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Lung: Short Report

Variations in Perioperative Thromboprophylaxis Practices: Do the Guidelines Need a Closer Look?

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ABSTRACT

BACKGROUND In 2022, the American Association for Thoracic Surgery (AATS) and the European Society of Thoracic Surgeons (ESTS) published joint guidelines regarding the timing, duration, and choice of agent for perioperative venous thromboembolism prophylaxis for thoracic cancer patients. Now, 1 year after their release, we looked to assess practices and general adherence to these recommendations.

METHODS We conducted a survey among board-certified/board-eligible thoracic surgeons in the United States, between July and October 2023.

RESULTS A total of 103 board-certified thoracic surgeons responded to the survey. Over half of the surgeons reported using preoperative chemical thromboprophylaxis routinely for lobectomy/sublobar resections (56.3%), pneumonectomy/extended lung resections (64.1%), and esophagectomy (67%). Over two thirds of thoracic surgeons limited the duration of postoperative chemical thromboprophylaxis to the patient's length of hospital stay and never administered chemoprophylaxis post-discharge. Among surgeons who always continued chemical thromboprophylaxis post-discharge, low-molecular-weight heparin (LMWH) was the most commonly used agent (>70%), followed by direct oral anticoagulants (13.8%-16.7%). Only 33.3% of surgeons prescribing post-discharge chemical thromboprophylaxis after lobectomy/sublobar resections continued prophylaxis up to 4 weeks postoperatively.

CONCLUSIONS Contrary to the 2022 joint AATS/ESTS guidelines, the majority of surveyed thoracic surgeons in the United States do not routinely prescribe postoperative thromboprophylaxis after lung and esophageal cancer resections. The dogma of routine extended thromboprophylaxis must be reevaluated as modern minimally invasive thoracic surgery allows for very earlier ambulation and enhanced recovery. There is a need for randomized controlled trials exploring the utility of extended thromboprophylaxis and newer agents such as direct oral anticoagulants.

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Venous thromboembolism (VTE), which includes deep vein thrombosis and pulmonary embolism, is a serious complication that may occur after major oncologic surgery.[1] While the use of perioperative thromboprophylaxis helps reduce the risk of VTE after major surgery, it also poses an increased risk of bleeding complications.[2] In addition, questions have been

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raised regarding the optimal duration of postoperative thromboprophylaxis and the cost-effectiveness of extended duration thromboprophylaxis after cancer surgery.[3] Clinical practice guidelines provide thromboprophylaxis recommendations based on risk assessments that consider both VTE and bleeding risk. The Caprini risk assessment model is one such system used for risk stratification across many surgical specialties, including thoracic surgery.[4] Over 90% of patients undergoing lung or esophageal resections are categorized as moderate/high risk for VTE as per the Caprini risk assessment model.[5,6] However, in practice, recent studies estimate a VTE incidence rate of 1.1% after lung resections and 4.1% after esophageal resections.[7]

In 2022, the American Association for Thoracic Surgery (AATS) and the European Society of Thoracic Surgeons (ESTS) published joint guidelines regarding the timing, duration, and choice of agent for perioperative VTE prophylaxis for thoracic cancer patients (Supplemental Table 1).[8] A particularly interesting recommendation with regard to duration of postoperative VTE chemoprophylaxis was that oncology patients undergoing lobectomy, segmentectomy, pneumonectomy, extended resection, and/or esophagectomy for thoracic cancer treatment at moderate or high risk of thrombosis [using the Caprini Risk Assessment Model] should receive extended prophylaxis for 28 to 35 days over-in hospital prophylaxis only. The guidelines also touched upon the use of direct oral anticoagulants (DOACs) and recommended against their routine clinical use for postoperative thromboprophylaxis except in the context of a clinical trial. Since its publication, there have been no reports on the adherence to these updated guidelines. Now, 1 year after their release, we looked to assess practices and general adherence to these recommendations. This study explores perioperative thromboprophylaxis practices in lung and esophageal cancer surgery among board-certified thoracic surgeons in the United States and discusses current practices in the broad context of evidence-based care in thoracic surgery.

MATERIAL AND METHODS

We conducted a survey among American Board of Thoracic Surgery-certified (ie, board-certified) surgeons within the United States between July and October 2023 after ethics approval from the institutional review board.

IN SHORT

- Despite guidelines from 2 major thoracic surgery societies, there are wide variations in the real-world use of perioperative thromboprophylaxis after lung and esophageal cancer surgery.
- Only a minority of surgeons administer post-discharge thromboprophylaxis after lung and esophageal cancer surgery, in contrast with current recommendations.
- There is a need for randomized control trials exploring the benefit, choice of agent, and optimal duration for thromboprophylaxis after thoracic surgery to better inform clinical practice guidelines.

SAMPLING TECHNIQUE. There are currently approximately 5000 cardiothoracic surgeons in the United States, a subset of which are general thoracic surgeons. As we were not able to gain access to any single repository of all board-certified thoracic surgeons, we relied on a mixture of methodologies to acquire contact information. These methodologies included searching for thoracic surgeons on CTSNet (an online community for cardiothoracic surgeons) and extracting corresponding authors' contact information from PubMed-indexed articles related to thoracic surgery that were authored by surgeons in the United States. We ensured that we did not contact the same surgeon across multiple different email addresses. In total, we emailed 1000 thoracic surgeons in the United States between July and October 2023.

DATA COLLECTION TOOL. We designed an anonymous questionnaire that explored the use of thromboprophylaxis in oncologic thoracic surgery (specifically, lobectomy and sublobar resection, pneumonectomy, and esophagectomy) across the perioperative continuum. This questionnaire included the choice of thromboprophylactic agent, timing of administration, duration of thromboprophylaxis, and VTE screening practices. The questionnaire was developed in close collaboration with 4 general thoracic surgeons at our institute. It underwent a round of pilot testing among 5 thoracic surgeons from other institutes to ascertain its content validity in terms of content relevance, comprehensiveness, and comprehensibility. No major changes to the questionnaire were deemed necessary after the pilot test. The questionnaire was preceded by an informed consent form, preliminary screening questions (ensuring that only board-certified thoracic surgeons practicing in the United States

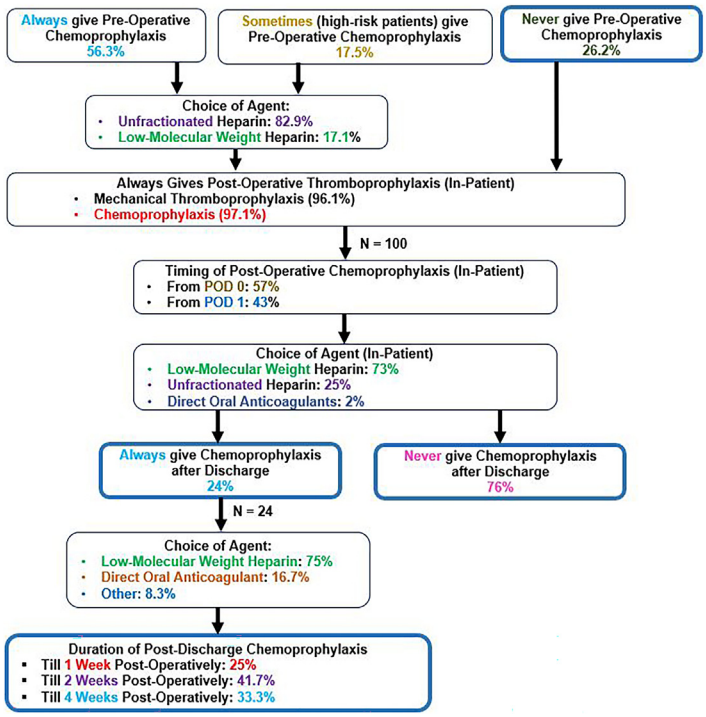

FIGURE 1 Perioperative thromboprophylaxis practices for lobectomy and sublobar lung resections among thoracic surgeons in the United States. (POD, postoperative day.)

completed the form), and a demographics information section. The questionnaire may be found in the Supplementary Material. The questionnaire was created on Google Forms and disseminated via email, allowing participants to complete it on their personal devices in a setting of their choice. The questionnaire took between 4 and 5 minutes to complete.

DATA ANALYSIS. All analyses were performed using IBM SPSS version 25.0. Categorical data are reported as gross numbers and percentages (n; %) and were compared using chi-squared/Fisher's Exact tests. A *P* value less than .05 was considered as significant for all analyses.

RESULTS

A total of 103 board-certified thoracic surgeons responded to the survey, with the majority having more than 10 years' experience (70.9%) and currently practicing in university-affiliated hospitals (70.9%). The majority of surgeons did not follow any guidelines with regard to perioperative thromboprophylaxis (87.4%). Among respondents that did report following guidelines (n = 13), the most commonly used guidelines were those by American College of Chest Physicians (6 of 13; 46.2%), AATS/ESTS (4 of 13; 30.7%), American Society of Clinical Oncology (2 of 13; 15.4%), and American Society of Hematology (1 of 13; 7.7%). Approximately one quarter (25 of 103; 24.3%) of surgeons reported that their thromboprophylaxis practices were based on personal experience and clinical judgment and varied on a case-by-case basis. Among these surgeons (n = 25), approximately half (12 of 25; 48%) used the Caprini score while the remainder (13 of 25; 52%) used their subjective clinical assessment of patients' risk factors (eg, comorbid cardiometabolic disease and prior VTE history) to estimate VTE risk.

PREOPERATIVE THROMBOPROPHYLAXIS PRACTICES. Over half of the surgeons reported using preoperative chemical thromboprophylaxis routinely for lobectomy/sublobar resections (56.3%), pneumonectomy/extended lung resections (64.1%), and esophagectomy (67%). Over a quarter of surgeons reported never giving preoperative chemical thromboprophylaxis for lobectomy/sublobar resections (26.2%); this number was lower for pneumonectomy/extended lung resections (23.3%) and esophagectomy (18.4%). The remainder of respondents administered preoperative chemical thromboprophylaxis on a case-by-case basis only in patients they considered high-risk for VTE after surgery.

Among surgeons who administered preoperative chemical thromboprophylaxis, the most common agent for all three types of oncologic thoracic resections was unfractionated heparin (>80%), with the vast majority of surgeons (>97%) administering the agent within 2 hours of the operative incision.

POSTOPERATIVE THROMBOPROPHYLAXIS PRACTICES. Over 95% of surgeons used mechanical thromboprophylaxis measures and chemoprophylaxis after all 3 types of oncologic thoracic resections. Over half (57%-58%) of the surgeons initiated postoperative chemical thromboprophylaxis on postoperative day 0 (ie, the same day as the surgery), with the remainder doing so on postoperative day 1. The most common choice of agent for chemoprophylaxis in the inpatient setting was LMWH (> 70% for all 3 types of resections), with the next most common choice being unfractionated heparin (24%-26%). Only 2% of surgeons used DOACs in the inpatient setting.

Over two thirds of thoracic surgeons limited the duration of postoperative chemical thromboprophylaxis to the patient's length of hospital stay

and never administered chemoprophylaxis post-discharge. Among surgeons who always continued chemical thromboprophylaxis post-discharge, LMWH remained the most commonly used agent (>70% for all 3 types of resections). However, between 13.8% and 16.7% of surgeons used DOACs post-discharge, while 6% to 13.8% used other agents. Only 33.3% of surgeons prescribing post-discharge chemical thromboprophylaxis after lobectomy/sublobar resections continued prophylaxis up to 4 weeks postoperatively. In contrast, over half of the surgeons continued chemoprophylaxis up to 4 weeks postoperatively for pneumonectomy/extended lung resections (51.7%) and esophagectomy (60.6%). The vast majority of surgeons did not routinely screen for postoperative VTE, with only 7.8% doing so after pneumonectomy, 5.8% after esophagectomy, and 1.9% after lobectomy/sublobar resection.

The results of our survey are summarized in Figures 1 to 3.

COMMENT

Our results reveal a lack of standardization in perioperative thromboprophylaxis practices for lung and esophageal cancer surgery, with very few board-certified thoracic surgeons adhering to the recommendations outlined in the joint AATS/ESTS guidelines. This noncompliance raises critical questions about the optimal balance between preventing VTE, minimizing bleeding complications, and prioritizing patient comfort. In addition, our findings call for a closer look at the latest evidence informing current best-practice recommendations.

Specifically, the AATS/ESTS guidelines recommend use of extended chemoprophylaxis for patients at moderate/high risk of VTE as per the Caprini risk assessment model (>90% of patients).[5,6] The cumulative rates of VTE were 2.5% after lobectomy/sublobar resections, 6% after pneumonectomy/extended lung resections, and 4.2% after esophagectomy, as calculated using the guidelines' supporting literature.[8] However, much of these data are historical and likely overestimate the frequency of VTE seen in the modern, predominantly minimally invasive practice of thoracic surgery with shorter lengths of stay and earlier ambulation. This may explain why over two thirds of surgeons in our survey never administered thromboprophylaxis post-discharge. Existing randomized controlled trials exploring the benefit of extended postoperative

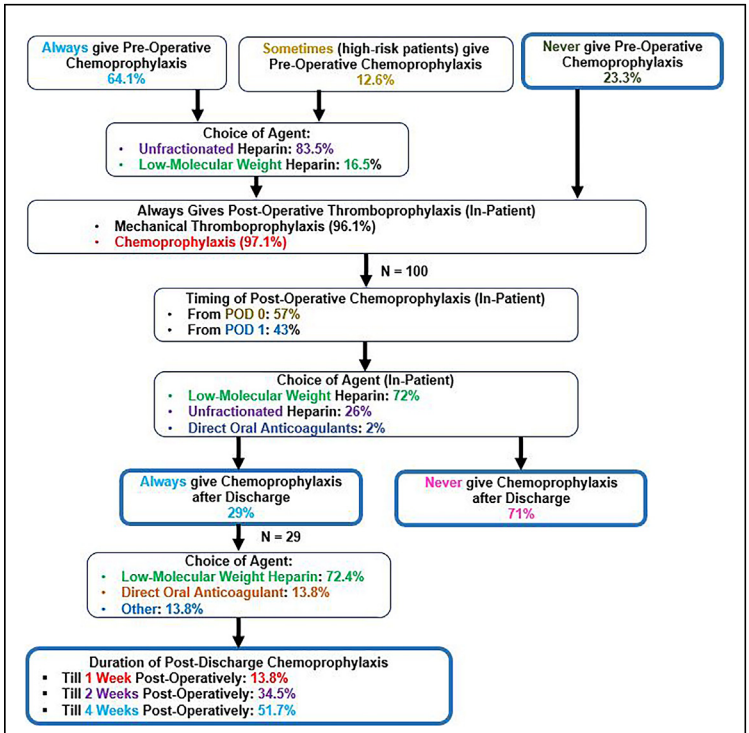

FIGURE 2 Perioperative thromboprophylaxis practices for pneumonectomy and extended lung resections among thoracic surgeons in the United States. (POD, postoperative day.)

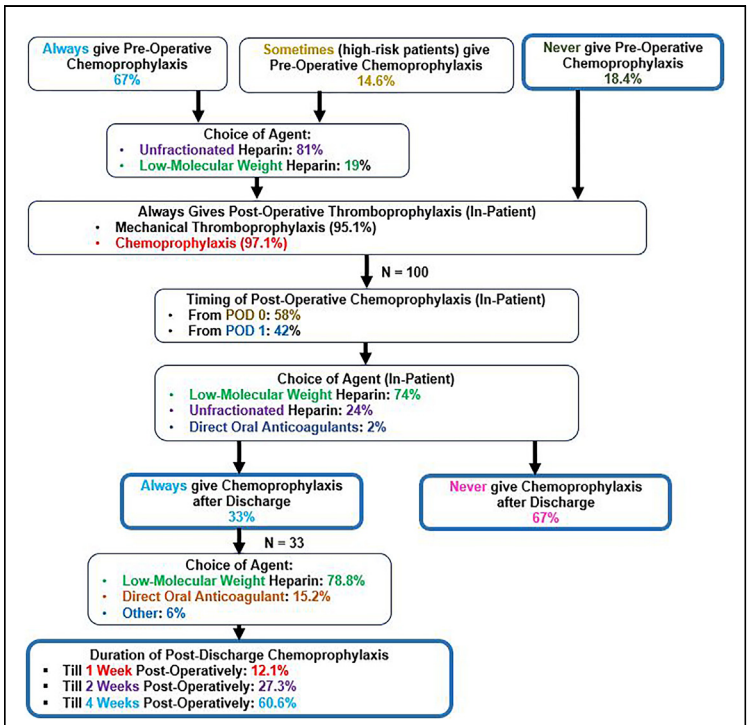

FIGURE 3 Perioperative thromboprophylaxis practices for esophagectomy among thoracic surgeons in the United States. (POD, postoperative day.)

thromboprophylaxis include only abdominopelvic surgery, with the only trial for lung cancer being underpowered and inconclusive.[9] Thus, level 1 evidence is needed for lung and esophageal cancer surgery to inform guidelines specific to the specialty.

With regard to the drug agent for postoperative thromboprophylaxis, the AATS/ESTS guidelines recommend LMWH over DOACs. However, the use of injectable thromboprophylaxis poses many limitations, including patient noncompliance, injection-related discomfort, and the need for close monitoring. Several of these limitations can be avoided or minimized by the use of DOACs, which have consistently demonstrated non-inferiority and even superiority to LMWH for thromboprophylaxis in studies for orthopedic, gynecologic, and even thoracic surgery.[10] For lung cancer surgery, rivaroxaban provides a 29.4% relative risk reduction in VTE compared with nadroparin, without an increase in bleeding events. In our survey, between 13.8% and 16.7% of surgeons who continued thromboprophylaxis post-discharge reported routinely using DOACs as their agent of choice. Thus, DOACs may prove a more convenient and popular option should best-practice guidelines continue to recommend extended thromboprophylaxis, although further investigation is necessary to determine their safety, efficacy, and optimal dosing.

While our sample represents a fraction of the total number of general thoracic surgeons in the United States, we received responses from surgeons across multiple practice settings and varied experience. This diversity of responses strengthens the generalizability of our findings.

In conclusion, contrary to the 2022 joint AATS/ESTS guidelines, the majority of surveyed thoracic surgeons in the United States do not routinely prescribe postoperative thromboprophylaxis after lung and esophageal cancer resections. Our findings suggest that the dogma of routine extended thromboprophylaxis must be reevaluated as minimally invasive thoracic surgery in the modern era allows for very early ambulation, less pain, and lower postoperative morbidity. There is a need for randomized controlled trials exploring the utility of extended thromboprophylaxis and newer agents such as DOACs. This level 1 evidence will lend greater value and credibility to clinical practice guidelines and dispel ongoing uncertainty in the optimal thromboprophylactic management of patients in thoracic surgery.

The Supplemental Material can be viewed in the online version of this article [https://doi.org/10.1016/j.atssr.2024.04.014] on http://www.annalsthoracicsurgery.org.

Waiver for informed consent was received from institutional review board due to anonymous nature of survey.

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Faiz Y. Bhora reports a relationship with AstraZeneca that includes: consulting or advisory; with Genentech that includes: consulting or advisory; with Biodesix that includes: consulting or advisory; with Johnson & Johnson Surgical Vision Inc that includes: consulting or advisory.; with Boston Scientific Corp that includes: consulting or advisory; with Medtronic that includes: consulting or advisory. The other authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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