

# Analysis of Venous Thromboprophylaxis Duration and Outcomes in Orthopedic Patients

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Following total hip replacement (THR) or total knee replacement (TKR) surgery, patients face increased risk for venous thromboembolism (VTE), including deep vein thrombosis (DVT) and pulmonary embolism (PE).<sup>1-3</sup> The incidence of hospital-acquired VTE is 40% to 60% following major orthopedic surgery.<sup>4</sup> Added to that is the risk of PE—some cases of which can be fatal. Because of these serious complications associated with major orthopedic surgery, the American College of Chest Physicians (ACCP) recommends routine use of thromboprophylaxis in these patients.<sup>3</sup>

The effectiveness, safety, and cost-effectiveness of pharmacologic thromboprophylaxis have been shown in a broad spectrum of patients who have undergone THR or TKR surgery. Thromboprophylaxis reduces the risk of VTE (including fatal PE) by more than 60%, and the risk of clinically relevant bleeding is low and similar to that in patients receiving mechanical prophylaxis or no prophylaxis.<sup>1,4,5</sup>

According to the international Global Orthopaedic Registry, which collected data from approximately 15,000 patients who underwent THR or TKR, VTE occurred after the median time to hospital discharge in 75% of THR and 57% of TKR patients who experienced this complication. The cumulative incidence of VTE within 3 months was 1.7% after THR and 2.6% after TKR.<sup>6</sup> Two meta-analyses compared studies with short-duration<sup>6</sup> and long-duration<sup>5</sup> thromboprophylaxis, and the results demonstrated that long-duration thromboprophylaxis resulted in a lower rate of VTE than short-duration prophylaxis.<sup>5,7</sup>

Current evidence-based guidelines recommend extending thromboprophylaxis beyond 10 days and up to 35 days after THR surgery and also suggest extending thromboprophylaxis for up to 35 days after TKR surgery.<sup>7</sup> There has been limited evaluation of thromboprophylaxis duration and clinical outcomes in nonclinical trial populations of THR/TKR patients in North America. The purpose of this study was to assess the incidence of DVT, PE, VTE, and bleeding events in patients receiving short- and extended-duration pharmacologic thromboprophylaxis after THR and/or TKR surgery in US clinical practice.

**Background:** Venous thromboembolism (VTE) following total hip replacement (THR) and total knee replacement (TKR) surgery imposes significant health and economic burden.

**Objective:** To examine the impact of thromboprophylaxis duration on deep vein thrombosis (DVT), pulmonary embolism (PE), total VTE (DVT and PE), and bleeding events among THR/TKR patients.

**Methods:** A retrospective study (April 1, 2004, to December 31, 2006) was conducted using a US health plan claims database linked to an inpatient database containing medication use. Outcomes were compared using  $\chi^2$  tests; predictors of outcomes were analyzed using multivariate logistic regression.

**Results:** Of 3497 patients, 3195 (91%) received thromboprophylaxis for  $\geq 1$  day postsurgery. Most patients (67%) received short-duration (1-14 days) rather than extended-duration (>14 days) thromboprophylaxis. The incidence of thromboembolic and bleeding events was higher in those who received short-duration thromboprophylaxis: DVT (2.84% vs 1.24%;  $P = .0038$ ), PE (1.12% vs 0.19%;  $P = .0052$ ), total VTE (3.96% vs 1.43%;  $P < .0001$ ), and major bleeding (1.68% vs 0.38%;  $P = .0011$ ). Multivariate logistic regressions (adjusted for observed demographic and clinical characteristics) revealed similar results. Baseline comorbidity score was significantly associated with major bleeding; most of the bleeding events in those who received short-duration thromboprophylaxis occurred within the first 14 days.

**Conclusions:** In this database analysis of patients who had undergone THR/TKR surgery, a large proportion of patients did not receive the minimum duration of thromboprophylaxis recommended by the guidelines. Extended-duration thromboprophylaxis was associated with a significantly lower risk of DVT, PE, and VTE compared with short-duration thromboprophylaxis.

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## METHODS

### Data Collection

This was a retrospective database analysis conducted to evaluate thromboprophylaxis patterns and outcomes

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### Take-Away Points

This study suggests that a large proportion of US patients undergoing total hip replacement or total knee replacement do not receive extended-duration (>14 days) thromboprophylaxis therapy as recommended by American College of Chest Physicians guidelines.

■ Potential barriers may include fear of increased risk of bleeding, difficulty of self-administering injectable low molecular weight heparin after hospital discharge, and complexity of international normalized ratio monitoring and food–drug interactions with oral warfarin.

■ Patients who received short duration (1-14 days) thromboprophylaxis were more likely to experience thromboembolic and bleeding events.

posthospital thromboprophylaxis,<sup>15</sup> as well as patients who did and did not receive thromboprophylaxis for the ACCP-recommended minimum 10 days.<sup>3</sup>

Clinical outcomes included DVT, PE, total VTE (DVT and PE), and bleeding (major or minor) events. Major bleeding included fatal bleeding,

in patients who underwent THR or TKR. Patient information was collected from 2 databases: the “claims database” from an i3 Innovus–affiliated (Eden Prairie, MN) US health plan and an “inpatient database” called Perspective, from Premier, Inc (San Diego, CA). The claims database included healthcare utilization information from the community collected through claims submitted by physicians, hospitals, and pharmacies; it included only limited information on medication use and procedures performed in the hospital during an inpatient stay and on deaths occurring postdischarge. The inpatient database was derived from more than 450 hospitals<sup>8</sup> and provided patient demographics, diagnosis, treatments, and medication use (including type of postsurgery thromboprophylaxis). Linkage between the claims database and the inpatient database was conducted in line with the methodology described by Hammill et al.<sup>9</sup>

### Patients and Treatment Assessments

Patients were commercial health plan members, age 18 years or older, who had elective THR or TKR between April 1, 2004, and December 31, 2006. They were enrolled continuously during the baseline (a 90-day period prior to surgery claim date), index hospitalization (presurgery and postsurgery), and follow-up (90-day period after hospital discharge) periods. Patients with evidence of any VTE or orthopedic surgery during the baseline period were excluded. Patient demographics (age, sex, geographic location) were captured from enrollment data in the claims database. See [eAppendix A](#) at [www.ajmc.com](http://www.ajmc.com) for details on patient enrollment and attrition. Baseline comorbidity was measured for each patient using the Deyo<sup>10</sup> adaptation of the Charlson Comorbidity Index.<sup>11</sup> This adaptation uses a scale of 0 to 28, representing the sum of individual weighted scores for each comorbid condition.

Patients were categorized into subclasses for thromboprophylaxis duration comparisons (short duration lasting 1-14 days vs extended duration lasting >14 days; 1-21 vs >21 days; and 1-28 vs >28 days). Use of the 14-day cutoff for short-duration thromboprophylaxis was based on previous comparative trials,<sup>12,13</sup> as well as the design proposed by Friedman<sup>14</sup> and others.<sup>15</sup> The 14-day time frame included both in-hospital and

nonfatal bleeding at a critical site, bleeding requiring reoperation, or overt bleeding. Fatal bleeding was defined as bleeding events during the postoperative period, with or without a diagnosis code of discharge bleeding, and evidence of death at discharge without stroke or myocardial infarction.<sup>16</sup> Bleeding (major or minor) events occurring on the day of surgery were excluded. Mortality was not included (6 [0.27%] in the short-duration (1-14 days) group and 1 [0.1%] in the longer-duration (>14 days) group; *P* = nonsignificant); the causes of death could not be confirmed.

### Statistical Analyses

Thromboprophylaxis duration was compared among subgroups using the  $\chi^2$  test for dichotomous and polychotomous variables and the *t* test for continuous variables.

Logistic regression was used to assess factors affecting probability of DVT, PE, any VTE, and bleeding events. These regressions controlled for observed baseline characteristics including age, sex, geographic region, Charlson-Deyo comorbidity score, surgery type (THR or TKR), and duration (1-14 days or >14 days) and type of thromboprophylaxis (oral vs injectable).

Warfarin was the only oral agent used for anticoagulation and considered as thromboprophylaxis, but data also were collected on the use of platelet aggregation inhibitors (clopidogrel, ticlopidine); injectable thromboprophylaxis included low molecular weight heparin, unfractionated heparin, and fondaparinux.

## RESULTS

### Patient Characteristics

Of 30,644 eligible patients, 3497 could be linked to the inpatient database records. Of these patients, 3195 had received anticoagulation (warfarin or other vitamin K antagonist, low molecular weight heparin, fondaparinux, or unfractionated heparin) or antiplatelet therapy (clopidogrel or ticlopidine) for at least 1 day postsurgery. Within the sample population of 3195 patients, 67% (*n* = 2148) received short-duration thromboprophylaxis (1-14 days) and 33% (*n* = 1047) received extended-duration thromboprophylaxis (>14 days). Of the 2148 patients in the short-duration group, 83% (56%

of the total sample population) received VTE prophylaxis for fewer than 10 days. Mean Charlson-Deyo comorbidity scores for all patients were less than 1 on the scale of 0 to 28, which was not clinically significant.

Of the 3195 patients in the sample population, 35% (n = 1123) had THR surgery and 65% (n = 2072) had TKR surgery. Patients in the THR group who received extended-duration thromboprophylaxis were younger, with lower rates of both hypertension and hepatic disease compared with patients who received short-duration thromboprophylaxis. Similarly, patients in the TKR group who received extended-duration thromboprophylaxis were more frequently younger males, with lower rates of prior long-term anticoagulant use (Table 1).

### Duration of Thromboprophylaxis and Outcomes

Across both THR and TKR groups, patients receiving short-duration thromboprophylaxis were more likely to experience the following events than patients who received extended-duration thromboprophylaxis: DVT (2.84% vs 1.24%;  $P = .0038$ ) and PE (1.12% vs 0.19%;  $P = .0052$ ). Total VTE occurred in 85 (3.96%) of 2148 patients who received short-duration thromboprophylaxis compared with 15 (1.43%) of 1047 patients who received extended-duration thromboprophylaxis ( $P < .0001$ ). Moreover, the rate of VTE decreased with increasing thromboprophylaxis duration (ie, 1.43%, 1.32%, and 0.97% for >14, >21, and >28 days of therapy, respectively; Table 2). Interestingly, there was a lower rate of major bleeding events in patients receiving extended-duration thromboprophylaxis (>14 days) compared with those receiving short-duration prophylaxis (1.68% vs 0.38%;  $P = .0011$ ). The rate of minor bleeding was not significantly different between short- and extended-duration thromboprophylaxis (Table 2).

Patients in the THR group who received short-duration thromboprophylaxis had a proportionally higher incidence of DVT (2.14% vs 1.60%), PE (0.94% vs 0.27%), or total VTE (3.08% vs 1.86%), but the difference did not reach statistical significance (Table 2). However, in the THR group, short-duration thromboprophylaxis was associated with higher rates of both major and minor bleeding events compared with extended-duration thromboprophylaxis. In the TKR group, patients receiving short-duration thromboprophylaxis were more likely to experience DVT (3.21% vs 1.04%;  $P = .0024$ ), PE (1.21% vs 0.15%;  $P = .0111$ ), and total VTE (4.43% vs 1.19%;  $P < .0001$ ). The major bleeding rate was significantly higher in patients who received short-duration compared with extended-duration thromboprophylaxis in the TKR group (Table 2).

Logistic regression analysis showed that patients who received extended-duration thromboprophylaxis after surgery

had a significantly lower probability of experiencing any VTE ([odds ratio [OR] = 0.40; 95% confidence interval [CI], 0.22-0.71;  $P < .01$ ), DVT (OR = 0.48; 95% CI, 0.25-0.90;  $P < .05$ ), PE (OR = 0.19; 95% CI, 0.04-0.83;  $P < .05$ ), or major bleeding (OR = 0.23; 95% CI, 0.08-0.67;  $P < .01$ ) following index surgery. The baseline Charlson-Deyo comorbidity score was associated with major bleeding (OR = 1.37; 95% CI, 1.02,-1.83;  $P < .05$ ).

### Secondary Analysis of Major Bleeding Events

There were no differences in baseline characteristics between patients who received short-duration versus extended-duration thromboprophylaxis. See eAppendix B at [www.ajmc.com](http://www.ajmc.com). Of the 40 patients who experienced major bleeding, 36 were in the short-duration group and 4 were in the extended-duration group. Of the 36 patients who received short-duration thromboprophylaxis, 10 experienced major bleeding on day 2 after surgery. Most major bleeding events (20/36, 56%) occurred in the first 2 weeks after surgery and therefore likely influenced the duration of therapy. See eAppendix C at [www.ajmc.com](http://www.ajmc.com). After removing from the analysis the 20 patients who experienced major bleeding during the first 2 weeks, the VTE rate in the short-duration group compared with the extended-duration group was 3.95% versus 1.43% ( $P < .001$ ).

## DISCUSSION AND CONCLUSIONS

This study evaluated the duration of thromboprophylaxis and associated real-world outcomes in US patients who underwent elective THR or TKR. The current ACCP guidelines recommend that thromboprophylaxis be extended beyond 10 days and up to 35 days after THR surgery, and suggest extending thromboprophylaxis for up to 35 days after TKR surgery.<sup>3</sup> Despite guideline recommendations and the clinical evidence of the benefit of extended thromboprophylaxis, results from the current study showed that in clinical practice, more than two-thirds of patients in the United States received only short-duration therapy (1-14 days), and among those, 83% (more than half of the total sample population) received VTE prophylaxis for less than 10 days, the minimum recommended thromboprophylaxis duration.

In the current study, a 14-day cutoff for short-term prophylaxis was used, based on previous comparative trials using enoxaparin,<sup>12,13</sup> as well as the design proposal by Friedman<sup>14</sup> and others.<sup>15</sup> This 14-day duration covers both in-hospital and posthospital prophylaxis<sup>15</sup> and includes patients who received an ACCP-recommended agent<sup>2,3</sup> for less than the minimum of 10 days. Overall, the results showed significantly higher rates of DVT, PE, and total VTE in patients who received short-

■ TRENDS FROM THE FIELD ■

■ **Table 1.** Baseline Patient Characteristics by Surgery Type<sup>a</sup>

Characteristic	THR Baseline Characteristics			P
	Therapy Total (N = 1123)	1-14 Days (n = 747)	>14 Days (n = 376)	
<b>Male sex</b>	584 (52.00)	374 (50.07)	210 (55.85)	.0671
<b>Geographic location</b>				.6971
Northeast	91 (8.10)	61 (8.17)	30 (7.98)	
Midwest	338 (30.10)	221 (29.59)	117 (31.12)	
South	544 (48.44)	370 (49.53)	174 (46.28)	
West	150 (13.36)	95 (12.72)	55 (14.63)	
<b>Geographic division</b>				<b>.0001</b>
New England	14 (1.25)	13 (1.74)	1 (0.27)	
Mid-Atlantic	77 (6.86)	48 (6.43)	29 (7.71)	
East North Central	195 (17.36)	131 (17.54)	64 (17.02)	
West North Central	143 (12.73)	90 (12.05)	53 (14.10)	
South Atlantic	336 (29.92)	224 (29.99)	112 (29.79)	
East South Central	31 (2.76)	16 (2.14)	15 (3.99)	
West South Central	177 (15.76)	130 (17.40)	47 (12.50)	
Mountain	60 (5.34)	26 (3.48)	34 (9.04)	
Pacific	90 (8.01)	69 (9.24)	21 (5.59)	
<b>Age group, y</b>				<b>&lt;.0001</b>
18-34	23 (2.05)	12 (1.61)	11 (2.93)	
35-54	394 (35.08)	247 (33.07)	147 (39.10)	
55-64	426 (37.93)	276 (36.95)	150 (39.89)	
65-74	183 (16.30)	123 (16.47)	60 (15.96)	
>75	97 (8.64)	89 (11.91)	8 (2.13)	
<b>Baseline comorbidities</b>				
Hemophilia	0 (0.00)	0 (0.00)	0 (0.00)	
Coagulation defects other than hemophilia	18 (1.60)	9 (1.20)	9 (2.39)	.1344
Abnormal coagulation profile	3 (0.27)	1 (0.13)	2 (0.53)	.2226
HIV infection/AIDS	3 (0.27)	3 (0.40)	0 (0.00)	.2185
Hypertension	447 (39.80)	326 (43.64)	121 (32.18)	<b>.0002</b>
Prior long-term use of anticoagulants	18 (1.60)	14 (1.87)	4 (1.06)	.3075
Prior long-term use of antiplatelets/ antithrombotics	0 (0.00)	0 (0.00)	0 (0.00)	
Personal history of PE	0 (0.00)	0 (0.00)	0 (0.00)	
Personal history of thrombophlebitis	0 (0.00)	0 (0.00)	0 (0.00)	
Hepatic disease	12 (1.07)	12 (1.61)	0 (0.00)	<b>.0135</b>
Renal disease	95 (8.46)	69 (9.24)	26 (6.91)	.1870
Cancer (excluding MDS)	34 (3.03)	24 (3.21)	10 (2.66)	.6096
<b>Age (continuous), mean (SD)</b>	58.14 (10.93)	59.23 (11.52)	55.97 (9.31)	<b>&lt;.0001</b>
<b>Charlson-Deyo comorbidity score, mean (SD)</b>	0.37 (0.77)	0.40 (0.80)	0.33 (0.70)	.1549

MDS indicates myelodysplastic syndrome; PE, pulmonary embolism; THR, total hip replacement; TKR, total knee replacement.  
<sup>a</sup>Values are number (percentage) unless indicated otherwise. Boldfaced entries are significant at  $P < .05$ .

## Venous Thromboprophylaxis Duration

duration thromboprophylaxis (1-14 days) compared with those who received >14 days of thromboprophylaxis. Moreover, the incidence rates were further reduced when thromboprophylaxis was used for >28 days. After adjusting for covariates, multivariate logistic regression revealed similar results. However, when data were analyzed according to the type of surgery, the decrease in VTE events in the extended-duration group did not reach statistical significance in patients undergoing THR, but this is likely due to the smaller number of patients in this group.

Because different bleeding definitions were used in different studies,<sup>17</sup> direct comparisons with other clinical studies cannot be made. Nevertheless, both minor and major bleeding rates were lower in this study than in those published previously.<sup>15,18,19</sup> The unexpected lower major bleeding rate observed in patients who received extended-duration thromboprophylaxis could not be attributed to the duration of anticoagulant therapy, as more than half of the bleeding events in those who received short-duration thromboprophylaxis occurred within the first 14 days. Bleeding events may have been one of the reasons for the discontinuation of thromboprophylaxis. In addition, logistic regression showed that the baseline Charlson-Deyo comorbidity score was significantly associated with major bleeding.

There are limitations to our study, typical of any retrospective claims data analysis. First, ideal stratification would have been done according to physician-intended duration, but this information was not available. Second, medications filled over-the-counter (eg, aspirin) or provided as samples by the physician were not measurable in the claims data. The impact of race/ethnicity,<sup>20</sup> body mass index,<sup>21</sup> extent of surgery,<sup>22</sup> anesthesia duration,<sup>21,23</sup> and other risk factors<sup>22,24</sup> on VTE and

TKR Baseline Characteristics			
Therapy Total (N = 2072)	1-14 Days (n = 1401)	>14 Days (n = 671)	P
788 (38.03)	501 (35.76)	287 (42.77)	<b>.0021</b>
			<b>.0016</b>
85 (4.10)	64 (4.57)	21 (3.13)	
784 (37.84)	491 (35.05)	293 (43.67)	
976 (47.10)	688 (49.11)	288 (42.92)	
227 (10.96)	158 (11.28)	69 (10.28)	
			<b>&lt;.0001</b>
20 (0.97)	13 (0.93)	7 (1.04)	
65 (3.14)	51 (3.64)	14 (2.09)	
390 (18.82)	251 (17.92)	139 (20.72)	
394 (19.02)	240 (17.13)	154 (22.95)	
541 (26.11)	361 (25.77)	180 (26.83)	
64 (3.09)	43 (3.07)	21 (3.13)	
371 (17.91)	284 (20.27)	87 (12.97)	
96 (4.63)	50 (3.57)	46 (6.86)	
131 (6.32)	108 (7.71)	23 (3.43)	
			<b>&lt;.0001</b>
3 (0.14)	2 (0.14)	1 (0.15)	
487 (23.50)	302 (21.56)	185 (27.57)	
929 (44.84)	587 (41.90)	342 (50.97)	
447 (21.57)	334 (23.84)	113 (16.84)	
206 (9.94)	176 (12.56)	30 (4.47)	
1 (0.05)	1 (0.07)	0 (0.00)	.4888
12 (0.58)	8 (0.57)	4 (0.60)	.9438
5 (0.24)	3 (0.21)	2 (0.30)	.7156
1 (0.05)	1 (0.7)	0 (0.00)	.4888
1086 (52.41)	735 (52.46)	351 (52.31)	.9481
58 (2.80)	50 (3.57)	8 (1.19)	<b>.0021</b>
1 (0.05)	0 (0.00)	1 (0.15)	.1484
6 (0.29)	5 (0.36)	1 (0.15)	.4100
1 (0.05)	1 (0.07)	0 (0.00)	.4888
25 (1.21)	18 (1.28)	7 (1.04)	.6374
208 (10.04)	147 (10.49)	61 (9.09)	.3205
80 (3.86)	59 (4.21)	21 (3.13)	.2318
61.18 (9.41)	62.16 (9.81)	59.11 (8.14)	<b>&lt;.0001</b>
0.48 (0.86)	0.51 (0.91)	0.43 (0.75)	<b>.0351</b>

**Table 2.** Comparison Between Duration of Thromboprophylaxis and Incidence of Venous Thromboembolism and Bleeding<sup>a</sup>

Outcome	1-14 Days of Therapy, No. (%)	>14 Days of Therapy, No. (%)	P	1-21 Days of Therapy, No. (%)	>21 Days of Therapy, No. (%)	P	1-28 Days of Therapy, No. (%)	>28 Days of Therapy, No. (%)	P
<b>Combined THR/TKR surgeries</b>									
Total no. of patients	2148	1047		2364	831		2576	619	
DVT	61 (2.84)	13 (1.24)	<b>.0038</b>	64 (2.71)	10 (1.20)	<b>.0108</b>	69 (2.68)	5 (0.81)	<b>.0041</b>
PE	24 (1.12)	2 (0.19)	<b>.0052</b>	25 (1.06)	1 (0.12)	<b>.0061</b>	25 (0.97)	1 (0.16)	<b>.0448</b>
Total VTE	85 (3.96)	15 (1.43)	<b>&lt;.0001</b>	89 (3.76)	11 (1.32)	<b>.0003</b>	94 (3.65)	6 (0.97)	<b>.0003</b>
Minor bleeding	84 (3.91)	31 (2.98)	.1893	93 (3.93)	22 (2.65)	.1037	98 (3.80)	17 (2.75)	.2303
Major bleeding	36 (1.68)	4 (0.38)	<b>.0011</b>	38 (1.61)	2 (0.24)	<b>.0009</b>	39 (1.51)	1 (0.16)	<b>.0038</b>
<b>THR surgery only</b>									
Total no. of patients	747	376		824	299		894	229	
DVT	16 (2.14)	6 (1.60)	.6514	17 (2.06)	5 (1.67)	.8105	20 (2.24)	2 (0.87)	.2833
PE	7 (0.94)	1 (0.27)	.2804	7 (0.85)	1 (0.33)	.6892	7 (0.78)	1 (0.44)	1.0000
Total VTE	23 (3.08)	7 (1.86)	.3265	24 (2.91)	6 (2.01)	.5310	27 (3.02)	3 (1.31)	.1751
Minor bleeding	34 (4.56)	6 (1.60)	<b>.0103</b>	36 (4.37)	4 (1.34)	<b>.0165</b>	37 (4.14)	3 (1.31)	<b>.0438</b>
Major bleeding	14 (1.87)	1 (0.27)	<b>.0267</b>	15 (1.82)	0 (0.00)	<b>.0156</b>	15 (1.68)	0 (0.00)	.0512
<b>TKR surgery only</b>									
Total no. of patients	1401	671		1540	532		1682	390	
DVT	45 (3.21)	7 (1.04)	<b>.0024</b>	47 (3.05)	5 (0.94)	<b>.0057</b>	49 (2.91)	3 (0.77)	<b>.0112</b>
PE	17 (1.21)	1 (0.15)	<b>.0111</b>	18 (1.17)	0 (0.00)	<b>.0062</b>	18 (1.07)	0 (0.00)	<b>.0340</b>
<b>Total VTE</b>	<b>62 (4.43)</b>	<b>8 (1.19)</b>	<b>&lt;.0001</b>	<b>65 (4.22)</b>	<b>5 (0.94)</b>	<b>.0001</b>	<b>67 (3.98)</b>	<b>3 (0.77)</b>	<b>.0005</b>
Minor bleeding	78 (3.57)	25 (3.73)	.9001	57 (3.70)	18 (3.38)	.7893	61 (3.63)	14 (3.59)	1.0000
Major bleeding	22 (1.57)	3 (0.45)	<b>.0304</b>	23 (1.49)	2 (0.38)	<b>.0395</b>	24 (1.43)	1 (0.26)	.0683

DVT indicates non-PE deep vein thrombosis; PE, pulmonary embolism; THR, total hip replacement; TKR, total knee replacement; VTE, venous thromboembolism.

<sup>a</sup>Boldfaced entries are significant at  $P \leq .05$ . All DVTs were considered to be non-PE DVTs. Venous thromboembolism is non-PE DVT + PE.

bleeding events was not available. Finally, the reasons for not continuing thromboprophylaxis therapy were not available and may have been because of higher risk for bleeding, which may have contributed to the higher bleeding rate in the short-duration thromboprophylaxis group.

The results from this analysis suggest that a large proportion of patients undergoing THR or TKR in the United States do not receive the ACCP guideline–recommended duration of thromboprophylaxis therapy. Extended-duration thromboprophylaxis is associated with a lower incidence of DVT, PE, and total VTE.

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