Full Length Article

Providers' utilization and perceptions of warfarin dosing algorithms☆

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ABSTRACT

Introduction: Warfarin dosing algorithms have proven beneficial in increasing time within therapeutic range (TTR) and decreasing adverse events associated with out-of-range international normalized ratios (INRs). Despite widespread availability, providers' utilization and perceptions of warfarin algorithms in real-world practice are unclear. Identifying perceptions and barriers to algorithm use may help attempts to improve warfarin therapy management.
Methods: Anticoagulation providers' utilization and perceptions of warfarin dosing algorithms were assessed via a nationwide electronic survey.
Results: Of the 246 providers who completed the survey, 82% were pharmacists, and 69% had over five years' experience dosing warfarin. Warfarin dosing algorithms were deemed beneficial by 84% of respondents and 72% currently use a warfarin dosing algorithm in their practice at least occasionally. Pharmacists were least likely of anticoagulation providers to use algorithms, although this was not statistically significant ($p = 0.12$). Algorithm utilization also decreased as years of warfarin dosing experience increased, with the highest rate of usage noted in the first year of dosing warfarin. The most common reason providers gave for discontinuing algorithm use was that they no longer felt it was needed. In this study, clinic patient volume did not appear to be associated with algorithm utilization.
Conclusion: Warfarin dosing algorithms are frequently used among anticoagulation providers, especially those new to dosing warfarin, but use is frequently not sustained over the long-term. Education on the continued benefits of warfarin dosing algorithms could increase long-term utilization, potentially improving patient outcomes.

1. Introduction

Warfarin is a narrow therapeutic index drug that requires frequent dose adjustments to minimize both thrombosis and bleeding adverse events [1,2]. Warfarin dosing can be challenging for a number of reasons: genetic variability [1,3,4], drug and dietary interactions [1,3], and other changes in health [1]. All of these variables alter individual drug response, and thus contribute to International Normalized Ratio (INR) instability. This instability results in decreased time in therapeutic INR range (TTR), increasing the risk of adverse events [1,2,5]. Even with these complications associated with warfarin dosing and the availability of simpler alternatives like the direct oral anticoagulants (DOACs), warfarin remains the oral anticoagulant of choice in patients with renal impairment [3], as well as for patients with mechanical

prosthetic heart valves, valvular atrial fibrillation, and antiphospholipid antibody syndrome [6,7]. Warfarin also continues to be used by orthopedic surgeons for the prevention of venous thromboembolism following knee [8] and hip replacement surgeries [9,10]. Additionally, DOACs may be cost-prohibitive for some patients, making warfarin an affordable choice [11]. Therefore, warfarin remains relevant in today's market even with newer anticoagulants available.

In an effort to maintain patients within the desired therapeutic INR range and thus decrease risk for adverse events, providers have utilized warfarin dosing algorithms. Algorithms are step-by-step protocols for management of a health care problem. In the context of warfarin, dosing algorithms provide a standardized method for warfarin dose adjustment where a given INR result prompts an anticoagulation provider to increase or decrease the warfarin dose by a specified amount or

Table 1
Demographics of anticoagulation providers responding to warfarin dosing algorithm survey.

	Total	Physicians	Pharmacist	Mid-level provider[a]	Nurse	Other[b]
Provider type, n (%)	246	5 (2)	201 (82)	8 (3)	30 (12)	2 (1)
Dosing warfarin is primary job function, n (%)	194 (79)	3 (2)	154 (79)	7 (4)	28 (14)	2 (1)
Practice site is an anticoagulation forum center of excellence, n (%)	61 (24)	2 (3)	46 (75)	4 (7)	9 (15)	0
CACP credentialed, n (%)	55 (22)	1 (2)	47 (85)	2 (4)	5 (9)	0
Level of experience dosing warfarin, n (%) N = 246						
0–6 months	7 (3)	0	5 (2)	0	2 (7)	0
7–12 months	6 (2)	0	4 (2)	0	2 (7)	0
1–2 years	20 (8)	0	18 (9)	0	2 (7)	0
2–5 years	43 (18)	1 (20)	36 (18)	1 (13)	5 (16)	0
5 + years	170 (69)	4 (80)	138 (69)	7 (87)	19 (63)	2 (100)
Hours spent dosing warfarin per week, n (%) N = 246						
0–10	64 (26)	3 (60)	58 (29)	2 (25)	1 (3)	0
11–20	46 (19)	1 (20)	42 (21)	2 (25)	1 (3)	0
21–30	45 (18)	0	37 (18)	1 (13)	7 (24)	0
31 +	91 (37)	1 (20)	64 (32)	3 (37)	21 (70)	2 (100)
Practice setting, n (%) N = 246						
Anticoagulation clinic	173 (70)	2 (40)	137 (68)	7 (88)	26 (86)	1 (50)
Primary care clinic	51 (21)	0	49 (24)	0	2 (7)	0
Specialty clinic[c]	8 (3)	2 (40)	3 (2)	0	2 (7)	1 (50)
Other	14 (6)	1 (20)	12 (6)	1 (12)	0	0
Number of patients in the practice being managed on warfarin, n (%) N = 246						
< 50	24 (10)	1 (20)	22 (11)	1 (12)	0	0
51–100	18 (7)	1 (20)	16 (8)	0	1 (3)	0
101–500	66 (27)	1 (20)	49 (25)	4 (50)	11 (37)	1 (50)
501–1000	50 (20)	1 (20)	41 (20)	0	8 (27)	0
> 1000	88 (36)	1 (20)	73 (36)	3 (38)	10 (33)	1 (50)
Self-reported clinic mean TTR, n (%) N = 246						
≤50%	0	0	0	0	0	0
51–60%	16 (7)	1 (20)	13 (7)	0	2 (7)	0
61–70%	89 (36)	1 (20)	79 (39)	1 (12)	8 (26)	0
> 70%	111 (45)	3 (60)	83 (41)	5 (63)	18 (60)	2 (100)
I don't know	30 (12)	0	26 (13)	2 (25)	2 (7)	0

CACP = certified anticoagulation care provider; TTR = time in therapeutic range.

[a] Nurse practitioners or physicians' assistants.
[b] Licensed practical nurse, medical assistants or pharmacy technicians.
[c] Rheumatology, pulmonary, cardiovascular, neurologic, hematology/oncology.

make no change in the warfarin dose. Warfarin dosing algorithms have proven beneficial in decreasing time to reach therapeutic INR range upon warfarin initiation, reducing the risk of excessive anticoagulation, as well as increasing TTR [12–15]. The most convincing evidence in favor of algorithm utilization was a study by Van Spall et al. demonstrating that a 10% increase in algorithm-consistent warfarin dosing was associated with a TTR improvement of 6.12%, which translated into a decrease in a composite outcome consisting of stroke, systemic embolism and major bleeding of 8% [16].

Although the benefits of using algorithms have been established from multiple clinical investigations, the influence of anticoagulation provider perceptions on real-world warfarin dosing algorithm use has not been studied. Thus, the purpose of this study was to describe anticoagulation providers' utilization and perceptions of algorithms and examine cross-sectional associations between the use of an algorithm and other factors in their clinical practices.

2. Methods

This was a nationwide cross-sectional study assessing providers' perceptions of warfarin dosing algorithms via an electronic survey. This study was reviewed and exempted by the University of Utah Institutional Review Board.

Study data were collected and managed using REDCap electronic data capture tools hosted at the University of Utah. REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies [17]. The electronic survey was hosted within REDCap and a hyperlink to the survey was distributed via email to outpatient anticoagulation providers locally at University of Utah Health, the Salt Lake City Veterans Affairs Medical

Center, Intermountain Health Care; and nationally to the American College of Clinical Pharmacy ambulatory care list-serve, Anticoagulation Forum members, the Veterans Affairs ambulatory care list-serve, and Kaiser Permanente's anticoagulation provider distribution list.

Anticoagulation providers in this study were defined as any health care provider who makes warfarin dose adjustments, and could include physicians, pharmacists, mid-level providers (physicians' assistants and nurse practitioners), nurses, licensed practical nurses (LPNs), medical assistants (MAs), and pharmacy technicians. Providers were required to be 18 years of age or older and willing to provide consent prior to participation in the survey. Providers were given four weeks to complete the survey. One reminder email was sent two weeks prior to survey closure. Participants were asked to complete the survey only once.

Respondents were asked to state their level of agreement on a 4-point Likert scale regarding whether they believed warfarin dosing algorithms are beneficial in improving warfarin therapy. Respondents indicated whether they currently use an algorithm "always," "occasionally," or "never." Those indicating that they "always" used an algorithm chose from a list containing possible reasons explaining why including: "required by scope of practice," "required by practice site," "required by collaborative practice agreement," "integrated into warfarin management software," or "personal choice." Those indicating occasional algorithm uses chose from a list of possible scenarios explaining why including: "training new providers," "warfarin therapy initiation," "patients with unstable INR control," or "other" reasons. Those who were not using an algorithm chose from a list of reasons why including: "inconvenient," "lack of access," "not needed," or "not required." Those who had stopped using an algorithm chose from a list of

reasons why including: "no perceived benefit," "inconvenient," "too complicated," "lack of confidence in algorithm," or "no longer needed." The frequency of deviations from the protocol was also recorded as "occasionally" or "never." Respondents also indicated how likely they are to use algorithms in the future.

We estimated the effectiveness of warfarin algorithms by participants self-reporting clinic TTR which was categorized as < 50%, 51–60%, 61–70%, or > 70%. Respondents were also asked to choose one word to describe their feelings about algorithms and to briefly explain why they chose that word. A flow chart example of the survey can be found in the Appendix.

2.1. Statistical analysis

Survey data was summarized using basic descriptive statistics. Cross-sectional associations between groups were examined using a Chi-squared test or Fisher's exact test as appropriate. P-values < 0.05 were considered statistically significant. One-word responses regarding respondents' feelings about warfarin dosing algorithms were summarized graphically using a word cloud. Explanations for the one-word responses were explored using thematic analysis.

3. Results

3.1. Provider demographics

A total of 246 anticoagulation providers completed the survey (Table 1). Survey respondents were mostly pharmacists (82%). The majority of the providers had > 5 years of experience in anticoagulation management and were aged between 31 and 50 years. 70% of respondents practiced specifically in anticoagulation management as opposed to primary care or specialty care settings. Over half of respondents worked in clinical settings where over 500 patients receiving warfarin therapy were being managed. All mid-level providers completing the survey were nurse practitioners. Most of the respondents (55%) spent over 20 h per week dosing warfarin. Less than half (45%) of respondents reported having an average clinic TTR of > 70%.

3.2. Algorithm utilization

A warfarin dosing algorithm was deemed beneficial by 84% (206) of respondents (Table 2), and of these, 171 (83%) were currently using (occasionally or always) an algorithm in their daily practice compared to only 7 of 40 (18%) of those who did not feel algorithms were beneficial (p < 0.0001). Algorithm utilization decreased among providers as years of warfarin dosing experience increased, 92% in the first year, 83% during years 1 through 5, and 67% after year 5 (p = 0.0163, Fig. 1). Nearly all (97%) of those using an algorithm occasionally deviated from the algorithm and 99% of those currently using an algorithm stated that they will continue to use them in the future compared to only 9% of those not currently using algorithms (p < 0.0001).

Pharmacists were the least likely of all providers surveyed to use a warfarin dosing algorithm. However, associations between current algorithm users and provider type were not statistically significant (p = 0.12). The most commonly reported reasons for discontinuing algorithm use was "no longer needed" (55%) and "no confidence in algorithm" (29%).

The association between algorithm use and self-reported TTR was not statistically significant. (p = 0.45, Fig. 2). Patient volume at respondents' practice sites was not associated with algorithm utilization. Notably, the proportion of providers using a dosing algorithm with center patient volumes > 1000 patients was similar to providers who practiced in centers with < 50 patients (69% and 71% respectively, p = 0.81). Respondent gender, hours per week spent dosing warfarin, Certified Anticoagulation Provider status, practice site type, or practice site Anticoagulation Center of Excellence status were not associated

with the current algorithm use (p > 0.10 for all).

Figure shows there was no association between algorithm utilization and providers' years of experience dosing warfarin (p = 0.0163).

The most common reason cited for occasional algorithm use was to train new anticoagulation providers (74%). Among providers who always utilize an algorithm the common reasons cited for doing so were a requirement based on professional discipline or practice site (63%) and personal choice (43%) (Table 2).

3.3. Providers' perceptions of warfarin dosing algorithms

Most respondents (84%) view warfarin dosing algorithms as beneficial and 72% report that they plan on using an algorithm in the future. A word cloud summarizing providers' "one-word" descriptions of algorithms is shown in Fig. 3. The words used most often by anticoagulation providers to describe algorithms were "helpful," "guide," "consistency," "standardized," and "useful." Some commonly cited negative words associated with algorithms were "incomplete," "inflexible," "unnecessary," "restrictive," "robotic," "oversimplified," and "cookie-cutter."

Thematic analysis of the explanations for one-word responses revealed barriers to algorithm use. Many providers cited the importance of using clinical judgement and the necessity of considering patient-specific parameters that would not be possible using algorithms. Another frequent response was that algorithms are good teaching tools for providers new to dosing warfarin, but clinical judgement should replace the algorithm with increased clinical experience. Table 3 gives some examples of providers' explanations of their "one word" choice.

4. Discussion

This descriptive assessment on the use and attitude toward warfarin dosing algorithms clearly demonstrated that providers acknowledge the benefits of using an algorithm in their clinical practice and that favorable attitudes toward algorithms are associated with current exposure to algorithm use. Current use of an algorithm was also strongly associated with the likelihood of using algorithms in the future. Many respondents expressed that algorithms are effective teaching tools to help train providers new to managing warfarin but also feel strongly that clinical judgement should not be replaced by an algorithm. This may explain why algorithm use wanes over time as providers become more confident in their clinical decision-making skills. Thus, providers may feel their ability to exercise clinical judgement and/or intellectual autonomy is restricted or threatened by algorithm use over time. This perceived barrier to algorithm use could be mitigated if the proven benefits of algorithm use are periodically reinforced and providers are reassured that 100% adherence is not expected. An interesting finding was that almost a third of respondents who indicated they had stopped using an algorithm did so due to lack of confidence in the algorithm. As there are many warfarin dosing algorithms available, there could be legitimate provider concerns with the accuracy and effectiveness of the specific algorithm used in the overall clinic population, or in certain populations where additional nuance is required and not accounted for in the algorithm.

Physicians who took the survey had the highest frequency of algorithm (100%) use while the providers in the "other" category had the lowest rate of algorithm use (50%), although the number of respondents in each of these categories was limited (physician 5, other 2). The provider category most represented in the survey was pharmacists, and they had the second lowest incidence of algorithm use among all professional disciplines. This observation could be partly due to the fact that pharmacists had the highest representation among all anticoagulation provider types in this study allowing a more accurate description of algorithm utilization in this provider category generally while the results of the other provider types may not accurately represent their professions as a whole. Legal scope of practice or practice-

Table 2
Provider utilization of warfarin dosing algorithms (N = 246).

	Total (N = 246)	Physicians (N = 5)	Pharmacist (N = 201)	Mid-level provider[a] (N = 8)	Nurse (N = 30)	Other[b] (N = 2)
Feel warfarin dosing algorithms are beneficial, n (%)	206 (84)	5 (100)	163 (81)	8 (100)	28 (93)	2 (100)
Currently using a warfarin dosing algorithm, n (%) N = 178						
Total	178 (72)	5 (100)	140 (70)	8 (100)	26 (87)	1 (50)
Always	80 (45)	2 (40)	60 (43)	3 (50)	14 (54)	1 (100)
Occasionally	98 (55)	3 (60)	80 (57)	3 (50)	12 (46)	0
Reasons for always using an algorithm[c], n (%) N = 80						
Required by professional scope of practice	30 (38)	1 (50)	20 (33)	1 (33)	8 (57)	0
Required by practice-specific protocol	50 (63)	0	36 (60)	1 (33)	12 (86)	1 (100)
Required by collaborative practice agreement	19 (24)	0	16 (27)	0	3 (21)	0
Integrated into electronic medical record	10 (13)	0	4 (7)	2 (67)	4 (29)	0
Personal choice	34 (43)	1 (50)	29 (48)	1 (33)	3 (21)	0
Scenarios when providers sometimes/occasionally use an algorithm[c], n (%) N = 98						
Training new anticoagulation providers	73 (74)	3 (100)	64 (80)	1 (33)	5 (42)	0
During warfarin therapy initiation	60 (61)	2 (67)	51 (64)	1 (33)	6 (50)	0
Patients with unstable INR control	55 (56)	2 (67)	40 (50)	3 (100)	10 (83)	0
Other[d]	18 (18)	0	15 (19)	1 (33)	2 (17)	0
Not currently using a dosing algorithm, n (%) N = 68						
Stopped using a warfarin dosing algorithm	31 (46)	0	29 (48)	2 (100)	0	0
Never used a warfarin dosing algorithm	37 (54)	0	32 (52)	0	4 (100)	1 (100)
Reasons for not currently using a dosing algorithm[c], n (%) N = 68						
Using an algorithm is inconvenient	3 (4)	0	3 (5)	0	0	0
I do not have access to an algorithm	14 (21)	0	11 (18)	0	3 (75)	0
I do not need to use an algorithm	54 (79)	0	51 (84)	2 (100)	1 (25)	0
I am not required to use an algorithm	22 (32)	0	20 (33)	0	1 (25)	1 (100)
Reasons for stopping algorithm, n (%) N = 31						
No perceived benefit	5 (16)	0	5 (17)	0	0	0
Inconvenient	0	0	0	0	0	0
Too complicated	0	0	0	0	0	0
No confidence in algorithm	9 (29)	0	8 (28)	1 (50)	0	0
No longer needed	17 (55)	0	16 (55)	1 (50)	0	0
Frequency of deviation from algorithm suggestions, n (%) N = 80						
Occasionally	78 (97)	2 (100)	59 (98)	3 (100)	13 (93)	1 (100)
Never	2 (3)	0	1 (2)	0	1 (3)	0
Likelihood of using an algorithm in the future, n (%) N = 246						
Very likely/likely	177 (72)	5 (100)	138 (69)	6 (75)	26 (87)	2 (100)
Not likely/very unlikely	69 (28)	0	63 (31)	2 (25)	4 (13)	0

[a] Nurse practitioners or physicians' assistants.
[b] Licensed practical nurse, medical assistants or pharmacy technicians.
[c] Could give multiple responses.
[d] Orthopedic inpatients, patients restarting on warfarin with new medications, out of range INRs, new patients to the provider but are not new start patients.
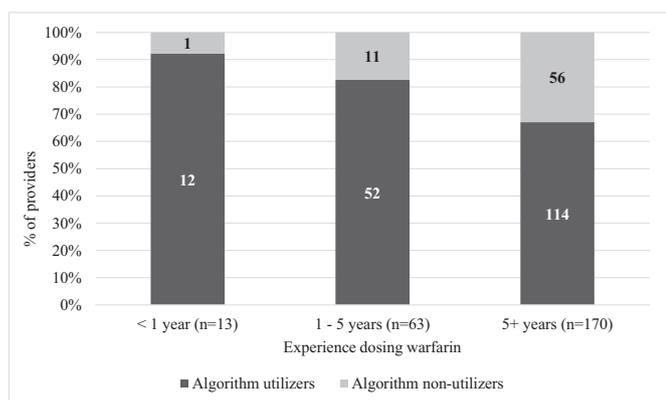
Fig. 1. Algorithm utilization based on provider years of experience dosing warfarin.

Fig. 2. Algorithm utilization and provider self-reported center time within therapeutic range.
Figure shows that there is no association between algorithm utilization and self-reported center time within therapeutic range (p = 0.45).

site specific requirements to use an algorithm may contribute to algorithm utilization and limit the autonomy to choose whether to use an algorithm or not, particularly for nurses, who reported these as a reason for using an algorithm, more commonly than other disciplines.

4.1. Limitations

When reviewing these results, the accuracy of the information reported is dependent upon the providers' willingness to provide thoughtful responses. Providers' time can be constrained, which could result in rushed responses and decreased accuracy of the responses provided. Results are also limited by the participants' ability to accurately determine their clinic's TTR, either due to inability or unwillingness to formally calculate or report this parameter. Dissemination of

Fig. 3. Word cloud depicting providers' perceptions of warfarin dosing algorithms
Providers were asked to list a one-word description of how they felt about warfarin dosing algorithms. The size of the print is proportional to the frequency the word was cited by respondents.

Table 3
Common explanations for "one-word" choices describing warfarin dosing algorithms.

"They are **helpful as a guide for management** and **for teaching new residents and students the basics** of management."

"**When I am on the fence** on managing a patient's warfarin dose, **the algorithm is beneficial in helping come to a conclusion**."

"It helps **standardize management** among our staff and **improves TTR**"

"In my experience, **using an algorithm is a best practice**"

"I don't think I could do my job without one"

"I think there are many **patient-specific factors not taken into account**, including risk of clot vs bleed for each individual"

"Perceived **lack of clinical judgement**"

"They are a very useful tool, but they **should not replace sound clinical judgement**"

"I have dosed warfarin so frequently that **I don't need to use the algorithm on a daily basis**"

"I feel algorithms **play a role in directing treatment decisions as clinicians gain experience**, but that **clinical experience is more valuable over time than an algorithm**"

Bolded text indicates key themes.

this survey was dependent upon organizations and colleagues forwarding it on to fellow anticoagulation providers. As a result, the survey results were biased toward pharmacists and providers employed at anticoagulation clinics, and underrepresented all other providers making warfarin adjustments and practice settings outside the specialty anticoagulation service. Additionally, as mentioned previously there are many different warfarin dosing algorithms available, without one particular algorithm being recommended as the standard. Variability between algorithms could explain some differences in respondents' perceptions. However, our study sought to describe *overall* perceptions and barriers to algorithm use, so differences among specific algorithms should not have a large effect on the overall results.

5. Conclusion

The majority of anticoagulation providers responding to this survey frequently use warfarin dosing algorithms to some extent and view them as beneficial; especially those less experienced in dosing warfarin. A decrease in algorithm use over time was observed, with providers expressing they no longer perceived benefit or needed them. Education on the potential benefits associated with continual algorithm use as well as addressing barriers to their use could improve the overall quality of warfarin therapy.

Authors' contributions

All authors fully contributed to the content of this manuscript, including meeting the four criteria of the Internal Committee of Medical Journal Editors. All authors had full access to all of the data in the study and take full responsibility for the integrity of the work and accuracy of the data analysis, from inception to published article.

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Declaration of competing interest

None.

Appendix A

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┌─────────────────┐         ┌──────────────────────┐
│ (Survey         │◄──No──  │ I give my consent to │
│ Termination)    │         │ participate in this  │
│                 │         │ study                │
└─────────────────┘         └──────────────────────┘
                                      │ Yes
                                      ▼
┌─────────────────┐         ┌──────────────────────┐
│ Thank you for   │         │ For improved         │
│ previously      │         │ accuracy, we ask     │
│ taking our      │◄──Yes── │ that you only        │
│ survey.         │         │ complete the survey  │
│ (Survey         │         │ once. Have you       │
│ Termination)    │         │ previously completed │
│                 │         │ the survey?          │
└─────────────────┘         └──────────────────────┘
                                      │ No
                                      ▼
┌─────────────────┐         ┌──────────────────────┐
│ (Survey         │◄──No──  │ Are you 18 or older? │
│ Termination)    │         │                      │
└─────────────────┘         └──────────────────────┘
                                      │ Yes
                                      ▼
                            ┌──────────────────────┐
                            │ I believe warfarin   │
                            │ dosing algorithms    │
                            │ are beneficial in    │
                            │ improving warfarin   │
                            │ therapy.             │
                            │ (Strongly agree;     │
                            │ Agree; Disagree;     │
                            │ Strongly disagree)   │
                            └──────────────────────┘
                                      │
                                      ▼
                            ┌──────────────────────┐
                            │ If I could choose    │
                            │ one word to describe │
                            │ how I feel about     │
                            │ warfarin dosing      │
                            │ algorithms it would  │
                            │ be. (one word)       │
                            └──────────────────────┘
                                      │
                                      ▼
                            ┌──────────────────────┐
                            │ Please explain why   │
                            │ you chose that word. │
                            └──────────────────────┘
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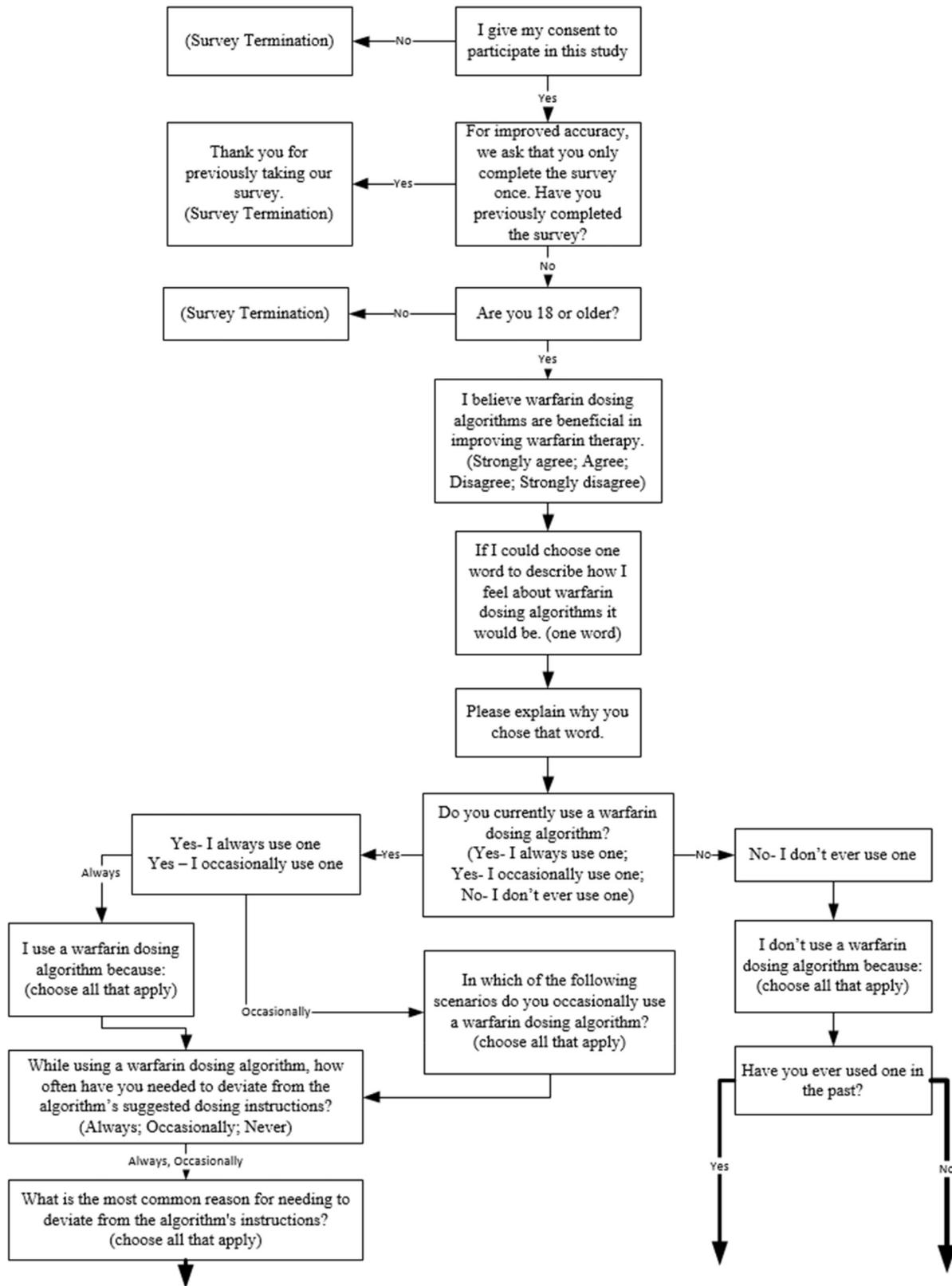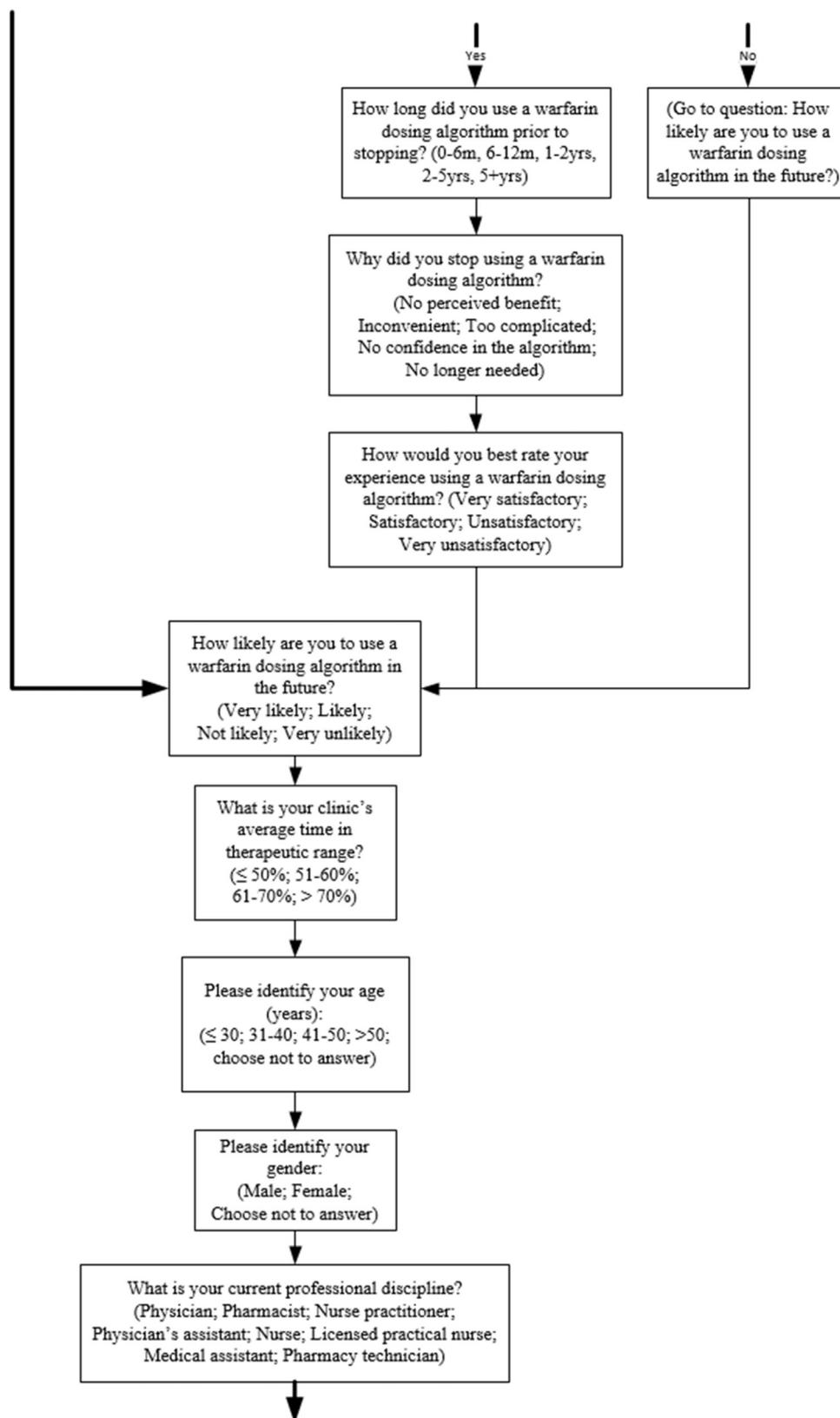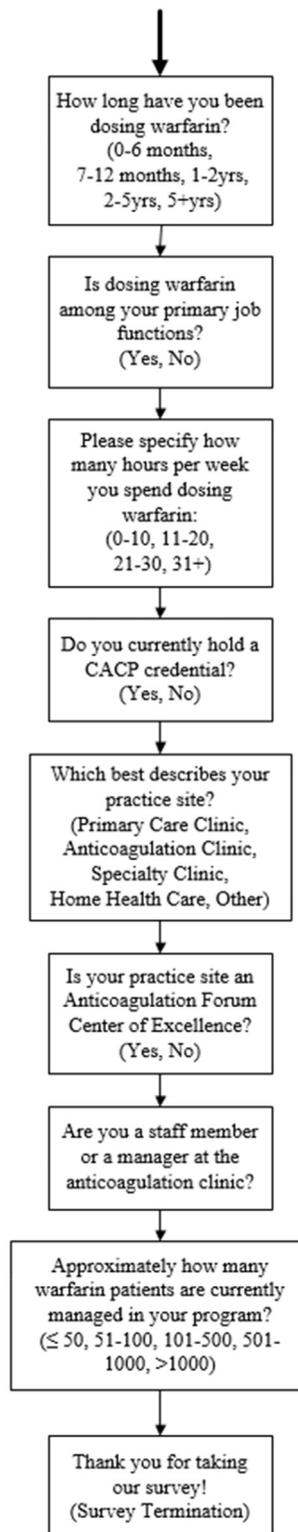
Do you currently use a warfarin dosing algorithm?
(Yes- I always use one; Yes- I occasionally use one; No- I don't ever use one)

Yes → Yes- I always use one / Yes – I occasionally use one

No → No- I don't ever use one

Always: I use a warfarin dosing algorithm because: (choose all that apply)

Occasionally: In which of the following scenarios do you occasionally use a warfarin dosing algorithm? (choose all that apply)

While using a warfarin dosing algorithm, how often have you needed to deviate from the algorithm's suggested dosing instructions? (Always; Occasionally; Never)

Always, Occasionally: What is the most common reason for needing to deviate from the algorithm's instructions? (choose all that apply)

I don't use a warfarin dosing algorithm because: (choose all that apply)

Have you ever used one in the past?

Yes

No

Yes

How long did you use a warfarin dosing algorithm prior to stopping? (0-6m, 6-12m, 1-2yrs, 2-5yrs, 5+yrs)

Why did you stop using a warfarin dosing algorithm?
(No perceived benefit; Inconvenient; Too complicated; No confidence in the algorithm; No longer needed)

How would you best rate your experience using a warfarin dosing algorithm? (Very satisfactory; Satisfactory; Unsatisfactory; Very unsatisfactory)

No

(Go to question: How likely are you to use a warfarin dosing algorithm in the future?)

How likely are you to use a warfarin dosing algorithm in the future?
(Very likely; Likely; Not likely; Very unlikely)

What is your clinic's average time in therapeutic range?
($\leq$ 50%; 51-60%; 61-70%; > 70%)

Please identify your age (years):
($\leq$ 30; 31-40; 41-50; >50; choose not to answer)

Please identify your gender:
(Male; Female; Choose not to answer)

What is your current professional discipline?
(Physician; Pharmacist; Nurse practitioner; Physician's assistant; Nurse; Licensed practical nurse; Medical assistant; Pharmacy technician)

How long have you been
dosing warfarin?
(0-6 months,
7-12 months, 1-2yrs,
2-5yrs, 5+yrs)

Is dosing warfarin
among your primary job
functions?
(Yes, No)

Please specify how
many hours per week
you spend dosing
warfarin:
(0-10, 11-20,
21-30, 31+)

Do you currently hold a
CACP credential?
(Yes, No)

Which best describes your
practice site?
(Primary Care Clinic,
Anticoagulation Clinic,
Specialty Clinic,
Home Health Care, Other)

Is your practice site an
Anticoagulation Forum
Center of Excellence?
(Yes, No)

Are you a staff member
or a manager at the
anticoagulation clinic?

Approximately how many
warfarin patients are currently
managed in your program?
(≤ 50, 51-100, 101-500, 501-
1000, >1000)

Thank you for taking
our survey!
(Survey Termination)

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