Effect of Patient Characteristics, Knowledge and Satisfaction with Warfarin Therapy on Willingness to Switch to a New Oral Anticoagulant

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Abstract

Background: There are limited studies addressing patient's willingness to switch to a new anticoagulant from warfarin. The goal of this study was to determine the effect of patient knowledge and satisfaction with warfarin therapy on willingness to switch to a new oral anticoagulation therapy in an urban clinic.

Methods: A cross-sectional study was conducted among warfarin-treated patients attending a pharmacist-run urban anticoagulation clinic at Howard University Hospital from August 2014-February 2015. The primary outcome evaluated was willingness to switch to a new oral anticoagulant. Other variables assessed include social demographics, clinic factors, patient knowledge and satisfaction. The modified anti-clot treatment survey (ACTS), the oral anticoagulant knowledge survey (OAKS), and a validated willingness to switch survey were used to measure patient knowledge (high ≥ 75%), satisfaction (Likert scale ≥ 4) and willingness to switch (Likert scale ≥ 4), respectively. Statistical analysis was conducted using (Statistical Package for the Social Sciences (SPSS) version 22.0.

Results: A total of 100 patients on warfarin treatment were included. The majority of participants were retired/disabled (59%), mostly African American (86%), and male (55%). The mean willingness to switch score was 21.59 (out of 35). Patients were most willing to switch to an alternative agent which required less follow up (3.55 ± 1.77) and had fewer drug interactions (3.75 ± 1.67). Factors associated with willingness to switch varied based on patient preferences. The only predictor of willingness to switch was low satisfaction (p=0.002). Knowledge was not associated with willingness to switch (p=0.249).

Conclusion: Patients in an anticoagulation clinic had low knowledge of their warfarin therapy, were overall satisfied with warfarin treatment, but were willing to consider using a new oral anticoagulant that was more convenient especially if low satisfaction with warfarin. Further studies should be directed toward patient preferences in determining optimal regimen.

Keywords: Warfarin; Willingness to switch; New oral anticoagulants; Patient satisfaction; Patient knowledge

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Introduction

In the past warfarin, a vitamin K antagonist (VKAs), was the only available oral agent to prevent blood clots. While it has proven efficacy in treating and preventing thrombotic conditions (stroke and venous thromboembolism [VTE]), warfarin is also associated with several disadvantages such as frequent lab monitoring, multiple drug interactions, narrow therapeutic index and interpersonal variability in metabolism and target effect due to genetic polymorphisms [1-7]. These factors correlate to a 40-fold

difference in the individual maintenance dose requirement (0.5-20 mg daily) to achieve exactly the same effect [1]. In addition to these disadvantages, warfarin carries the risk of intracranial hemorrhage which occurs in 0.4% of patients per year and has a mortality of approximately 50% [5-7]. Overall these disadvantages have resulted in apprehension in physicians' prescribing and patients' uptake of this medication.

This delicate balance of risk versus benefit plays a significant role in the hesitation of many prescribers to prescribe warfarin and discourages many patients from taking the drug [8]. Current evidence suggests that almost 50% of patients with an indication for anticoagulation for stroke prophylaxis in atrial fibrillation are not treated [8,9]. Therefore, alternative anticoagulants were much needed to potentially better serve this population. These agents include the oral thrombin inhibitor dabigatran, and the factor Xa inhibitors, rivaroxaban, apixaban, and edoxaban. Although these medications lack the above mentioned disadvantages of warfarin (need for frequent monitoring, less drug interactions), patients and prescribers must be aware of potential drawbacks such as (monitoring difficulty, availability/cost of effective antidotes in the event of severe bleeding, and less forgiving in those with poor adherence) [10].

Gaps in existing studies in the area of patient preferences to anticoagulation treatments include limited assessment of the collective impact of patient knowledge and satisfaction on therapy choices, inadequate inclusion of minorities, and limited scope of patient population to atrial fibrillation patients only.

In order to fill the aforementioned knowledge gaps the goal of this study was to determine if patient warfarin knowledge, their satisfaction with therapy, or any other patient characteristics impact a patient's decision to switch to one of the new oral agents in a majority African American population of patients with thrombolytic conditions. The secondary goals of the study were to assess the level of patient knowledge and satisfaction with warfarin therapy in an urban university-affiliated pharmacist-run clinic.

Methods and Materials

Study design and patient population

A cross sectional study of warfarin treated patients attending the outpatient anticoagulation management services clinic at Howard University Hospital from August 2014 to February 2015 was conducted. Patients were eligible for the study if they were 18 or older, currently taking warfarin, attended the outpatient anticoagulation clinic, and provided informed consent to participate in the study. Patients with all indications for warfarin therapy were included in the study. No financial incentive was provided for participation in the study. The project was approved by the Howard University Institutional Review Board. The sample size was determined based on the concept of saturation which was predetermined to be 100 participants based on factors such as heterogeneity of the population, number of selection criteria, data collection method, budget and resources available.

Patient recruitment

Recruitment was clinic-based and at the point of care. Procedurally, patients were invited to participate in the study in the evaluation room where they would normally receive their INR reading. Prior to obtaining a blood sample, the investigator informed the patient about the study and invited them to participate. Patients were informed that the study would take approximately 10 minutes. After agreeing to participate, patients were informed of the study procedures and provided informed consent. Patients that declined to participate proceeded with their normally scheduled INR monitoring visit.

Study variables

The primary outcome of this study was patient willingness to switch to a new oral anticoagulant. Other study variables of interest collected through the investigator-administered survey included patient knowledge of warfarin therapy, patient satisfaction with warfarin therapy, employment status, marital status, highest completed education, alcohol consumption, smoking status, physical activity assessment, frequency of bleeding episodes in past year, sum of missed doses over past month, average days the patient consumes green vegetables per week, duration of warfarin therapy, and whether the patient was involved in decision to use warfarin. Data abstracted from patients' charts included age, ethnicity, gender, insurance, indication for warfarin, number of total medications, warfarin dose, comorbid conditions, percent of appointments patient's INR within target range over last 4 visits, number of appointments kept and missed over the past 6 months.

Data collection

Data collection for this study was done via an interviewer-administered survey and chart abstraction. Data collection in the former case was initiated immediately after study recruitment and at the start of their face to face clinic consultation. Only one interviewer, the clinical pharmacist, was responsible for conducting the interviewer-administered surveys. The interviewer-administered survey contained four sections: 1) patient demographics and characteristics questionnaire, 2) patient satisfaction assessment, 3) patient knowledge assessment, and 4) patient willingness to switch to new oral anticoagulation assessment.

The scales used in the assessment of patient satisfaction, knowledge, willingness to switch have been widely used by other researchers and have high reliability and validity [11-15].

The assessment of satisfaction was done using the validated Anti-Clot Treatment Scale (ACTS) [16]. The ACTS was selected on the basis of its good psychometric properties (Chronbach's alpha 0.90 to 0.93). It was also used in 2 large randomized controlled trials and was included as an outcome in both the Outcomes Registry for Better Informed Treatment of Atrial Fibrillation and the Global Anticoagulant Registry in the FIELD prospective longitudinal AF patient registries [17,18]. The modified scale contains 12 questions about respondents opinions of warfarin risk, benefits, burdens, and overall satisfaction. The questions on the assessment were comprised of 5 item Likert scales ranging from 1 to 5 (1="not at

all", to 5="extremely"). For the first 9 questions, higher scores represented less favorable perceptions and for questions 10-12, higher scores will represent favorable perceptions. Patients were considered to be satisfied if they responded to question 11 "How satisfied are you with your warfarin therapy" with a rating of 4 or above.

The assessment of warfarin knowledge was done using a 10-item multiple choice scales which has items derived from the validated Oral Anticoagulant Knowledge Survey (OAKS) [19]. The modified OAKS consist of questions that determine a patient's knowledge of warfarin interactions, warfarin side effects, and monitoring parameters. A score over 75% (at least 8 correct responses) constitutes high knowledge of warfarin therapy while a lower score represent lower knowledge of warfarin therapy. The OAKS was selected because it has good internal consistency reliability as determined by the Kuder–Richardson 20 value [19].

The willingness to switch assessment was based on items obtained from a survey created by Elewa et al. [20]. This instrument was selected because of the topic specificity in measuring willingness to switch to new anticoagulation medications and its prior use in a similar care setting. From this survey, a total of 7 items assessed willingness to switch on the basis of opinions and awareness of new anticoagulant medications as well as perceived conveniences and barriers related to current warfarin therapy. The 7 items were Likert type and inquired willingness to switch based on a likelihood of switching. The response options ranged from 1 to 5 (1="Very unlikely"; to 5="Very likely"). For analytic purposes, willingness to switch was assessed in two ways. First patients were considered willing to switch based on a rating of 4 or above for each of the 7 items. Secondly, patients' responses to these items were summed up in order to examine willingness to switch as a summary score. Ratings for each individual item were also summarized as a mean score. Higher scores represented a higher willingness to switch. Willingness to pay for a new treatment was also assessed in an item that queried the patients on an amount the participant would be willing to pay for a new treatment.

Several measures were taken in order to reduce the influence of bias in the study. Acquiescence and Social desirability bias was avoided by asking neutral questions with no perceived right answers and creating a comfortable judgment-free environment which encouraged honest responses. The use of set predetermined answer choices for respondents to choose avoids confirmation bias. Also following a script and not providing immediate feedback of answer choices prevent leading question and wording bias.

Statistical analysis

Descriptive statistics were used to describe patients' characteristics, along with their knowledge, satisfaction, and willingness to switch scores. Pearson's chi-square test and independent sample t-test were used to determine the associations between socio-demographic and willingness to switch ratings (willing *vs.* unwilling). A linear regression analysis was conducted to examine predictive factors of willingness to switch. Simple linear regression was first conducted to examine unadjusted effects. Study variables evaluated were age, yearly bleeds, missed doses, weekly intake of green vegetables, duration of therapy, number of comorbid conditions, number of medications taken, percent of time in therapeutic range, number of missed appointments, number of kept appointments, average warfarin dose, number of dose changes, knowledge score, satisfaction score, employment status, marital status, smoking status, alcohol intake, highest education level, exercise habits, responsibility to take medication, ethnicity, insurance, indication, and gender. The factors that had $p<0.2$ in simple linear regression analysis and those of clinical importance were then eligible for entry into the multiple linear regression. These factors were entered simultaneously (enter method) into the model and adjusted odds ratios reported. All analyses were conducted using (Statistical Package for the Social Sciences (SPSS) version 22.0 at an alpha level of 0.05.

Results

Patient characteristics

A total of 130 patients were recruited to participate in the survey, of them 30 patients declined to participate. A total of 100 patients completed the survey (76.9%). The majority of participants were retired/disabled (59%), mostly African American (86%), male (55%). The average age of the participants was 62.58 ± 13.90 years old and 87% receive either Medicare or Medicaid as their primary source of insurance. The indications for taking warfarin included deep venous thrombosis and/or pulmonary embolism (59%), atrial fibrillation (23%), or other indication (18%). The average time in therapeutic range among participants was 38.75% ± 30.64 based on patients last 4 INR readings. A detailed description of patient demographics information is provided in **Table 1**.

Willingness to switch

The overall mean willingness to switch score was 21.59 (maximum score=35) A summary of patient responses to the willingness to switch items is shown in **Figure 1.** As shown, willingness to switch to an anticoagulant with equal/lower cost, fewer drug interactions, less monitoring frequency and equal efficacy was each over 50%.

Higher scores on the willingness to switch scale represented a more willingness to switch to a new medication while lower scores represent an unwillingness to switch. The mean willingness to switch scores was 3.19 ± 1.50 for expressed willingness to switch to an agent that had equal efficacy as warfarin, 3.10 ± 1.54, for a treatment with a similar risk profile as warfarin, 3.55 ± 1.77 for a treatment that required less frequent follow up and 3.75 ± 1.67 for a treatment that had fewer drug-drug and no drug-food interactions.

Notable barriers to switching to a new anticoagulant for respondents were the need to take the medication twice daily instead of once daily (mean willingness to switch score=2.5 ± 1.6) and higher patient co-pays (mean willingness to switch score=2.06 ± 1.55). When asked to quantify the amount of out-of-pocket cost participants were willing to pay to switch to these new agents,

Table 1 Participant Characteristics in Warfarin Study (N=100).

		Frequency	Percent
Employment Status	Full time	10	10.0
	Part time	11	11.0
	Unemployed	20	20.0
	Retired/Disabled	59	59.0
Marital Status	Single	45	45.0
	Married	32	32.0
	Divorced	11	11.0
	Widowed	12	12.0
Highest Education Level	Less than high school	36	36.0
	High school graduate/ GED	28	28.0
	Some college	16	16.0
	College graduate	14	14.0
	Graduate school	6	6.0
Alcohol Use	Yes	20	20.0
	No	80	80.0
Smoker	Yes	15	15.0
	No	85	85.0
Regular Exercise	Yes	26	26.0
	No	74	74.0
Responsibility to take medications	Yours	92	92.0
	Someone else	8	8.0
Yearly Bleeds	No bleeds	74	74.0
	One bleed	13	13.0
	Two bleeds	7	7
	More than 2	6	6.0
Monthly Missed Doses	No missed doses	58	58.0
	1-3 missed doses	27	27.0
	More than 3 missed doses	15	15.0
Weekly Green Vegetables Intake	None	14	14.0
	Once a week	17	17.0
	Twice a week	17	17.0
	Three times a week	24	24.0
	Over 3 times a week	28	28.0
Duration of Warfarin Treatment	One year or Less	20	20.0
	Between 1-2 years	17	17.0
	Between 2-3 years	16	16.0
	Between 3-4 years	11	11.0
	Over 4 years	36	36.0
Number of additional comorbid conditions	No Conditions	8	8.0
	1-2 Conditions	32	32.0
	3-4 Conditions	36	36.0
	More than 4 Conditions	24	24.0
Ethnicity	White	2	2.0
	Black	86	86.0
	Hispanic	4	4.0
	Other	8	8.0
Gender	Male	55	55.0
	Female	45	45.0
Indication	DVT	30	30.0
	PE	18	18.0
	DVT with PE	11	11.0
	AF	23	23.0
	Other	18	18.0
Age	Less than 50	14	14.0
	50-59	27	27.0
	60-69	24	24.0
	70-79	23	23.0
	80 or over	12	12.0
Number of medications	Between 1 and 4	32	32.0
	Between 5 and 8	37	37.0
	Between 9 and 12	21	21.0
	Over 12	10	10.0
Percent of time in therapeutic range during last 4 visits	0	24	24.0
	25	27	27.0
	50	27	27.0
	75	14	14.0
	133	8	8.0
Missed appointments during past 6 months	None	37	37.0
	One	20	20.0
	Two	13	13.0
	Three	17	17.0
	More than three	13	13.0
Average warfarin daily dose	5mg or Less	31	31.0
	Between 4 mg to 6 mg	23	23.0
	Between 6 mg to 10 mg	21	21.0
	Over 10 mg	25	25.0
Insurance type	Medicare	18	18.0
	Medicaid	65	65.0
	Private	17	17.0
Number of appointments seen in past 6 months	4 or Less	39	39.0
	Between 5 to 7	40	40.0
	Over 7	21	21.0
Number of dose changes in past year	None	37	37.0
	One change	19	19.0
	Two changes	17	17.0
	Three changes	14	14.0
	Over 3 changes	13	13.0

82% responded less than $10 a month, 13% agreed to pay up to $49 per month, 3% agreed to pay up to $99 per month, while 2% would be willing to pay over $100 per month in order to switch medications.

Factors associated with willingness to switch

Findings on factors associated with major barriers to willingness to switch are presented in **Table 2**. Willingness to switch if cost was similar was associated with age. Specifically the mean age was lower for the willingness to switch patient group versus the not willing to switch group (59.6 years *vs.* 67.1 years, p=0.008).
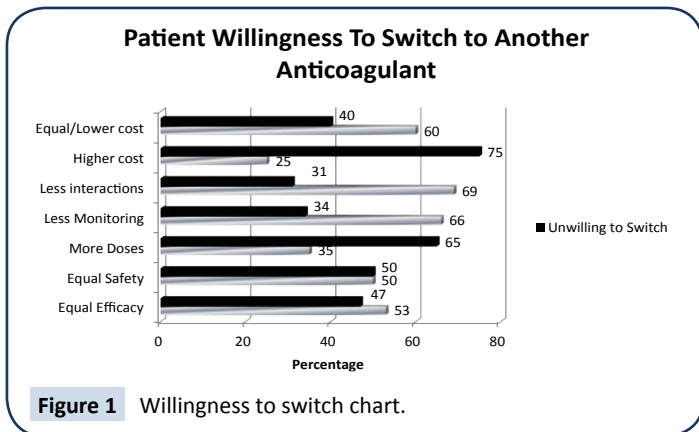
Figure 1 Willingness to switch chart.

Satisfaction was also associated with willingness to switch if cost was similar with patients reporting lower satisfaction having a higher proportion of willingness (85.7% *vs.* 50%, p=0.001)

Willingness to switch if monitoring frequency was less was associated with ethnicity and satisfaction. Ethnicity was associated with willingness to switch if monitoring frequency was less with African Americans having a higher proportion of willingness compared to non-African Americans (72.1% *vs.* 28.6%, p=0.018). Satisfaction was also associated with willingness to switch if monitoring frequency is less with patients reporting lower satisfaction having a higher proportion of willingness to switch (85.7% *vs.* 58.3%, p=0.009).

Willingness to switch if concerned with drug-drug and drug-food interactions was associated with age, warfarin dose, responsibility for taking medications, and satisfaction. Age was associated with willingness to switch if concerned with drug interactions with younger patients having a higher proportion of willingness to switch (67.1 *vs.* 60.5, p=0.033). Warfarin dose was associated with willingness to switch if concerned with drug interactions with the mean warfarin dose being higher for the willingness to switch patient group versus the not willing to switch group (6.13 mg *vs.* 7.32 mg, p=0.046). Responsibility for taking medications was associated with willingness to switch if concerned with drug interactions with patients who report being solely responsible for taking their medications having a higher proportion of willingness to switch (71.7% *vs.* 37.5%, p=0.045). Satisfaction was associated with willingness to switch if concerned with drug interactions with patients who report lower satisfaction having a higher proportion of willingness to switch (85.7% *vs.* 62.5%, p=0.024).

Willingness to switch if concerned about taking more doses of medications per day was associated with age, number of comorbid conditions, time in therapeutic range, alcohol use, and satisfaction. Age was associated with willingness to switch if concerned about taking more doses of medications per day with mean age being lower for the willingness to switch patient group versus the not willing to switch group (65.5 years *vs.* 57.1 years, p=0.003). Comorbid conditions was associated with willingness to switch if concerned about taking more doses of medications per day with mean number of comorbid conditions being lower for the willingness to switch patient group versus the not willing to switch group (3.3 *vs.* 2.5, p=0.021). Percent time in therapeutic range was associated with willingness to switch if

concerned about taking more doses of medications per day with patients spending less time with INR in therapeutic range having a higher proportion of willingness to switch (43.5% *vs.* 30.0%, p=0.044). Alcohol use was associated with willingness to switch if concerned about taking more doses of medications per day with patients who report drinking alcohol having a higher proportion of willingness to switch (55% *vs.* 30%, p=0.036). Satisfaction was associated with willingness to switch if concerned about taking more doses of medications per day with patients who report lower satisfaction having a higher proportion of willingness to switch (53.6% *vs.* 27.8%, p=0.015).

Predictors of willingness to switch are shown in **Table 3**. The only predictor of willingness to switch was low patient satisfaction (p=0.002). Based upon the beta coefficient, those with high satisfaction had a lower willingness to switch score compared to those with low satisfaction. Other factors the trended toward predicting willingness to switch included less time in therapeutic range (p=0.068) and higher warfarin dose (p=0.60). Knowledge was found to not be a predictor of willingness to switch (p=0.249).

Discussion

The primary goal of this study was to determine if patient knowledge or satisfaction with warfarin therapy or other patient characteristics impacted a patient's decision to switch to one of the new oral agents in a predominantly African American population.

Patient satisfaction was determined to be a significant predictor of patient willingness to switch to a new oral anticoagulant with patients with high satisfaction having lower willingness to switch scores compared to those with low satisfaction. The authors were unable to find a comparative study that examined the predictive effect of patient satisfaction on willingness to switch to the newer anticoagulation therapies so our findings would be the first to have examined such an effect. These findings were expected as patients dissatisfied with warfarin could likely have reduced quality of life due to associated complications and would be more willing to switch. Our findings reflect a general sentiment of willingness to switch based on dissatisfaction with therapy and additional studies could be done to further quantify the effect of satisfaction. Several studies have examined patient satisfaction after switching to warfarin alternatives [21,22]. In a RE-LY sub study, it was determined that health-related quality of life scores between dabigatran and warfarin were comparable.21 These results illustrate that patients were willing to switch to the new oral anticoagulants and when they do, maintain equal satisfaction with their therapy. Another study found that patients taking the new oral anticoagulants were more satisfied compared to warfarin users, even though they experienced more adverse events [22].

Based on these findings targeted efforts can be made to identify patients who are dissatisfied with current therapy as they would be those most likely to benefit from a switch to a newer anticoagulation.

Our study did not find a predictive effect of knowledge on willingness to switch. These findings were contradictory to our original hypothesis, as we had expected higher knowledge about

Table 2 Associations between major barriers to willingness to switch and patient characteristics.

Patient characteristics	Willingness to switch if cost is similar	Willingness to switch if monitoring frequency was less	Willingness to switch if you had few drug food interactions	Willingness to switch more doses
Age	0.008*	0.401	0.033*	0.003*
Yearly Bleed	0.266	0.432	0.653	0.062
Missed doses	0.744	0.582	0.461	0.298
Green vegetable intake	0.125	0.086	0.125	0.341
Duration of therapy	0.927	0.909	0.767	0.513
Number of comorbidities	0.067	0.289	0.133	0.021*
Number of medications	0.331	0.721	0.750	0.074
Percent of time in therapeutic range	0.317	0.100	0.050	0.044*
Number of missed appointments	0.607	0.205	0.140	0.771
Average warfarin dose	0.157	0.510	0.046*	0.475
Number of appointments seen	0.938	0.112	0.264	0.073
Number of dose changes	0.703	0.757	0.822	0.434
Insurance type	0.432	0.866	0.866	0.193
Employment status	0.263	0.219	0.272	0.985
Marital status	0.150	0.594	0.138	0.298
Education level	0.126	0.904	0.425	0.802
Alcohol use	0.351	0.139	0.084	0.036*
Smoker	0.568	0.515	0.318	0.028
Regular exercise	0.264	0.686	0.601	0.166
Responsibility to take medications	0.176	0.319	0.045*	0.164
Ethnicity	0.137	0.018*	0.117	0.732
Gender	0.682	0.329	0.086	0.916
Warfarin indication	0.953	0.729	0.446	0.774
Satisfaction rating	0.001*	0.009*	0.024*	0.015*
Knowledge rating	0.869	0.386	0.554	0.866

*P<0.05

warfarin therapy would lead to more willingness to switch to newer therapy. These expectations were based on prior research that have shown patient knowledge being a factor modulating treatment acceptance [23,24]. It was possible that patients knowledge of their therapy may simply reflect awareness of its disadvantages and limitations but may not be a driver of action towards change to seeking newer therapies. More studies would need to be conducted to confirm these findings.

Despite the high satisfaction with warfarin therapy, many patients showed interest in switching to a new oral anticoagulant that required less frequent monitoring, fewer drug interactions, with similar efficacy and safety. The lack of drug interactions was the leading reason for the preference to switch therapies. Patients preferred freedom of diet over less rigorous monitoring schedule. The biggest barrier to patients' willingness to switch from warfarin to one of the newer agents in a previous study was the increased cost to the patient. This was reflected in our study with a reduction in willing to switch occurred when informed that the warfarin alternatives could cost more. The vast majority were unwilling to pay over $10 more per month for the conveniences afforded with the new oral anticoagulants.

Our survey findings were also consistent with results of several other studies in which examine patients preferences, warfarin or switch to alternative oral anticoagulants to warfarin [20]. A study in a similar patient population done by Elewa et al. using the same Likert scale ranging from 1 to 5, showed high willingness to switch to an agent with less frequent follow up visits (mean score of 3.9), lacks interaction with food (mean score of 4.1) and was as efficacious as warfarin (mean score of 3.7). 20 In our study those mean scores were 3.75, 3.55, and 3.19, respectively. Other earlier studies have also showed equal or greater preference to switching to new anticoagulation therapies. In the latter case, a survey investigating patient attitudes toward switching from warfarin to newer agents indicated a general willingness to switch to new oral anticoagulants [25].

Our study has several limitations which must be addressed. First, our sample size may not fully represent the general population who are taking warfarin. Being an outpatient anticoagulation clinic located in an inner city of Washington D.C. and affiliated with a historically black university, our patient population comprises of less Caucasians, Hispanics and Asians and more African Americans. The socioeconomic level of our patient population was possibly lower than the general population leading to a more exaggerated response regarding barriers to switching such as cost. Also foods such as collard and turnip greens are a staple in the African American community which may have affected responses regarding patient feelings about drug-food interactions

Table 3 Predictors of Willingness to Switch Score.

Variable	Unadjusted β (95%CI)	Unadjusted P value	Adjusted β (95%CI)	Adjusted P value
Weekly intake of green vegetables	0.154 (-.188, 1.493)	0.127	0.087 (-4.22,1.158)	0.357
Number of comorbid conditions	-0.214 (-2.392, -0.106)	0.033	-0.091 (-1.625,0.559)	0.335
Age	-0.257 (-0.315, -0.044)	0.010	-0.086 (-0.198, 0.078)	0.389
Percent of time in therapeutic range	-0.249 (-0.140, -0.017)	0.012	-0.167 (-0.110, 0.004)	0.068
Average warfarin dose	0.197 (0.002, 1.331)	0.049	0.191 (-0.029, 1.321)	0.060
Ethnicity (black vs. non-black)	0.239 (1.246, 12.087)	0.016	0.136 (-1.236, 8.827)	0.137
Alcohol intake	0.184 (-0.310, 9.210)	0.067	0.126 (-1.534, 7.642)	0.189
Gender	0.130 (-1.338, 6.384)	0.198	0.109 (-1.643, 5.876)	0.266
Knowledge rating	-0.012 (-4.144, 3.660)	0.902	-0.108 (-5.693, 1.497)	0.249
Satisfaction rating	-0.384 (-12.242, -4.274	0.000	-0.287 (-10.129, -2.236)	0.002

of warfarin. Furthermore, only patients who attended clinic were recruited for the study which excludes patients who were less engaged in their warfarin therapy. Another limitation was that our survey did not include other potential barriers to switching to oral anticoagulants such as lack of reliable monitoring parameters, absence/cost of an antidote, and short duration of action of the medications in comparison to warfarin. In addition, several of our variables were self-reported which could result in reporting bias. Additional bias may have been introduced by using an investigator administered survey model which may prompt patients to report being more satisfied than they truly were with current therapy leading to an overestimation of warfarin satisfaction. Despite these limitations, this study finding adds to our current body of research on willingness to switch in minority patients, and

was the first of such a study to determine both knowledge and satisfaction on willingness to switch together.

Conclusion

This study suggest that patients at our pharmacist run outpatient anticoagulation clinic have low knowledge of their warfarin therapy, were overall satisfied with warfarin treatment, but were willing to consider using a new oral anticoagulant that was more convenient. The major barrier to switching was cost and the need to take some of the newer agents twice daily as opposed to once daily. Patient satisfaction with their warfarin therapy was the biggest predictor of the patient's willingness to switch. Further studies should be directed toward patient preferences when determining optimal regimen to manage anticoagulant conditions.

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