

# Warfarin Therapy: Survey of Patients' Knowledge of their Drug Regimen

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## Abstract

**Background:** Warfarin is utilised for the treatment of thromboembolic disease. Its use demands a careful and continual monitoring given its narrow therapeutic index and potentially life-threatening complications. The aim of this study was to assess the extent of patients' knowledge of their warfarin therapy.

**Methods:** A total of 200 consecutive patients from a single community hospital completed an online survey questionnaire (www.eSurveysPro.com). Using the responses to the questionnaire, we recorded compliance to warfarin therapy, knowledge about drug interactions, adverse effects of warfarin therapy, complications, and resulting hospitalisation.

**Results:** We recruited 200 patients, 55% (109/200) women and 45% (91/200) men, among which 88% were compliant with their daily medication. Of the 200 patients, 56% were unaware of any potential drug interactions, 58% were unaware of any adverse effects, 27% had experienced adverse effects, 12% had been hospitalised because of adverse effects (33% of which were due to bleeding), and 65% kept a personal record of their international normalised ratio.

**Conclusions:** Despite the high level of compliance, patient knowledge of warfarin therapy was low. Given the potential drug interactions and complexities involved with warfarin therapy, it is of high importance that medical professionals educate their patients and make them aware of any impending signs of emergent medical complications.

**Keywords:** warfarin, hemorrhage, anticoagulation, patient education

## Introduction

Warfarin is a commonly prescribed oral anticoagulant worldwide. Its mechanism of action is through vitamin K epoxide reductase inhibition, which prevents carboxylation and reduction of extrinsic coagulation factors 2, 7, 9, and 10 (1). It is commonly used prophylactically in patients with a high risk of thromboembolic events, such as those with atrial fibrillation, prosthetic heart valves, and transient ischemic attacks (2–5). The central purpose of its utilisation is to sustain a certain level of anticoagulation effect sufficient to prevent any thrombotic events while concurrently minimising the risk of hemorrhagic complications. A patient's risk of either complication (thrombosis or hemorrhage) is determined by time and the extent that his or her international normalised ratio (INR) lies outside the suggested therapeutic range (6,7). Previous literature reports poor patient understanding of the indications and the complications of

treatment with warfarin (8,9). For example, Hu et al. (10) reported that 61% of their patients had insufficient understanding of their medication. Treatment with warfarin has several potential adverse effects and drug interactions. Using a survey-based approach, and with previously recorded facts about warfarin, the present study was designed to assess patients' knowledge about their prescribed medication (warfarin) and to assess factors causing any variations in the patients' knowledge. Furthermore, we assessed if patient education regarding the clinical indication and the complexities of warfarin is necessary.

## Materials and Methods

This study was conducted with institutional review board approval and was compliant with the Health Insurance Portability and Accountability Act. Informed written consent was obtained. We

enrolled 200 consecutive patients from April 2013 to June 2013 from a single university-affiliated hospital. All patients completed an online 20-question format questionnaire (www.eSurveysPro.com). Our team retrospectively reviewed their medical records to ensure a prescription for warfarin and the indication for the same. Variables measured included INR monitoring, other medications, comorbidities, associated warfarin adverse effects, medication knowledge by age, and patients' knowledge of medical terminology. All other variables in the study, including compliance to warfarin therapy, complications, and hospitalisation, were self-reported. All analyses were performed using R, a free software for statistical computing and graphics (11). Categorical variables were expressed as frequency n (%). Continuous variables were expressed as mean (SD). All statistical tests were two sided. A significance level of  $\alpha = 0.05$  (two tailed) was deemed significant and used for all comparisons.

## Results

A total of 200 patients, 55% (109/200) women and 45% (91/200) men, participated in this survey-based study. The mean age of the patients was 69 (SD = 11) years. Eighty-nine percent (177/200) of patient records clearly indicated why the patients were on warfarin. Thrombosis (43%), blood thinning (29%), and arrhythmias (17%) were the most frequent causes for a warfarin prescription. Warfarin duration in 39% (77/200) of the patients was two years or less. Eighty-eight percent (175/200) were compliant with their medication. About 72% of

patients in the non-compliant group reported forgetfulness as a reason for non-compliance; the remaining 28% did not state a reason for non-compliance. Sixty-five percent (130/200) of patients reported monitoring their INR regularly. In this study, 56% (112/200) of patients indicated they were not aware of any drug interactions with warfarin. The 44% of patients who were aware of drug interactions named aspirin (63%) and antibiotics (22%) as the most common drugs. Increasing age correlated with decreased knowledge of drug interactions ( $P = 0.007$ ). Only 42% (83/200) of the patients in our study knew of any adverse effects. Among the adverse effects of warfarin, patients in our study reported knowledge of bleeding (52%), bruising (31%), and headaches (11%) (Table 1). In this study, 72% (143/200) of patients claimed to have information about the appropriate action to be taken in case of bleeding (Table 2). The proportion of patients claiming knowledge about the appropriate action to be taken in case of bleeding was significantly greater in younger patients ( $P = 0.029$ ) compared with older patients (> 75 years) and in those with knowledge of medication interactions ( $P = 0.018$ ).

Complications were reported by 27% (54/200) of our respondents. The most common complications were bleeding (33%), bruising (26%), fatigue (12%), and gastrointestinal adverse effects (11%). Hospitalisations as a result of these adverse reactions occurred in 12% (24/200) of our respondents. The incidences of non-compliance included forgetfulness, clotting, and binge drinking. Seventy percent (140/200) of the participants were not familiar with the term "INR." The most frequent reference was blood

**Table 1:** Patient perceived complications of warfarin

Adverse effects	Frequency (n)	Percentage (%)
Bleeding	104	52
Bruising	62	31
Headache	22	11
Fatigue	6	3
GIT complications	2	1
Weight gain	2	1
Hair Loss	2	1
Total	200	100

\*GIT = Gastrointestinal.

**Table 2:** Patient perceived actions during bleeding

Actions	Frequency (n)	Percentage (%)
Consult a physician	66	46
Apply pressure	32	22
Apply bandage	18	13
Discontinue Warfarin	15	11
Other	12	8
Total	143	100

testing, at 69% (138/200). Increasing age was associated with a decreased awareness of INR ( $P = 0.005$ ). The mean time since the patients' last INR monitoring was 3.4 weeks (SD 3.31 weeks, 95% CI of 2.77–3.86 weeks). The mean number of times patients had their INR monitored in the past 6 months was 8.21 (SD 7.62).

Among the 67% (134/200) of patients with comorbid conditions, cardiovascular disease and diabetes were the highest (42% and 25%, respectively). Men had higher comorbidities ( $P = 0.026$ ) compared with women. Co-prescription of medications was present in 57% (114/200) of participants. "Anti-hypertensives" were the most common co-medications, followed by insulin (27% and 12%, respectively). Alcohol use with warfarin was considered permissible by 39% of participants; however, 29% did not know whether it was permissible, and 32% knew alcohol consumption was unsafe.

## Discussion

In our study, patient awareness of the many facets of taking warfarin was poor. An area of concern is their lack of understanding of what steps to take in case of bleeding, which can be fatal. Their lack of understanding of warfarin's adverse effects is also concerning. Only 42% of the patients knew of any possible adverse effects of warfarin. The most important adverse effects include hemorrhage and stroke (12). Patients are warned that normal adverse effects include easy bruising and hemorrhage (12). However, only 52% reported hemorrhage, and 31% listed bruising as a potential complication. Physicians therefore should take notice of these knowledge gaps and make a strong commitment to patient education regarding the risks of hemorrhage, stroke, and other symptoms that should prompt immediate medical attention.

An additional area of concern is that 56% of the patients did not know of any drug interactions with warfarin. Because many drugs, foods, and herbal remedies interact with warfarin, emphasis must be placed on these potential interactions. The avoidance of agents with clotting-inhibitory activity such as: aspirin (ASA) and nonsteroidal anti-inflammatory drugs (NSAIDs) are of particular importance and must be stressed to all patients (13,14). Remarkably, none of the respondents in this study mentioned the effect on warfarin regarding foods that are high in vitamin K (e.g. spinach, brussels sprouts, kale, beet greens, cooked collards). This may indicate that insufficient dietary consultation is given prior

to starting warfarin. Previous literature indicates potential interaction between warfarin and fruit juices, particularly cranberry and grapefruit, which may increase INR or hemorrhagic complications. These studies recommend that patients who are prescribed warfarin should avoid cranberry and grapefruit juice (15–20).

Studies show that anticoagulants are accountable for 7.9% of all adverse drug events, among which one third are considered preventable (21). Warfarin has also been estimated to cause 6.2% of emergency department admissions for adverse drug reactions (22). In our study, 27% of the respondents experienced complications, and 12% were hospitalised as a result of their treatment with warfarin. This is comparable with previous literature, which has shown hospitalisation rates of 3.5 per 100 patients per year (23). Previous literature indicates that monitoring the INR is the strongest prediction of warfarin activity (13). Assuming a basic level of comprehension, healthcare professionals commonly use the term "INR" when discussing warfarin anticoagulation with their patients. However, 70% of our patients did not understand what this term means.

Our study showed that 88% of the patients were compliant with their daily medication, and 65% kept a record of their INR, despite their lack of comprehension. Our study population had various co-morbidities and co-prescriptions and was an aging population, with a mean age of 69 years. This may affect the frequency of INR monitoring required.

## Limitations

This study had a modest number of patients, all of who were recruited at a single urban center. Therefore, our results need to be externally validated. Moreover, most of the variables in our study were self-reported. Because survey tools with psychometric properties were not validated, unintended biases from wording of questions may exist. Future studies should aim at using more objective methods—for example, reviewing patient records—to determine compliance, complications, and hospitalisation.

## Conclusion

Despite a high compliance level, patients' knowledge of warfarin and its related effects continue to be an area requiring further educational consideration, especially in the older-patient population. Having an awareness

of impending signs of hemorrhage can be lifesaving. Given the potential drug interactions and complexities involved with warfarin therapy, it is of high importance that medical professionals educate their patients and make them aware of any impending signs of emergent medical complications.

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## Conflict of Interest

None.

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## Authors' Contributions

Conception and design and final approval of the article: WS, HS

Analysis and interpretation of the data, provision of study materials or patient, and statistical expertise: WS

Drafting of the article: HI, RA

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Administrative, technical or logistic support: HI

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