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Venous thromboembolism (VTE) prophylaxis after bariatric surgery: a national survey of MBSAQIP director practices

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Abstract

Background: Venous thromboembolism (VTE) is the most common cause of death following metabolic/bariatric surgery (MBS), with most events occurring after discharge. The available evidence on ideal prophylaxis type, dosage, and duration after discharge is limited.

Objectives: Assess metabolic/bariatric surgeon VTE prophylaxis practices and define existing variability.

Setting: Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program (MBSAQIP)-accredited centers.

Methods: The members of the ASMBS Research Committee developed and administered a web-based survey to MBSAQIP medical directors and ASMBS members to examine the differences in clinical practice regarding the administration of VTE prophylaxis after MBS.

Results: Overall, 264 metabolic/bariatric surgeons (136 medical directors and 128 ASMBS members) participated in the survey. Both mechanical and chemical VTE prophylaxis was used by 97.1% of the participants, knee-high compression devices by 84.7%, enoxaparin (32.4% 40 mg every 24 hours, 22.7% 40 mg every 12 hours, 24.4% adjusted the dose based on body mass

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Authors' contributions

The authors confirm contribution to the paper as follows: Study conception and design: Stefanidis D, Athanasiadis D., Giannopoulos S, Clapp B., Lyo V., Ghanem O., Puzziferri N, Edwards M; Data collection: Giannopoulos S, Athanasiadis D; Analysis and interpretation of results: Giannopoulos S, Stefanidis D; Kalantar Motamedi SM; Draft preparation: Giannopoulos S; Stefanidis D; Kalantar Motamedi SM; Critical content revision: Stefanidis D., Clapp B., Lyo V., Ghanem O., Puzziferri N;

Supplementary data

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index) by 56.5%, and heparin (46.1% 5000 units every 8 hours, 22.6% 5000 units every 12 hours, 20.9% 5000 units once preoperatively) by 38.1%. Most surgeons (81.6%) administered the first dose preoperatively, while the first postoperative dose was given on the evening of surgery by 44% or the next morning by 42.2%. Extended VTE prophylaxis was prescribed for 2 weeks by 38.7% and 4 weeks by 28.9%.

Conclusions: VTE prophylaxis practices vary widely among metabolic/bariatric surgeons. Variability may be related to limited available comparative evidence. Large prospective clinical trials are needed to define optimal practices for VTE risk stratification and prophylaxis in bariatric surgery patients.

Keywords

Bariatric surgery; Venous thromboembolism (VTE) prophylaxis; Mechanical prophylaxis; Chemoprophylaxis; Survey

Metabolic/bariatric surgery (MBS) offers the most effective treatment for obesity and related medical problems. It improves the overall life expectancy more than nonsurgical weight control methods and is considered very safe with less than .1% overall mortality [1–5]. However, venous thromboembolism (VTE)events, including pulmonary embolism (PE) and deep vein thrombosis (DVT), occur in .1%–2% and 1%–3% of MBS [6,7]. Although the lifetime risk of VTE and mortality decreases with MBS, it remains one of the most common causes of mortality postoperatively [8–11]. VTE may occur during hospitalization, but 73%–83% of the events happen after discharge [11–14]. Thus, in-hospital and postdischarge prophylaxis is of utmost importance.

The American Society of Metabolic and Bariatric Surgeons (ASMBS) conducted 2 surveys previously, 1 in 1998 [15] and then 10 years later in 2007 [6] in order to evaluate the practices of metabolic/bariatric surgeons regarding prophylaxis of VTE. During that time, there have been changes in practice patterns; namely, the use of low molecular weight heparin (LMWH) increased from 13% in 1998 to 58.4% in 2007. Since then, many studies have added to the body of evidence, and the ASMBS also issued an updated position statement in 2022 [16]. In addition many VTE risk assessment models (RAM) have been developed to help physicians optimize their targets for prophylaxis [10,11,17,18]. New guidelines have been recently issued by surgical and medical societies based on available evidence to recommend standard prophylaxis protocols [19–21]. Due to the rare incidence of VTE, high-quality comparative evidence of prophylaxis choices is scarce [19,22]. Such uncertainty further affects the dosage, frequency, time of initiation, and total duration of administration of chemoprophylactic agents. Further, current VTE RAMs do not take postoperative bleeding risk into account [11,17,23].

In this context, the standardization of VTE prophylaxis practices may be difficult, as the current existing evidence is based on low-level data, requiring metabolic/bariatric surgeons to make decisions based on their clinical judgment. Such conditions can, however, result in inconsistencies in patient care. Our objective in this study was to evaluate current patterns of practice in VTE prophylaxis among metabolic/bariatric surgeons and define existing variability that might inform new trials for improving standards of care in MBS.

Methods

The Research Committee of the ASMBS [24] created a questionnaire to examine the differences in clinical practice regarding the administration of VTE prophylaxis perioperatively and after MBS. Prior to distributing the survey, an institutional review board exemption was obtained. This survey was part of an effort of the ASMBS Research Committee to establish a research collaboration among Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program (MBSAQIP)-accredited centers. The interest of MBSAQIP-accredited center medical directors was initially solicited via email contact. The survey was distributed twice to this group of 215 medical directors in November 2021 via a web-based anonymous link, allowing for a minimum of 1-week interval until the second dissemination. The invitation provided a brief background of the study's purpose and the topic to be assessed. After collecting the responses of the medical directors, the participation was extended to the entire ASMBS membership. As such, the survey was posted in the ASMBS newsletter in December 2021 and January 2022.

The survey was created using an online survey platform (Qualtrics, Provo, Utah, USA), where the answers were collected and stored. The participation was voluntary and confidential as all responses were deidentified and only cumulative results or anonymous individual responses were presented. The survey was conducted in English and was closed for analysis on February 4th, 2022.

The questionnaire included 28 multiple-choice and open-guided questions (Appendix 1). It was developed by a working group of the ASMBS Research Committee using an iterative process [25,26] and was piloted with Research Committee members before being finalized based on provided feedback. Questions regarding demographic information (e.g., surgeon's ethnicity and gender), occupational characteristics (e.g., years in practice after fellowship, practice type of primary location, and annual metabolic/bariatric volume of the program), and differences in VTE prophylaxis, such as type of medication, dose, frequency of administration, duration post-discharge, initiation after surgery, and complications, were presented to participants. A separate answer, mentioned as "Other," was included in each question, and a box to specify their choice was provided to ensure the collection of all possible answers. In this context, this survey aimed only to detect and analyze differences in clinical practices among metabolic/bariatric surgeons and not to identify the most beneficial VTE prophylaxis.

Descriptive statistics were used to analyze the survey results, and qualitative data from the open-text box questions were analyzed accordingly. Additionally, a separate analysis of the responses in the medical directors' group versus ASMBS members was conducted to investigate variations in surgeons' practices based on their position. Binary variables were presented as absolute or relative frequencies. Chi-square test or Fisher's exact test, when applicable, were used to determine significant variables. For all tests, $P < .05$ was considered significant. All statistical analyses were performed with STATA 16.0 software (STATA Corporation, College Station, TX, USA).

Results

Two hundred sixty-four surgeons participated in the survey, with 136 being medical directors and 128 surgeons from the ASMBS membership, with the vast majority of them completing the survey (85%). The calculated response rate for the 2 groups was 63% for the directors and 4% for the broader membership. The baseline characteristics of each group are presented in Table 1. The groups were similar in terms of gender composition, ethnicity, and practice type of the primary location. However, surgeons in the medical director group had more years in practice after fellowship and were employed at higher volume programs.

Surgeons' responses to the questions related to clinical practice differences during and after hospitalization are presented in Table 2. In both groups, almost all surgeons (97.1%) used chemoprophylaxis (CP) combined with mechanical prophylaxis (MP). Of those offering MP, 84.7% selected knee-length sequential compression devices (SCD), 5.2% SCDs combined with thromboembolus deterrent (TED) hose, and 4.8% thigh-length SCDs. The type of MP was similar across the groups, with only the combination of TED hose and SCDs being more frequently used by ASMBS participants than the directors (Table 3). Of the surgeons administering CP before and after MBS, enoxaparin (56.5%) and heparin (38.1%) were the most preferred anticoagulants regardless of the group surgeons belonged to. In most cases, perioperative CP administration was initiated just before the operation in the preoperative area (81.6%), and the patient resumed anticoagulation the evening of surgery (44%) or the next morning (42.2%) (Table 2). The practices regarding the dose ($P = .07$ for heparin; $P = .153$ for enoxaparin) and frequency ($P = .501$ for heparin; $P = .09$ for enoxaparin) of VTE CP did not differ significantly between the groups (Table 4). The most common dosage options for enoxaparin were 40 mg every 24 hours (32.4%), 40 mg every 12 hours (22.7%), and adjusted dose based on body mass index (BMI) (24.4%), while for heparin it was 5000 units every 8 hours (46.1%) and 5000 units every 12 hours (22.6%).

After discharge, 73.8% of both medical directors and AMSBS members provided VTE CP only to select patients, and the most common duration was 2 weeks followed by 4 weeks, while 13.8% did not administer anticoagulants (Table 2). Most respondents who selected "Other" mentioned a period of 2–4 weeks CP based on the risk for VTE. Enoxaparin was the most frequently prescribed anticoagulant for extended VTE prophylaxis, reaching 80.1%. Apixaban and Rivaroxaban were selected by 10.5% and 5.5%, respectively.

Modification of the VTE prophylaxis protocol when there is a concern about bleeding was selected by 66.2% of the participants (Table 5). They indicated that the most common reason for this was excessive intraoperative bleeding or concerning operative findings (36.1%), followed by increased risk of bleeding (12.7%), significant hemoglobin/hematocrit drop postoperatively (8.9%), and active postoperative bleeding (8.2%). Moreover, 19.4% of surgeons had encountered PE in patients under CP. Postoperative complications related to bleeding were the most frequently reported factor that kept surgeons from using extended CP (Table 5). Surgeons reported a wide range of criteria on how they decide to administer extended prophylaxis (Table 6). However, family history of PE/DVT (17.2%), presence of hypercoagulable state (15.8%), immobility/paraplegia (12.2%), and increased BMI were amongst the most popular. Of these criteria, history of PE/DVT and hypercoagulable state

were selected more frequently by the ASMBS membership participants than the medical directors.

Discussion

The present study examined the current clinical practice variability among MBSAQIP program directors regarding VTE prophylaxis after MBS. Our study showed that almost all metabolic/bariatric surgeons who responded to the survey considered VTE prophylaxis as a critical part of their practice. Specifically, they reported using both mechanical and chemical prophylaxis to prevent VTE in their patients during hospitalization. However, the clinical patterns regarding the type of medication, dosage, time of initiation, frequency, and duration of administration varied substantially among surgeons. This inconsistency was observed in both the medical director and the ASMBS membership groups.

Based on the results of the present study, the ASMBS Research Committee has established a multicenter collaboration among MBSAQIP-accredited centers aspiring to identify the optimal pattern of VTE prophylaxis (e.g., dose, frequency, post-discharge duration of administration) and maximize the benefits for patients following bariatric surgery. This collaboration aims to create a prospective multisite database that will include all MBSAQIP variables and carefully selected VTE prophylaxis data. The first goal will be to investigate the timing of VTE prophylaxis. Therefore, the primary outcomes will include the effect of preoperative, in-hospital, and postdischarge VTE prophylaxis on bariatric surgery outcomes at 90 days postoperatively. The results of this prospective study are expected to provide valuable insights regarding the future standard of care for VTE chemoprophylaxis after bariatric surgery. Although several surveys exploring VTE prophylaxis practices in MBS have been published over the past few years [6,27–29], this is the first comprehensive study to capture all critical clinical pattern questions without focusing only on one aspect (e.g., only type of medication or time of administration, etc.). Since the last survey of ASMBS members in 2007 [6], several studies, risk assessment tools, and guidelines have been released or revised to improve standards of care for the prevention of VTE, indicating the need for an update of the current VTE prophylaxis patterns of ASMBS members.

The previous ASMBS survey reported that 94% and 98% of surveyed surgeons routinely administered CP and MP [6]. This aligns with the results of our study, where almost all metabolic/bariatric surgeons (97.1%) utilized both mechanical and chemical prophylaxis at the time of surgery. This VTE prevention practice is consistent with current guidelines and recommendations [19,20,22]. In another survey of 385 members of the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) in 2012, 92% of surgeons applied SCDs on high-risk patients postoperatively, with 97% of them also receiving CP [27]. As such, it seems that the need for both MP and CP in the perioperative setting is well-established and accepted by metabolic/bariatric surgeons [17]. Moreover, all bariatric patients are considered at least moderate risk for VTE, and thus, in the absence of high risk for bleeding, they would benefit from both CP and MP [17,18,30].

When it comes to the specific type of MP, the use of SCD has shifted from 60% in 2007 to 90% today [6]. This finding aligns with the reports of Pryor et al., where 92%

of the surgeons used SCDs postoperatively [27], and the recommendations of the Clinical Issues Committee of ASMBS [31]. Moreover, the recent American Society of Hematology (ASH) guidelines by the ASH recommended the use of SCDs over graduated compression stockings in hospitalized surgical patients [19]. In contrast, a French multicenter survey reported that the most common type of MP in bariatric patients was the combination of SCD and compression stocking (39%), followed by compression stocking alone (32%), and SCD alone (26%) [28].

Regarding the choice of postoperative CP, LMWH was the most preferred (57%) type of anticoagulation in our study. This percentage did not drastically differ from the ones reported by ASMBS members in 2007 (60%) and SAGES members in 2012 (50%) [6,27]. Along those lines, Moulin et al. described that 90% of the respondents in their survey were using LMWH routinely in the postoperative setting [28]. This finding is not surprising, as it is consistent with the updated ASMBS 2022 VTE prophylaxis guidelines [16], which were based on national and international data. In accordance with several studies showing the LMWH effectiveness in this patient population [32–35], ASMBS recommended in favor of LMWH. Similarly, the European Society of Anesthesiology VTE Guideline Task Force supported LMWH over unfractionated heparin [21].

The most common in-hospital enoxaparin dosage reported in the current survey was 40 mg every 24 hrs (32.4%) and 40 mg every 12 hrs (22.7%), while the corresponding percentages in the previous ASMBS report were 21.1% and 45.4%, respectively [6]. At the same time, 83% of French centers prescribing enoxaparin used 80 mg daily [28]. Protocols using weight-adjusted enoxaparin dosing have been described in the literature for morbidly obese patients [36], with some studies suggesting dose corrections based on the antifactor Xa levels [37]. When comparing the current with previous surveys, we observed similar differences in heparin doses. We found 5000 IU every 8 hrs (46.1%) to be the most frequently selected dosage compared to 62.1% in other studies [6]. Having said that, none of the doses for either type of CP stood out, confirming the substantial variability and lack of standardization of doses and administration intervals.

Most of our respondents favored initiation of CP preoperatively (82%). This number was higher among SAGES respondents (92%), while conversely, in the French national survey [28], only 15% of centers were administering preoperative CP. Evidence for the best initiation time of prophylaxis is not yet conclusive due to the paucity of high-quality evidence in MBS; therefore, the ASMBS did not have any specific recommendation in 2013 [30]. However, the guidelines are all based on low to moderate level of evidence [21,22,30].

We also found that the surgeons' practices are largely diverse regarding the administration and duration of postdischarge extended CP. In our study, the percentage of surgeons considering extended CP was 74% versus the slightly lower 60% reported in older studies, but still the duration ranged from 1 to 4 weeks [6]. In contrast, in the SAGES survey, 44% of the participants prescribed CP post-discharge, mainly for 2–4 weeks. In this context, several studies have attempted to find a balance between overtreatment and the optimal level of VTE prevention. Specifically, Aminian et al [11]. suggested 3 levels of VTE risk (<.4%, >.4%, and >1%) to help surgeons decide on extended CP. According to these recommendations,

patients in the first group should not receive extended CP, while those in the second and third should be covered with CP for 2- and 4-weeks postdischarge, respectively.

In our survey, we observed that surgeons considered only a fraction of the risk factors as criteria for a decision on extended CP. Very few (5.4%) participants in our survey considered anti-Xa level monitoring or duplex sonography for decision-making. Furthermore, only 11.3% of respondents use any type of RAM, which is inconsistent with the ASMBS recommendations and the guidelines on extended CP [11,17,19,20,22,30]. The lack of awareness about the most recent evidence or recommendations may be the reason for the nonapplication of these measures. In addition, the literature suggests that it may take up to 17 years for only 14% of published evidence to be implemented into clinical practice [38,39]. As such, we expect these VTE prophylaxis guidelines to become an integral part of postoperative bariatric patient care in the future. Finally, filling out RAM forms can be time-consuming and not feasible for all. Some RAMs have developed and validated patient-friendly versions so that patients can reliably report VTE risk scores. This approach may remove the burden from practices and improve the utilization rate [40,41].

This study has inherent limitations such as sampling, nonresponse, recall, and social desirability bias. We tried to minimize these issues first by designing a concise and clear questionnaire while balancing the survey's convenience and comprehensiveness. We excluded personal and identifiable questions which might trigger social desirability bias. Secondly, we choose a secure and online form for easier access and anonymous data collection. Thirdly, the survey was sent out multiple times at reasonable intervals (a minimum of 1 week between each distribution), primarily to the medical directors and then to the entire ASMBS membership. As expected, directly inviting medical directors via email to participate in our survey resulted in a high response rate (60%) in this group, especially considering the consistently lower rates in web-based surveys compared to other survey modes [42] However, the different strategy for participant enrollment in the ASMBS membership survey by posting the link in the ASMBS newsletter resulted in a significantly lower response rate [43]. This is in line with current literature, where response rates as low as 2% have been reported [44]. As a result, the responses of the ASMBS membership may not be generalizable to the entire society.

The necessity for mechanical and/or chemical VTE prophylaxis in the inpatient and postdischarge setting after the metabolic/bariatric procedure was recognized by participating surgeons. However, practices related to the type of CP agents, dosing, frequency, timing, and duration of extended administration varied widely among respondents, reflecting several gaps in the literature regarding best practices for VTE risk stratification and prophylaxis in MBS patients. In view of the above, there is an absolute need for well-designed multicentric studies to optimize VTE prophylaxis following MBS.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Baseline characteristics of participants by group

Questions	Medical directors	Membership	Total	*P* value
What is the practice type of your primary location?				
Academic	34 (30.6%)	37 (30.1%)	71 (30.3%)	.058
Hospital-employed	52 (48.9%)	40 (32.5%)	92 (39.3%)	
Multi-specialty clinic-employed	1 (.9%)	1 (.8%)	2 (.9%)	
Private practice	24 (21.6%)	45 (36.6%)	69 (29.5%)	
Approximately what is your program's bariatric volume?				
0–49	2 (1.8%)	9 (7.3%)	11 (4.7%)	.007*
50–99	18 (16.1%)	10 (8.1%)	28 (11.9%)	
100–200	32 (28.6%)	21 (17.1%)	53 (22.6%)	
>200	60 (53.6%)	83 (67.5%)	143 (60.9%)	
What is your sex?				
Female	27 (25.2%)	25 (20.3%)	52 (22.6%)	.472
Male	76 (71%)	96 (78.1%)	172 (74.8%)	
Other	1 (.9%)	0 (0%)	1 (.4%)	
Prefer not to say	3 (2.8%)	2 (1.6%)	5 (2.2%)	
How many years in practice following fellowship?				
<5	14 (13.3%)	39 (31.7%)	53 (23.3%)	.010*
5–10	20 (19.1%)	21 (17.1%)	41 (18%)	
10–15	17 (16.2%)	18 (14.6%)	35 (15.4%)	
>15	54 (51.4%)	45 (36.6%)	99 (43.4%)	
What is your ethnicity?				
White	76 (73.8%)	86 (72.9%)	162 (73.3%)	.786
Black/ African American	5 (4.9%)	4 (3.4%)	9 (4.1%)	
Asian	15 (14.6%)	16 (13.6%)	31 (14%)	
Other	7 (6.8%)	12 (10.2%)	19 (8.6%)	

Data are expressed as n (%).

*The difference is significant at the .05 level.

Table 2

Type and duration of VTE prophylaxis during and after hospitalization

Questions	Medical directors	Membership	Total	*P* value
What type of VTE prophylaxis do you use for your bariatric patients?				
Chemoprophylaxis and mechanical	114 (98.3%)	120 (96%)	234 (97.1%)	.105
Chemoprophylaxis only	0 (0%)	4 (3.2%)	4 (1.7%)	
Mechanical prophylaxis only	1 (.9%)	0 (0%)	1 (.4%)	
Other (please define)	1 (.9%)	1 (.8%)	2 (.8%)	
When do you administer the first dose of the chemoprophylaxis?				
During the operation (after incision)	1 (.9%)	1 (.8%)	2 (.9%)	.983
During the operation (before incision)	7 (6.4%)	8 (6.5%)	15 (6.4%)	
Just before the operation (Preoparea)	89 (80.9%)	101 (82.1%)	190 (81.6%)	
Only after the operation	13 (11.8%)	13 (10.6%)	26 (11.2%)	
When do you administer the first postoperative dose of chemoprophylaxis?				
After “X” hours	18 (16.5%)	14 (11.4%)	32 (13.8%)	.476
The evening of surgery	48 (44%)	54 (43.9%)	102 (44%)	
The next morning	43 (39.5%)	55 (44.7%)	98 (42.2%)	
Do you use extended chemoprophylaxis on discharge?				
No	17 (14.9%)	16 (12.7%)	33 (13.7%)	.425
Yes, on all patients	11 (9.7%)	19 (15.1%)	30 (12.5%)	
Yes, on selective patients	86 (75.4%)	91 (72.2%)	177 (73.8%)	
For how long?				
1 wk	3 (3.4%)	10 (9.4%)	13 (6.7%)	.462
2 wk	38 (43.2%)	37 (34.9%)	75 (38.7%)	
3 wk	6 (6.8%)	7 (6.6%)	13 (6.7%)	
4 wk	24 (27.3%)	32 (30.2%)	56 (28.9%)	
Other	17 (19.3%)	20 (18.9%)	37 (19.1%)	

VTE = venous thromboembolism.

Data are expressed as n (%).

P value is calculated using Chi-square or Fisher’s exact test when appropriate.

Table 3

Types of mechanical and chemical prophylaxis during hospitalization

Questions	Medical directors	Membership	Total	*P* value
What type of mechanical VTE prophylaxis do you use? (Preop and during hospitalization)†				
(SCD) - knee length	106 (86.9%)	104 (82.5%)	210 (84.7%)	.111
(SCD) - thigh length	6 (4.9%)	6 (4.8%)	12 (4.8%)	.927
TED hose	3 (2.5%)	1 (.8%)	4 (1.6%)	.359
TED hose and SCDs	2 (1.6%)	11 (8.7%)	13 (5.2%)	.013*
Ambulation only	2 (1.6%)	2 (1.6%)	4 (1.6%)	1.000
Other	3 (2.5%)	2 (1.6%)	5 (2%)	.677
What type of chemical VTE prophylaxis do you use? (Preop and during hospitalization)†				
Heparin	56 (39.2%)	64 (37.2%)	120 (38.1%)	.805
Enoxaparin	81 (56.6%)	97 (56.4%)	178 (56.5%)	.293
Apixaban	2 (1.4%)	2 (1.2%)	4 (1.3%)	1.000
Rivaroxaban	0 (0%)	2 (1.2%)	2 (.6%)	.499
Fondaparinux	2 (1.4%)	2 (1.2%)	4 (1.3%)	1.000
Other	2 (1.4%)	5 (2.9%)	7 (2.2%)	.310

VTE = venous thromboembolism; SCD = sequential compression devices; TED = thromboembolus deterrent.

Data are expressed as n (%).

P value is calculated using Chi-square or Fisher's exact test when appropriate.

*The difference is significant at the .05 level.

†Multiple response questions.

Table 4

Dose and frequency of VTE prophylaxis during hospitalization

Questions	Medical Directors	Membership	Total	*P* value
What is the dose you use (Heparin)?				
5000 units	40 (72.7%)	55 (85.9%)	95 (79.8%)	.070
7500 units	8 (15.6%)	2 (3.1%)	10 (8.4%)	
Other	7 (12.7%)	7 (10.9%)	14 (11.8%)	
What is the frequency (Heparin)?				
Q6	2 (3.8%)	0 (0%)	2 (1.7%)	.501
Q8	32 (60.4%)	37 (59.7%)	69 (60%)	
Q12	7 (13.2%)	7 (11.3%)	14 (12.2%)	
Other	12 (22.6%)	18 (29%)	30 (26.1%)	
What is the dose you use (Enoxaparin)?				
30 mg	8 (10%)	7 (7.3%)	15 (8.5%)	.153
40 mg	42 (52.5%)	63 (65.6%)	105 (59.7%)	
60 mg	2 (2.5%)	5 (5.2%)	7 (4%)	
Based on patient weight/BMI	26 (32.5%)	17 (17.7%)	43 (24.4%)	
Other	2 (2.5%)	4 (4.2%)	6 (3.4%)	
What is the frequency (Enoxaparin)?				
Q12	41 (51.3%)	40 (41.2%)	81 (45.8%)	.090
Q24	28 (35%)	49 (50.5%)	77 (43.5%)	
Based on patient weight/BMI	9 (11.3%)	8 (8.3%)	17 (9.6%)	
Other	2 (2.5%)	0 (0%)	2 (1.1%)	
Do you use anti-Xa level to determine extended prophylaxis dosing?				
No	90 (93.8%)	104 (95.4%)	194 (94.6%)	.598
Yes	6 (6.3%)	5 (4.6%)	11 (5.4%)	

VTE = venous thromboembolism; BMI = body mass index.

Data are expressed as n (%).

P-value is calculated using Chi-square or Fisher's exact test when appropriate.

Table 5

Complications of VTE prophylaxis during hospitalization

Questions	Medical Directors	Membership	Total	*P*- value
Do you modify the VTE prophylaxis protocol when concerned about bleeding risk?				
No	36 (31.9%)	44 (35.5%)	80 (33.8%)	.556
Yes	77 (68.1%)	80 (64.5%)	157 (66.2%)	
In your practice, have you seen any patients who received extended chemoprophylaxis and developed PE?				
No	92 (82.1%)	99 (79.2%)	191 (80.6%)	.557
Yes	20 (17.9%)	26 (20.8%)	46 (19.4%)	
Which postoperative complications would keep you from using extended chemoprophylaxis? *				
Infection	2 (1%)	0 (0%)	2 (.5%)	.222
Return to operating room	8 (4.2%)	5 (2.6%)	13 (3.4%)	.228
Any bleeding	23 (12%)	26 (13.5%)	49 (12.8%)	.955
Bleeding requiring chemoprophylaxis cessation and observation	53 (27.6%)	48 (25%)	101 (26.3%)	.141
Bleeding requiring chemoprophylaxis cessation and blood transfusion	48 (25%)	48 (25%)	96 (25%)	.464
Bleeding requiring chemoprophylaxis cessation and reoperation	41 (21.4%)	46 (24%)	87 (22.7%)	.968
Other	1 (.5%)	0 (0%)	1 (.3%)	.470
None	16 (8.3%)	19 (9.9%)	35 (9.1%)	.837
In your practice, did your patients have any side effects from extended VTE chemoprophylaxis? *				
Hematoma	36 (22.5%)	36 (21.2%)	72 (21.8%)	.625
Infection	1 (.6%)	0 (0%)	1 (.3%)	.478
Bleeding requiring chemoprophylaxis cessation and observation	31 (19.4%)	32 (18.8%)	63 (19.1%)	.794
Bleeding requiring chemoprophylaxis cessation and blood transfusion	22 (13.8%)	22 (13%)	44 (13.3%)	.746
Bleeding requiring chemoprophylaxis cessation and reoperation	12 (7.5%)	11 (6.5%)	23 (7%)	.658
Other	5 (3.1%)	2 (1.2%)	7 (2.1%)	.263
None	53 (33.1%)	67 (39.4%)	120 (36.4%)	.246

VTE = venous thromboembolism; PE = pulmonary embolism.

Data are expressed as n (%).

P value is calculated using Chi-square or Fisher's exact test when appropriate.

*Multiple response questions.

Table 6

Criteria for extended VTE chemoprophylaxis postdischarge

Questions	Medical directors	Membership	Total	*P*- value
What are the criteria for extended chemoprophylaxis on discharge?[†]				
Age	11 (3.4%)	9 (2.4%)	20 (2.8%)	.541
Gender	8 (2.5%)	5 (1.3%)	13 (1.8%)	.331
BMI > 40	1 (.3%)	2 (.5%)	3 (.4%)	1.000
BMI > 50	30 (9.2%)	33 (8.7%)	63 (8.9%)	.850
BMI > 60	13 (4%)	21 (5.5%)	34 (4.8%)	.179
Family or personal history of PE/DVT	53 (16.2%)	69 (18.1%)	122 (17.2%)	.039[*]
Immobility/paraplegia	41 (12.5%)	45 (11.8%)	86 (12.2%)	.815
Operative length	9 (2.8%)	12 (3.2%)	21 (3%)	.576
Based on risk calculator	39 (11.9%)	41 (10.8%)	80 (11.3%)	.965
Use of anticoagulants	22 (6.7%)	30 (7.9%)	52 (7.3%)	.281
Congestive heart failure	5 (1.5%)	8 (2.1%)	13 (1.8%)	.448
Length of stay	3 (.9%)	3 (.8%)	6 (.9%)	1.000
COVID	3 (.9%)	4 (1.1%)	7 (1%)	1.000
Pulmonary hypertension	5 (1.5%)	1 (.3%)	6 (.9%)	.110
Birth control pills/hormonal replacement	8 (2.5%)	9 (2.4%)	17 (2.4%)	.896
Inflammatory bowel disease	1 (.3%)	4 (1.1%)	5 (.7%)	.369
Venous stasis	15 (4.6%)	17 (4.5%)	32 (4.5%)	.832
Hypercoagulable state	48 (14.7%)	64 (16.8%)	112 (15.8%)	.044[*]
Other	12 (3.7%)	4 (1.1%)	16 (2.3%)	.026[*]

VTE = venous thromboembolism; PE = pulmonary embolism; DVT = deep vein thrombosis.

Data are expressed as n (%).

P-value is calculated using Chi-square or Fisher's exact test when appropriate.

[*] The difference is significant at the .05 level.

[†] Multiple response questions.