%	75	0.3%	1.15	0.79-1.64
	Men	17	0.2%	50	0.3%	0.61	0.34-1.04
	CCI 0-1	39	0.2%	85	0.3%	0.86	0.58-1.25
	CCI >1	26	0.4%	40	0.4%	1.09	0.65-1.77
Acute renal failure	Age 19-65 y	82	0.9%	163	0.9%	0.96	0.73-1.25
	Age 65-74 y	125	1.2%	194	1.1%	1.08	0.86-1.35
	Age 75+ y	60	2.2%	82	1.5%	1.31	0.93-1.83
	Women	119	0.9%	216	0.9%	0.97	0.77-1.22
	Men	148	1.7%	223	1.4%	1.17	0.94-1.44
	CCI 0-1	84	0.5%	188	0.6%	0.84	0.65-1.10
	CCI >1	183	2.7%	251	2.3%	1.22	1.00-1.48
Myocardial infarction	Age 19-65 y	11	0.1%	15	0.1%	1.39	0.62-3.02
	Age 65-74 y	34	0.3%	27	0.2%	2.04	1.23-3.41
	Age 75+ y	5	0.2%	16	0.3%	0.73	0.28-1.72
	Women	19	0.1%	24	0.1%	1.33	0.72-2.44
	Men	33	0.4%	34	0.2%	1.67	1.02-2.70
	CCI 0-1	14	0.1%	21	0.1%	1.23	0.63-2.46
	CCI >1	38	0.6%	37	0.3%	1.66	1.05-2.62
Cerebrovascular accident	Age 19-65 y	21	0.2%	30	0.2%	1.35	0.76-2.36
	Age 65-74 y	66	0.6%	90	0.5%	1.20	0.87-1.65
	Age 75+ y	23	0.8%	45	0.8%	0.91	0.54-1.50
	Women	61	0.4%	94	0.4%	1.11	0.80-1.53
	Men	49	0.5%	71	0.4%	1.16	0.80-1.67
	CCI 0-1	35	0.2%	49	0.2%	1.36	0.88-2.10
	CCI >1	75	1.1%	116	1.0%	1.04	0.77-1.39
30 d							
Deep vein thrombosis	Age 19-65 y	300	3.2%	482	2.7%	1.18	1.02-1.37
	Age 65-74 y	394	3.8%	483	2.8%	1.38	1.21-1.58
	Age 75+ y	92	3.4%	118	2.2%	1.52	1.15-2.01
	Women	472	3.5%	597	2.4%	1.43	1.26-1.61
	Men	314	3.5%	486	3.0%	1.17	1.01-1.35
	CCI 0-1	488	3.1%	728	2.4%	1.27	1.13-1.43
	CCI >1	298	4.4%	355	3.2%	1.39	1.19-1.63
Pulmonary embolism	Age 19-65 y	84	0.9%	179	1.0%	0.89	0.68-1.15
	Age 65-74 y	114	1.1%	210	1.2%	0.91	0.72-1.14
	Age 75+ y	31	1.1%	61	1.1%	0.97	0.62-1.49
	Women	142	1.0%	266	1.1%	0.95	0.77-1.17
	Men	87	1.0%	184	1.1%	0.88	0.65-1.09
	CCI 0-1	145	0.9%	317	1.1%	0.86	0.70-1.04
	CCI >1	84	1.2%	133	1.2%	1.04	0.78-1.36
Acute renal failure	Age 19-65 y	110	1.2%	208	1.2%	0.99	0.78-1.25
	Age 65-74 y	202	1.9%	357	2.0%	0.93	0.78-1.12
	Age 75+ y	85	3.1%	150	2.8%	1.02	0.77-1.34
	Women	182	1.3%	337	1.4%	0.94	0.78-1.13
	Men	215	2.4%	378	2.3%	0.98	0.83-1.17
	CCI 0-1	145	0.9%	311	1.0%	0.88	0.72-1.07
	CCI >1	252	3.7%	404	3.6%	1.02	0.87-1.20
Myocardial infarction	Age 19-65 y	27	0.3%	35	0.2%	1.45	0.88-2.40
	Age 65-74 y	62	0.6%	72	0.4%	1.42	1.01-1.99
	Age 75+ y	21	0.8%	47	0.9%	0.83	0.49-1.38
	Women	49	0.4%	74	0.3%	1.16	0.80-1.66
	Men	61	0.7%	80	0.5%	1.32	0.94-1.84
	CCI 0-1	41	0.3%	74	0.2%	1.05	0.71-1.53
	CCI >1	69	1.0%	80	0.7%	1.4	1.01-1.94
Cerebrovascular accident	Age 19-65 y	52	0.6%	70	0.4%	1.40	0.97-2.01
	Age 65-74 y	106	1.0%	204	1.2%	0.84	0.66-1.06
	Age 75+ y	50	1.8%	95	1.8%	0.97	0.68-1.36
	Women	111	0.8%	208	0.8%	0.92	0.72-1.15
	Men	97	1.1%	161	1.0%	1.02	0.79-1.32
	CCI 0-1	89	0.6%	168	0.6%	1.00	0.78-1.29
	CCI >1	119	1.8%	201	1.8%	0.95	0.76-1.20

[b] Readmissions only at 90 d after discharge.