

Evaluation of Surgeons' Awareness of and Attitudes Toward Antiplatelet and Anticoagulant Medications

✉ Muhammet Hüseyin Erkan¹, ✉ Ömer Faruk Rahman²

¹Balıkesir University Faculty of Medicine, Department of Cardiovascular Surgery, Balıkesir, Türkiye

²İzmir Bakırçay University Faculty of Medicine, Department of Cardiovascular Surgery, İzmir, Türkiye

ABSTRACT

Introduction: This study aimed to evaluate the levels of knowledge, clinical approaches, attitudes, and recent experiences of bleeding complications among physicians in non-cardiovascular surgical disciplines regarding perioperative antithrombotic drug management.

Methods: This cross-sectional descriptive study included 176 physicians from various surgical specialties in Türkiye. Data were collected on demographic information, clinical practice preferences, and antithrombotic medication knowledge, assessed with a 13-item true/false questionnaire. Construct validity was confirmed using confirmatory factor analysis, with comparative fit index: 0.98 and root mean square error of approximation: 0.012. Descriptive statistics and non-parametric tests were used for analysis.

Results: The mean knowledge score was 7.69 out of 13. Warfarin was the drug causing the greatest preoperative concern (65.9%). During the previous six months, 47.2% of participants reported minor bleeding complications, and 11.4% reported major bleeding complications. Knowledge scores were highest among anesthesiology physicians and significantly lower among pediatric surgery, urology, and ear, nose and throat physicians ($p<0.001$). Physicians older than 51 years and those with more than 15 years of experience had significantly lower scores ($p<0.05$). Aspirin management varied considerably, with 39.8% discontinuing treatment and 40.3% consulting another specialty.

Conclusion: Physicians demonstrated moderate knowledge levels and substantial inter-specialty variability in perioperative antithrombotic management. Lower knowledge scores among more experienced physicians highlight the need for continuous education. Establishing multidisciplinary anticoagulation management teams and standardized decision-support protocols may improve patient safety and reduce complications.

Keywords: Perioperative antithrombotic management, anticoagulants, antiplatelet agents, surgical training, knowledge level

Introduction

While surgical interventions are life-saving, surgical stress can disrupt the delicate balance between bleeding and thrombosis, posing a significant perioperative risk. Patients with a history of cardiovascular and cerebrovascular disease who are therefore receiving anticoagulant or antiplatelet therapy constitute a high-risk group during the perioperative period (1). The management of antithrombotic drugs before surgery in these patients requires complex clinical decision-making. Continuing these drugs increases the risk of life-threatening bleeding complications, while discontinuing them can lead to fatal thromboembolic events such as stroke, myocardial infarction, or mechanical valve thrombosis (2).

Guidelines (American College of Chest Physicians and European Society of Cardiology) offer guidance to physicians; however, the ideal management strategy should be personalized according to the patient's thrombosis-bleeding risk profile, the pharmacokinetic properties of the medication used, the bleeding risk of the planned surgery, and the

center's capabilities (3,4). There may be differences in the application of current guideline recommendations across surgical disciplines, and physicians' adherence to these recommendations may be directly influenced by their personal experience, professional seniority, and previous encounters with bleeding/thrombosis complications (5).

Few comprehensive studies have evaluated the current level of knowledge, clinical approaches, and experiences of physicians across different surgical specialties in Türkiye regarding preoperative antithrombotic drug management. Although some specialty-specific studies have been conducted -such as surveys evaluating anticoagulant and deep vein thrombosis knowledge among obstetrics and gynecology physicians- comprehensive data covering multiple surgical disciplines remain limited (6). This study aims to reveal the preoperative approaches of physicians working in surgical disciplines other than cardiovascular surgery for patients using antithrombotic drugs, their level of knowledge about these drugs, and their experience with bleeding complications.



Address for Correspondence: Asst. Prof., Muhammet Hüseyin Erkan, Balıkesir University, Department of Cardiovascular Surgery, Balıkesir, Türkiye

E-mail: mhuseyinerman@gmail.com **ORCID ID:** orcid.org/0000-0002-8390-2493

Cite this article as: Erkan MH, Rahman ÖF. Evaluation of surgeons' awareness of and attitudes toward antiplatelet and anticoagulant medications. İstanbul Med J. 2026; 27(3): 181-8

Received: 21.01.2026

Accepted: 03.06.2026

Publication Date: 03.08.2026



©Copyright 2026 by the University of Health Sciences Türkiye, İstanbul Training and Research Hospital/İstanbul Medical Journal published by Galenos Publishing House.
Licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 (CC BY-NC-ND) International License

Methods

This cross-sectional, descriptive survey was designed to evaluate the knowledge levels, attitudes, and clinical practices of surgical specialists regarding the management of preoperative antithrombotic drugs (antiplatelet and anticoagulant agents). Ethical approval for this study was obtained from the Necmettin Erbakan University Ethics Committee for Non-Pharmaceutical and Non-Medical Device Research (decision number: 2024/5184; meeting number: 204; date: 20.09.2024). Online informed consent was obtained from participants before data collection began; all data were collected anonymously and were used only for scientific purposes.

Study Population

A total of 176 surgeons who actively practice or are engaged in academic activities in the field of surgery participated in the study. Participants consisted of specialist physicians, assistant physicians, and academic physicians. Inclusion criteria were defined as physicians working in any surgical specialty who were involved in the management of antithrombotic drugs in surgical procedures. Those working in cardiovascular surgery and participants who did not complete the questionnaire were excluded from the study.

Data Collection Tool

Data were collected using a structured questionnaire developed by the researchers based on a literature review and expert opinions. The questionnaire was prepared online using the Google Forms platform and distributed to volunteer participants via social media channels (WhatsApp, email groups, etc.). Since the survey was distributed through voluntary online channels, a predefined sampling frame and response rate could not be calculated. The questionnaire took an average of 5-7 minutes to complete, and informed consent was obtained from participants online.

The survey consists of three sections:

- 1. Demographic and professional information (6 questions): Questions asking about participants' gender, age range, surgical specialty, title, length of professional experience, and average monthly number of cases.
- 2. Clinical practice and approach (5 questions): These questions address participants' clinical practices and attitudes, such as their caseload of patients using anticoagulants and antiplatelets, their approach to aspirin discontinuation, their concerns about specific drugs, and their experiences with minor and major bleeding complications in the last six months.
- 3. Knowledge level assessment (15 questions): Questions on the monitoring parameters and indications of direct oral anticoagulants (DOACs), reversal of warfarin, pharmacology of low molecular weight heparins, mechanisms of action of aspirin and clopidogrel, discontinuation periods, and bleeding risk (Table 1).

Development and Evaluation of the Knowledge Questionnaire

The antithrombotic medication knowledge questionnaire initially consisted of 15 true/false items. Based on item analysis, items 5 and 15 were removed from the scale because their discriminant indices (point biserial) were below 0.20. Following their removal, the Kuder-Richardson coefficient (KR)-20 reliability coefficient increased from 0.428 to 0.469. Item difficulty values for the 13 items ranged from 0.307 to 0.864, with most items falling within an acceptable difficulty range. Point-biserial correlations ranged from 0.251 to 0.529, indicating variable but generally acceptable item discrimination. Biserial correlation values ranged from 0.324 to 0.665 and were above 0.3 for all items, suggesting that the items were related to the total score. The KR-20 reliability coefficient of the final 13-item scale was 0.469, indicating low internal consistency (Table 2).

Table 1. Items of the antithrombotic medication knowledge questionnaire

Question number	Question
1	The effectiveness of novel oral anticoagulants can be monitored using aPTT.
2	Novel oral anticoagulants can be safely used during pregnancy.
3	In patients with mechanical heart valves, novel oral anticoagulants can be used as an alternative to warfarin.
4	The anticoagulant effect of low-molecular-weight heparins cannot be monitored using aPTT.
6	Renal failure is a condition that requires dose adjustment during low-molecular-weight heparin therapy.
7	Warfarin is an anticoagulant that can be neutralized by protamine sulfate.
8	Platelet transfusion is required prior to emergency surgical intervention in patients with elevated INR due to warfarin use.
9	The dosage of warfarin therapy should be planned according to the patient's body weight.
10	Patients with a history of mechanical valve replacement can be managed with acetylsalicylic acid therapy during the perioperative period.
11	Although the duration of action of acetylsalicylic acid is 7-10 days, it is generally not necessary to discontinue it before surgical procedures.
12	The inhibition of platelet aggregation by acetylsalicylic acid is irreversible.
13	Clopidogrel is an anticoagulant drug that exerts its effect through inhibition of Factor V and Factor VII.
14	Discontinuation of clopidogrel therapy 5 days prior to elective surgical procedures is sufficient.

aPTT: Activated partial thromboplastin time, INR: International normalized ratio

The first-order unidimensional structure of the blood thinner medications questionnaire, comprising 13 items was tested using confirmatory factor analysis (CFA) with the RSP library in R (R Project) (Figure 1). Since the data did not meet the assumption of multivariate normality, model fit was tested using the diagonally weighted least squares (DWLS) estimation technique to assess construct validity. The CFA results are presented in Figure 1. Based on the resulting goodness-of-fit values (χ^2 : 66.604, df: 65, $p=0.422$, root mean square error of approximation: 0.012, comparative fit index: 0.98, standardized root mean square residual: 0.063, χ^2/df : 1.025), the proposed single-factor model showed good fit with the data and was acceptable. These findings suggest that the single-factor structure of the questionnaire is acceptable in the present sample.

The final antithrombotic medication knowledge questionnaire consisted of 13 dichotomously coded items, with incorrect answers scored as 0 and correct answers scored as 1. The total score on the scale is calculated by summing the correct item responses and ranges from 0 to 13.

Statistical Analysis

In this study, the internal consistency and reliability of the questionnaire were first evaluated using the KR-20 coefficient. CFA was performed using DWLS estimation to assess construct validity. For subgroup analyses, the distribution of survey scores was tested for normality using the Kolmogorov-Smirnov test when $n>50$ for each group, and the Shapiro-Wilk test when $n<50$. The Mann-Whitney U test and the Kruskal-Wallis H test were used to compare survey scores across groups when the scores were not normally distributed. For the Kruskal-Wallis H test, pairwise comparisons to assess significant differences were conducted using the Bonferroni-corrected Dunn test and presented with a lettering method.

The analysis results were presented as mean and standard deviation (SD) (mean $\pm$ SD) for normally distributed quantitative data and as median, minimum, and maximum [median (minimum-maximum)] for non-

normally distributed data. For categorical data, they were presented as frequencies (n) and percentages (%). A significance level of " $p<0.05$ " was considered in all calculations. R software was used to obtain the findings of the analysis. The application results were obtained using the RSP package in R.

Results

A total of 176 surgeons were included in the study. Examination of the age distribution of participants showed that 64.8% were in the 31-40 age range. The distribution of participants by gender showed that 60.8% were male and 39.2% were female. When the distribution by specialty was examined, the highest percentage of physicians was in general surgery (19.3%), followed by anesthesiology and resuscitation (16.5%) and orthopedics and traumatology (13.6%) (Table 3).

Examination of the distribution of titles showed that 57.4% of the participants were specialists, 28.4% were research assistants, and 14.2% were academics. Surgeons with 1-5 and 6-11 years of experience were equally represented (38.6% each), followed by those with 11-15 years (14.2%) and more than 15 years (8.5%). Regarding monthly case numbers, 26.7% of participants see more than 41 cases per month, while 17.6% see between 1 and 10 cases per month.

Half of the participants (50%) stated that the proportion of patients using antithrombotic agents in their clinics was between 0% and 25%. This was followed by 32.4% and 14.2% in the 25-50% and 50-75% ranges, respectively. Regarding aspirin use, 39.8% of surgeons stated that they discontinued aspirin before surgery, 19.9% did not discontinue it, and 40.3% consulted the relevant specialist before making a decision. Warfarin was identified as the drug of most concern in the preoperative process, with 65.9%. When the occurrence of complications during the last

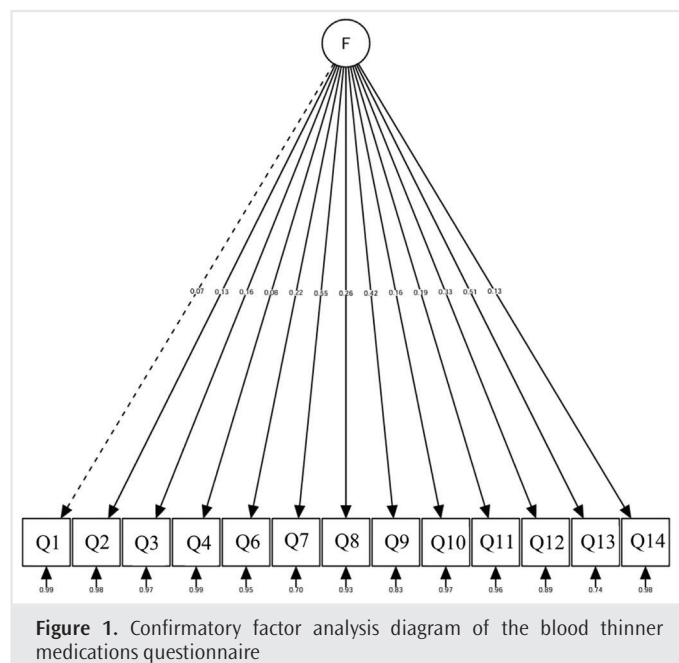


Table 2. Item analysis and reliability results of the antithrombotic medication knowledge questionnaire

Question	Item difficulty	Point biserial	Biserial
Q1	0.693	0.251	0.329
Q2	0.619	0.254	0.324
Q3	0.307	0.351	0.461
Q4	0.710	0.288	0.382
Q6	0.693	0.394	0.518
Q7	0.455	0.529	0.665
Q8	0.562	0.382	0.480
Q9	0.438	0.429	0.540
Q10	0.756	0.319	0.436
Q11	0.489	0.374	0.468
Q12	0.665	0.420	0.544
Q13	0.443	0.486	0.612
Q14	0.626	0.264	0.415
Number of participants			176
Number of item			13
KR-20			0.469
KR: Kuder-Richardson coefficient			

Table 3. Descriptive statistics of demographic characteristics

	n	%
Age		
25-30	36	20.5
31-40	114	64.8
41-50	18	10.2
>51	8	4.5
Gender		
Male	107	60.8
Female	69	39.2
Specialty		
Anesthesiology and reanimation	29	16.5
Neurosurgery	7	4
Pediatric surgery	4	2.3
General surgery	34	19.3
Thoracic surgery	15	8.5
Ophthalmology	11	6.3
Obstetrics and gynecology	21	11.9
Otorhinolaryngology	8	4.5
Orthopedics and traumatology	24	13.6
Plastic and reconstructive surgery	9	5.1
Urology	14	8
Title		
Research assistant	50	28.4
Specialist physician	101	57.4
Academic staff	25	14.2
Years of experience in specialty		
1-5	68	38.6
6-11	68	38.6
11-15	25	14.2
>15	15	8.5
Number of cases per month		
1-10	31	17.6
11-20	35	19.9
21-30	41	23.3
31-40	22	12.5
>41	47	26.7
Proportion of patients using blood thinners		
0-25	88	50
25-50	57	32.4
50-75	25	14.2
75-100	6	3.4

Table 3. Continued

	n	%
Discontinuation of aspirin before surgery		
Yes	70	39.8
No	35	19.9
Consultation with the relevant physician	71	40.3
Anticoagulant of concern in the preoperative period		
Aspirin	22	12.5
Clopidogrel	24	13.6
Warfarin	116	65.9
DOACs	14	8
Minor complications in the last 6 months		
No	93	52.8
Yes	83	47.2
Major complications in the last 6 months		
No	156	88.6
Yes	20	11.4
DOAC: Direct oral anticoagulant		

six months was examined, 47.2% of participants reported experiencing minor complications, while 11.4% reported major complications.

The mean total score on the antithrombotic medication knowledge questionnaire was 7.69 (range: 2-13) (Table 4).

There was a statistically significant difference in total scores on the antithrombotic medication knowledge questionnaire between age groups ($p=0.019$). This difference was particularly evident between the scores of participants aged 51 and older and the scores of participants in other age groups. The median total score on the antithrombotic medication knowledge questionnaire was 5 for participants aged 51 and older, compared with 8 for participants in other age groups (Table 5).

A statistically significant difference in participants' total scores on the antithrombotic medication knowledge questionnaire was observed across specialties ($p<0.001$). This difference was particularly observed between the scores of participants in the anesthesiology and resuscitation specialty and those of participants in the pediatric surgery, gynecology and obstetrics, otolaryngology, and urology specialties. The median total score was 9 for anesthesiology and resuscitation, 5 for pediatric surgery, and 6 for obstetrics and gynecology, otolaryngology, and urology.

Table 4. Descriptive statistics for the total score of the antithrombotic medication knowledge questionnaire

	Mean $\pm$ SD	Median (min-max)
Total score (n=176)	7.69 $\pm$ 2.24	8 (2-13)
SD: Standard deviation, min: Minimum, max: Maximum		

Table 5. Relationship between the antithrombotic medication knowledge questionnaire total score and demographic characteristics

	Mean ± SD	Median (min-max)	Statistic	p
Age				
25-30	7.83±1.98	8 (4-11) ^a	9.954	0.019 ^h
31-40	7.75±2.26	8 (2-13) ^a		
41-50	8.17±2.31	8 (4-12) ^a		
>51	5.25±1.67	5 (3-8) ^b		
Gender				
Male	7.58±2.36	8 (2-13)	0.970	0.332 ^m
Female	7.87±2.05	8 (3-12)		
Specialty				
Anesthesiology and reanimation	9.31±1.56	9 (6-12) ^a	42.621	<0.001 ^h
Neurosurgery	8.57±2.07	9 (5-11) ^{ab}		
Pediatric surgery	4.5±1	5 (3-5) ^b		
General surgery	8.41±2.27	8 (4-13) ^{ab}		
Thoracic surgery	7.53±1.73	8 (5-10) ^{ab}		
Ophthalmology	7.82±1.99	8 (4-10) ^{ab}		
Obstetrics and gynecology	6.29±2.08	6 (2-10) ^b		
Otorhinolaryngology	6.25±1.98	6 (3-9) ^b		
Orthopedics and traumatology	7.54±2.08	8 (3-13) ^{ab}		
Plastic and reconstructive surgery	6.78±2.22	7 (4-10) ^{ab}		
Urology	6.93±2.16	6 (4-11) ^b		
Title				
Research assistant	7.82±1.87	8 (4-11)	4.135	0.126 ^h
Specialist physician	7.83±2.21	8 (3-12)		
Academic staff	6.88±2.86	6 (2-13)		
Years of experience in specialty				
1-5	8.07±1.99	8 (4-13) ^a	9.676	0.022 ^h
6-11	7.59±2.2	8 (2-13) ^{ab}		
11-15	7.92±2.58	8 (3-12) ^{ab}		
>15	6.07±2.34	6 (3-11) ^b		
Number of cases per month				
1-10	8.03±1.87	8 (4-11)	4.061	0.398 ^h
11-20	7.46±1.85	7 (3-11)		
21-30	7.29±2.5	7 (2-13)		
31-40	7.55±2.6	7 (3-13)		
>41	8.06±2.31	9 (3-12)		

Table 5. Continued

	Mean ± SD	Median (min-max)	Statistic	p
Proportion of patients using blood thinners				
0-25	7.31±2.4	7 (2-13)	5.769	0.124 ^h
25-50	8.09±2.2	9 (3-12)		
50-75	8.12±1.67	8 (4-12)		
75-10	7.83±1.6	8.5 (5-9)		
Discontinuation of aspirin before surgery				
Yes	7.24±2.12	7 (3-12)	5.073	0.079 ^h
No	8.2±2.42	8 (3-13)		
Consultation with the relevant physician	7.89±2.21	8 (2-13)		
Anticoagulant of concern in the preoperative period				
Aspirin	6±1.95	6 (3-9) ^a	18.152	<0.001 ^h
Clopidogrel	8.79±2.11	9 (6-13) ^b		
Warfarin	7.76±2.16	8 (2-12) ^b		
DOACs	7.93±2.27	8 (3-13) ^{ab}		
Minor complications in the last 6 months				
No	7.4±2.27	7 (2-13)	1.803	0.071 ^m
Yes	8.02±2.17	8 (3-13)		
Major complications in the last 6 months				
No	7.63±2.19	8 (2-13)	0.824	0.410 ^m
Yes	8.15±2.64	8 (4-13)		
^m : Mann–Whitney U test, ^h : Kruskal–Wallis H test, ^{a and b} : No significant difference between groups sharing the same letter (Bonferroni-corrected Dunn test), Mean: Average, SD: Standard deviation, min: Minimum, max: Maximum				

^m: Mann-Whitney U test, ^h: Kruskal-Wallis H test, ^a and ^b: No significant difference between groups sharing the same letter (Bonferroni-corrected Dunn test), Mean: Average, SD: Standard deviation, min: Minimum, max: Maximum

Participants' total scores on the antithrombotic medication knowledge questionnaire differed significantly by length of experience in the specialty ($p=0.022$). This difference was particularly evident between the scores of participants with 1-5 years of experience in the specialty and those with more than 15 years of experience. The median total score for participants with 1-5 years of experience in the specialty was 8, while the median score for participants with more than 15 years of experience in the specialty was 6.

There were no statistically significant differences in participants' total scores on the antithrombotic medication knowledge questionnaire across other demographic characteristics ($p>0.05$).

Discussion

This study examines surgeons' knowledge, attitudes, and practices regarding the management of anticoagulant and antiplatelet drugs prior to elective surgeries and procedures and provides an overview of current clinical practice. The findings, particularly the moderate

level of knowledge, the reverse relationship with experience and age, contrary to expectations, and the differences between specialties, are consistent with trends reported in the literature, while also offering new perspectives on some details.

Guidelines on perioperative anticoagulant and antiplatelet therapy management recommend a balanced approach between bleeding and thrombosis risks and guide decisions on discontinuation and reinitiation of treatment. For example, the CHEST guidelines specify discontinuation and restart timing for vitamin K antagonists and DOACs, while recommending that most antiplatelet drugs, such as aspirin, should not be discontinued in most non-cardiac surgeries if the surgical risk is low (1). The aim of this approach is to strike a balance between preventing major thromboembolic complications and minimizing preventable bleeding complications.

In our study, surgeons' knowledge of the risk assessment and management strategies recommended in international guidelines was generally moderate. This reflects the heterogeneity in knowledge regarding the management of anticoagulant and antiplatelet drugs across many clinical settings worldwide. For example, in our study, heterogeneity in approaches to aspirin discontinuation (39.8% discontinue, 19.9% do not discontinue, 40.3% consult) indicates significant inconsistency in translating current guidelines into practice. This deviation indicates the need to disseminate guideline recommendations locally and to convert them into simple clinical decision-support tools (checklists and flowcharts). On the other hand, systematic reviews have reported that discontinuing antiplatelet therapy has varying effects on the risk of major bleeding or thrombosis across different studies (7). In this context, methodological differences in information and practice across surgical specialties and according to the bleeding risk of the procedure are to be expected.

In our study, the majority of participants (65.9%) reported warfarin as the medication of greatest concern during the preoperative period; this finding can be explained by epidemiological realities and clinical experience in Türkiye. Warfarin is a medication that has been used for decades; it is cost-effective and widely accessible. Therefore, it is used in a much wider patient population compared to DOACs, especially in specific indications such as mechanical heart valves and rheumatic valve disease (8). Consequently, surgeons more frequently encounter patients who use warfarin in their clinical practice and are therefore more exposed to bleeding complications associated with this drug. This high exposure may have created concern among physicians regarding warfarin. Furthermore, warfarin's narrow therapeutic window, numerous drug-food interactions, and challenging management process due to international normalized ratio fluctuations are another factor that increases the experience of complications (9). DOACs, on the other hand, are relatively new agents; their use is limited to more controlled indications (particularly non-valvular atrial fibrillation and venous thromboembolism), and they have a more stable pharmacokinetic profile. This may have contributed to physicians experiencing fewer complications with DOACs and, consequently, being relatively less concerned. However, the lack of routine monitoring for DOACs and the cost and accessibility issues of their emergency antidotes (idarucizumab and andexanet alfa) pose challenges to their use. However, the lack

of routine monitoring of DOACs and the cost/accessibility issues of their emergency antidotes (idarucizumab, andexanet alfa) should not obscure the potential risks associated with these drugs (10). Ultimately, this finding suggests that concerns stem not only from the drug's pharmacological risks but also from its prevalence in the population and consequently, physicians accumulated clinical experience.

In this study, the fact that a significant proportion of participants (40.3%) reported consulting with a specialist physician before deciding to discontinue aspirin is an encouraging finding and can be considered a reflection of the "patient-specific, multidisciplinary approach" that forms the essence of the guidelines in practice (1). Studies exist suggesting that coordinated work between surgeons, anesthesiologists, cardiologists, and hematologists is necessary in perioperative antithrombotic management (11). Similarly, structured multidisciplinary services such as a "perioperative antithrombotic clinic" or a standard consultation pathway have been shown to increase physician confidence and reduce the rate of adverse events (12). Therefore, establishing "Perioperative Medicine Units" or "Anticoagulation Management Teams" in hospitals and implementing simple consultation algorithms, in addition to educational activities aimed at increasing knowledge, may be among the most effective ways to translate our findings into improved clinical outcomes.

The significantly high knowledge scores of physicians in the field of anesthesiology and resuscitation also support this field's role as a perioperative risk manager and a multidisciplinary bridge for surgical patients. Similar to our study, a survey involving 296 anesthesiologists and assistant physicians working in various hospitals across Türkiye showed that physicians in this specialty manage anticoagulant drugs in accordance with international guidelines (13).

In our study, advanced age and longer professional experience were associated with lower, rather than higher, knowledge scores. This finding contradicts the general assumption that "knowledge increases with experience" and emphasizes the critical importance of continuous professional development in rapidly evolving fields such as perioperative medicine. This inverse relationship can be explained by several factors. First, when more senior physicians were undergoing basic medical training, DOACs had not yet entered clinical use, and antithrombotic management was warfarin-focused. Second, physicians with established clinical practice habits may be less willing to follow current guideline recommendations or may have limited time to integrate them into practice. This situation can also be linked to the concept of "clinical inertia" (14). Third, the complexity and frequent updates of guidelines make it difficult for all physicians to keep up with these changes (15).

On the other hand, the rate at which physicians adopt new treatment protocols is generally shaped by their past prescribing habits and clinical experience. For example, physicians who prescribed almost exclusively warfarin in their practice in 2013 showed a slower increase in the adoption rate of DOACs by 2018 (16). This suggests that more senior physicians may feel more confident with warfarin management, which they are familiar with through years of experience, while newer graduates and younger physicians may be more familiar with and open to adopting these new agents because they were exposed to DOAC

protocols during their training. This finding points to the necessity of designing postgraduate training programs to target not only residents and young specialists, but physicians at all seniority levels.

The results of our study clearly demonstrate the need for structured and continuous education on perioperative antithrombotic drug management in surgical specialties. The participants' average knowledge score of 7.69 (out of 13) indicates that the correct answer rate was approximately 59%, which poses a risk to clinical decision-making. The finding that 47.2% of participants reported minor bleeding complications in the previous six months may indicate patient safety concerns; however, this result should be interpreted cautiously because it was based on self-report and not objectively verified. This educational need is not specific to surgical disciplines but is a common requirement across different areas of medicine involving drug management. Indeed, a survey conducted with dentists and specialists also reported significant knowledge gaps and educational needs regarding antithrombotic drug management (17). The literature suggests that, due to the persistence of preventable patient harm associated with anticoagulants, anticoagulation management programs structured similarly to antibiotic management should be developed, and healthcare institutions should adopt a proactive approach in this regard (18).

Study Limitations

This study has some limitations. Due to its cross-sectional design, the findings do not allow for establishing causal relationships and only reflect the level of knowledge and clinical approaches during a specific time period. The collection of data through self-reported online surveys carries the risk of social desirability and recall bias; in particular, the inability to verify experiences of complications with objective clinical records may limit the reliability of the results. Furthermore, participation based on voluntary enrollment may increase the likelihood of physicians more involved in anticoagulant and antiplatelet management being included in the study, thereby limiting the representativeness of the sample. An important limitation of this study is the relatively low internal consistency of the knowledge scale, as indicated by the KR-20 coefficient of 0.469. Although the final 13-item form showed acceptable construct validity in CFA, the total knowledge scores should be interpreted with caution. This may limit the precision of subgroup comparisons and indicates the need for further validation of the scale in larger samples. In addition, formal content validity assessment, pilot testing, and exploratory factor analysis were not performed, which limits the strength of validity claims regarding the questionnaire.

Conclusion

This exploratory study suggests that physicians working in surgical specialties other than cardiovascular surgery may have moderate knowledge levels regarding perioperative anticoagulant and antiplatelet drug management, with variability across clinical practice patterns. Heterogeneous approaches to aspirin discontinuation and practices inconsistent with guideline recommendations highlight the need for standardized decision-making processes. The higher knowledge scores of anesthesiologists and resuscitation physicians support the role of this specialty in perioperative risk management, while the association

of older age and longer professional experience with lower knowledge levels emphasizes the importance of continuing professional education. These findings suggest that the development of multidisciplinary and structured antithrombotic management approaches based on current guidelines in surgical clinics is critical for patient safety.

Ethics

Ethics Committee Approval: Ethical approval for this study was obtained from the Necmettin Erbakan University Ethics Committee for Non-Pharmaceutical and Non-Medical Device Research (decision number: 2024/5184; meeting number: 204; date: 20.09.2024).

Informed Consent: Online informed consent was obtained from participants before data collection began; all data were collected anonymously and were used only for scientific purposes.

Footnotes

Authorship Contributions: Concept- M.H.E.; Design- M.H.E., Ö.F.R.; Data Collection or Processing- M.H.E., Ö.F.R.; Analysis or Interpretation- Ö.F.R.; Literature Search- M.H.E., Ö.F.R.; Writing- M.H.E., Ö.F.R.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

References

1. Douketis JD, Spyropoulos AC, Murad MH, Arcelus JL, Dager WE, Dunn AS, et al. Perioperative management of antithrombotic therapy: an American College of Chest Physicians Clinical Practice Guideline. *Chest*. 2022; 162: e207-43.
2. Kristensen SD, Knuuti J, Saraste A, Anker S, Bøtker HE, Hert SD, et al. 2014 ESC/ESA Guidelines on non-cardiac surgery: cardiovascular assessment and management: the joint task force on non-cardiac surgery: cardiovascular assessment and management of the European Society of Cardiology (ESC) and the European Society of Anaesthesiology (ESA). *Eur Heart J*. 2014; 35: 2383-431.
3. Douketis JD, Spyropoulos AC, Duncan J, Carrier M, Le Gal G, Tafur AJ, et al. Perioperative management of patients with atrial fibrillation receiving a direct oral anticoagulant. *JAMA Intern Med*. 2019; 179: 1469-78.
4. Steffel J, Collins R, Antz M, Cornu P, Desteghe L, Haeusler KG, et al. 2021 European Heart Rhythm Association Practical Guide on the use of non-vitamin k antagonist oral anticoagulants in patients with atrial fibrillation. *Europace*. 2021; 23: 1612-76. Erratum in: *Europace*. 2021; 23: 1676.
5. Narouze S, Benzon HT, Provenzano D, Buvanendran A, De Andres J, Deer T, et al. Interventional spine and pain procedures in patients on antiplatelet and anticoagulant medications (second edition): guidelines from the American Society of Regional Anesthesia and Pain Medicine, the European Society of Regional Anaesthesia and Pain Therapy, the American Academy of Pain Medicine, the International Neuromodulation Society, the North American Neuromodulation Society, and the World Institute of Pain. *Reg Anesth Pain Med*. 2018; 43: 225-62.
6. Balcı AB, Rahman ÖF, Dağdeviren E. Knowledge levels of obstetricians and gynecologists on deep vein thrombosis. *Eur Res J*. 2025; 11: 1098-107.
7. Shah S, Urtecho M, Firwana M, Nayfeh T, Hasan B, Nanaa A, et al. Perioperative management of antiplatelet therapy: a systematic review and meta-analysis. *Mayo Clin Proc Innov Qual Outcomes*. 2022; 6: 564-73.
8. Mandefro BT, Sundara SV, Lu X, Busmail H, Weerakoon S, Avula S, et al. Effectiveness and safety of direct oral anticoagulants versus warfarin in

- patients with mechanical heart valves: a systematic review. *Cureus*. 2025; 17: e89736.
9. Limdi NA. Warfarin pharmacogenetics: challenges and opportunities for clinical translation. *Front Pharmacol*. 2012; 3: 183.
 10. Raval AN, Cigarroa JE, Chung MK, Diaz-Sandoval LJ, Diercks D, Piccini JP, et al. Management of patients on non-vitamin K antagonist oral anticoagulants in the acute care and periprocedural setting: a scientific statement from the American Heart Association. *Circulation*. 2017; 135: e604-33.
 11. Rossini R, Tarantini G, Musumeci G, Masiero G, Barbato E, Calabrò P, et al. A multidisciplinary approach on the perioperative antithrombotic management of patients with coronary stents undergoing surgery: surgery after stenting 2. *JACC Cardiovasc Interv*. 2018; 11: 417-34.
 12. Douketis JD, Spyropoulos AC, Anderson JM, Arnold DM, Bates SM, Blostein M, et al. The perioperative anticoagulant use for surgery evaluation (PAUSE) study for patients on a direct oral anticoagulant who need an elective surgery or procedure: design and rationale. *Thromb Haemost*. 2017; 117: 2415-24.
 13. Eman A, Balaban O. Perioperative use of anticoagulant and antiaggregant drugs; approaches of anesthesiology and reanimation physicians in Türkiye: a survey study. *Ann Med Res*. 2022; 29: 1311-6.
 14. Reach G. Clinical inertia, uncertainty and individualized guidelines. *Diabetes Metab*. 2014; 40: 241-5.
 15. Qumseya B, Goddard A, Qumseya A, Estores D, Draganov PV, Forsmark C. Barriers to clinical practice guideline implementation among physicians: a physician survey. *Int J Gen Med*. 2021; 14: 7591-8.
 16. Wheelock KM, Ross JS, Murugiah K, Lin Z, Krumholz HM, Khera R. Clinician trends in prescribing direct oral anticoagulants for US Medicare beneficiaries. *JAMA Netw Open*. 2021; 4: e2137288.
 17. Erçal P, Tayşi AE, Şişmanoğlu S. Knowledge and practices of dentists towards patients on antithrombotic medication therapy: a cross-sectional survey. *Cerrahpaşa Med J*. 2023; 1. Available from: <https://cerrahpasamedj.org/index.php/pub/article/view/578>
 18. Burnett AE, Barnes GD. A call to action for anticoagulation stewardship. *Res Pract Thromb Haemost*. 2022; 6: e12757.