

Safe and Effective Anticoagulation with Warfarin within One-year Time Period- Team Work of Healthcare Professionals

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ABSTRACT

Background: At the study site, Quality team found many incident reports of bleeding due to increased INR in patients on Warfarin anticoagulation therapy. These patients were unaware about adverse effects of anticoagulation therapy and drug-drug/food-drug interactions. Hence to ensure safety in anticoagulation with Warfarin, team of a Pharmacologist, Clinical Pharmacist and Quality manager decided to conduct a clinical audit to improve high alert medication safety with warfarin. **Materials and Methods:** After obtaining Institutional Ethics committee approval, clinical audit proposal form was submitted to the Clinical Audit Committee. Clinical Pharmacists took their clinical rounds to identify patients on anticoagulation with warfarin, asked for their consent in local language, reviewed their case files for data and interviewed them. Action plan was made based on the observations in gap analysis conducted from April-May 2018. Interventions were planned to improvise these standards and analysis continued monthly. Bilingual warfarin education leaflets were given to all patients on warfarin therapy. **Results:** Improved awareness on drug-drug and food-drug interactions was observed among the patients from 61.50% to 92.30% in one year. Increase in adherence of INR checking from 76.9% to 100% patients. ADRs to warfarin were recognized and action was taken to treat them within 24 hr by the end of one year of the study. **Conclusion:** Marked improvement was observed in the patients' awareness on drug-drug and food-drug interactions as well as INR monitoring, ADR reporting by clinicians and clinical interventions to prevent harm to the patient.

Keywords: Clinical Pharmacists, Audit, Warfarin, Interventions.

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INTRODUCTION

Warfarin is used as an oral anticoagulant in conditions like deep vein thrombosis and pulmonary embolism and to prevent stroke in patients who have atrial fibrillation, valvular heart disease or artificial valves. It is a drug with narrow safety margin, its pharmacokinetics and pharmacodynamics is affected by genetic variables, associated with many known drug-drug and drug-food interactions and regular monitoring of International Normalized Ratio (INR) is needed to provide safe and effective care for patients on warfarin.

In this University teaching hospital, Quality team found many incident reports of bleeding due to increased INR in patients on anti-coagulation therapy with Warfarin. After analysis it

was found that most of these patients were unaware about side effects of anticoagulation therapy and drug-drug/food-drug interactions. This led to wrong dietary lifestyle culminating in complications like mild to severe bleeding episodes.

According to rational pharmacotherapy principles, rational indication for warfarin should be mentioned by clinicians in the case files and patients should check their INR at prescribed intervals as per the physician's advice. Patients should have knowledge about the anticipated adverse drug reactions and drug-drug and drug-food interactions of warfarin. Action should be taken within 24 hr of recognition of adverse drug reaction to warfarin regarding its treatment. Maintaining INR in patients on oral anticoagulation with warfarin within the therapeutic range is a challenge for the physician to achieve maximal therapeutic benefit without encountering adverse effects in these patients.

There was a challenging situation in these patients on anticoagulation therapy with warfarin to prevent bleeding episodes which are at times are life threatening adverse events. Hence to ensure safety in anticoagulation with Warfarin, the



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team of a Pharmacologist, Clinical Pharmacist along with Quality manager decided to conduct a clinical audit to improve high alert medication safety with warfarin.

MATERIALS AND METHODS

After obtaining Institutional Ethics committee and Clinical Audit Committee approval from the tertiary care teaching hospital, audit criteria and measurable standards were set as follows:

- 100% Patients should have rational indication for Warfarin recorded.
- Have the adverse drug reactions or deranged INR of patients on warfarin recorded (Past/present/follow up).
- In 100% cases, action is taken within 24 hr after recognition of adverse drug reaction to warfarin.
- At least 90% patients check their INR at prescribed intervals by physician.
- At least 90% patients are educated regarding drug-drug and drug-food interactions of the medication.

To measure the standards, data collection checklist was formulated which included patient interview and consent form. Before implementation of this clinical audit, training of Clinical pharmacist was conducted on the audit process and medication related information like dose, indication, adverse drug reactions, drug-drug and food-drug interactions along with management of these aspects. It was decided that data will be collected on daily basis for in-patients and analysis to be done on monthly basis. All patients care areas were distributed amongst team of Clinical Pharmacists. Clinical pharmacists took their clinical rounds to identify in-patients on anticoagulation with warfarin and these patients were included in the clinical audit. Patient's consent was taken for the involvement in the study in local language and their case files were reviewed for rationality of indication for warfarin, correct dose, duration of therapy whether mentioned or not, drug-drug and food-drug interactions if any, prescribed intervals for checking INR and adverse drug reactions if encountered. Then

patients were interviewed for knowledge about the medication (warfarin), drug-drug and food-drug interactions, prescribed intervals for checking INR and adverse drug reactions with the drug. All this information was noted down in the data collection checklist form for individual patient.

After initial data collection, a gap analysis was done in the month of April-May 2018 to know the baseline situation of the clinical audit standards. Based on these findings, interventions like establishment of separate Clinical Pharmacy and Pharmacovigilance department and preparation of patient education leaflets (local language), Nutritionist advice, proper counselling for Warfarin details (drug information, drug-drug interactions, warning signs for adverse effects, importance and frequency of INR monitoring), were planned to improvise these standards and analysis continued monthly. This data was clubbed together for further months and presented quarterly in Clinical audit committee meetings till April 2019.

Statistical Analysis

Data was expressed as percentages and analysed using Epi Info software version 7.2. The audit criteria before and after intervention was compared by Chi square test and p value < 0.05 was considered statistically significant.

RESULTS

As safer and equi-effective options to warfarin are available, we did not get many case files for review, so total 13 case files were reviewed initially in April and May 2018 and we found 2 cases of bleeding as adverse reactions, 2 cases of increased INR and 4 cases of anticipated drug-drug interactions among these cases. Table 1 depicts the results of gap analysis performed for warfarin clinical audit where other than rational indication for prescribing warfarin, all other criteria were poorly met in patient care. Figure 1 explains the root cause analysis of the observations in gap analysis of the clinical audit considering man, method, material and miscellaneous factors responsible for the unmet criteria of Warfarin clinical audit.

Table 1: Gap analysis of Warfarin clinical audit at the study site.

	Process	Outcome	Outcome	Process	Outcome
Criteria	Patient should have the indication for Warfarin recorded.	Has the patient developed adverse drug reaction or deranged INR when on warfarin (Past/present/follow up).	Were ADRs recognized, action taken by hospital within 24 hr.	Patient should have their INR checked as prescribed intervals by physician.	Patient education given on Medication
Benchmark	100%	--	100%	90%	90%
Gap analysis ¹⁵ April to 14 th May 2018	100%	30.8%	76.9%	53.8%	61.5%

Table 2 shows the recommendation plan prepared for executing the progress of the Warfarin clinical audit to achieve the set criteria. The plan involved team work by Pharmacologist, Clinical Pharmacists and Clinicians in the study set-up.

Figure 2 shows increase in recognition and management of ADRs to warfarin within 24 hr of reporting ($p=0.05$). Among the total 84 cases reviewed during the study period, only 4 incident reports of

bleeding due to increased INR with Warfarin therapy were found. Adherence of INR checking in patients on Warfarin significantly increased from 53.8% to 100% patients ($p<0.001$). Patient's awareness about warfarin medication was significantly found to be increased from 61.5% to 100% ($p<0.01$) due to education on drug-drug and food-drug interactions through patient education leaflets.

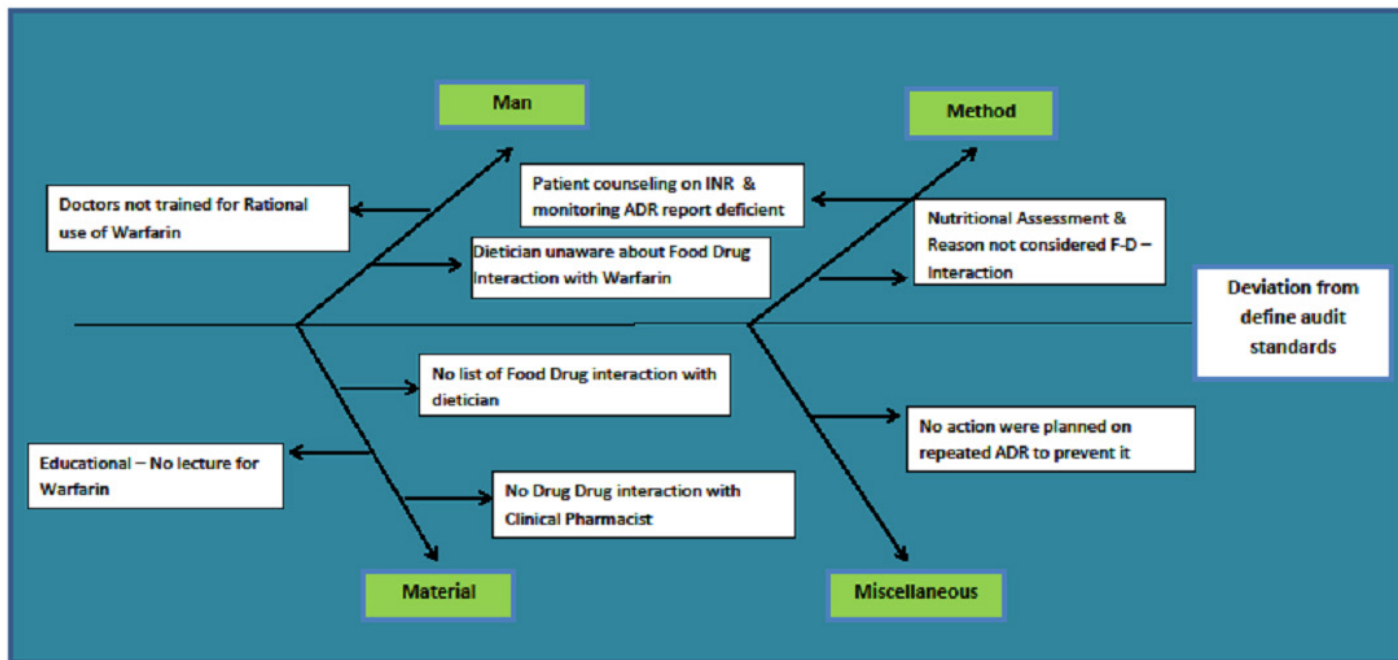


Figure 1: Fish bone diagram for Root Cause Analysis of Warfarin clinical audit gap analysis.

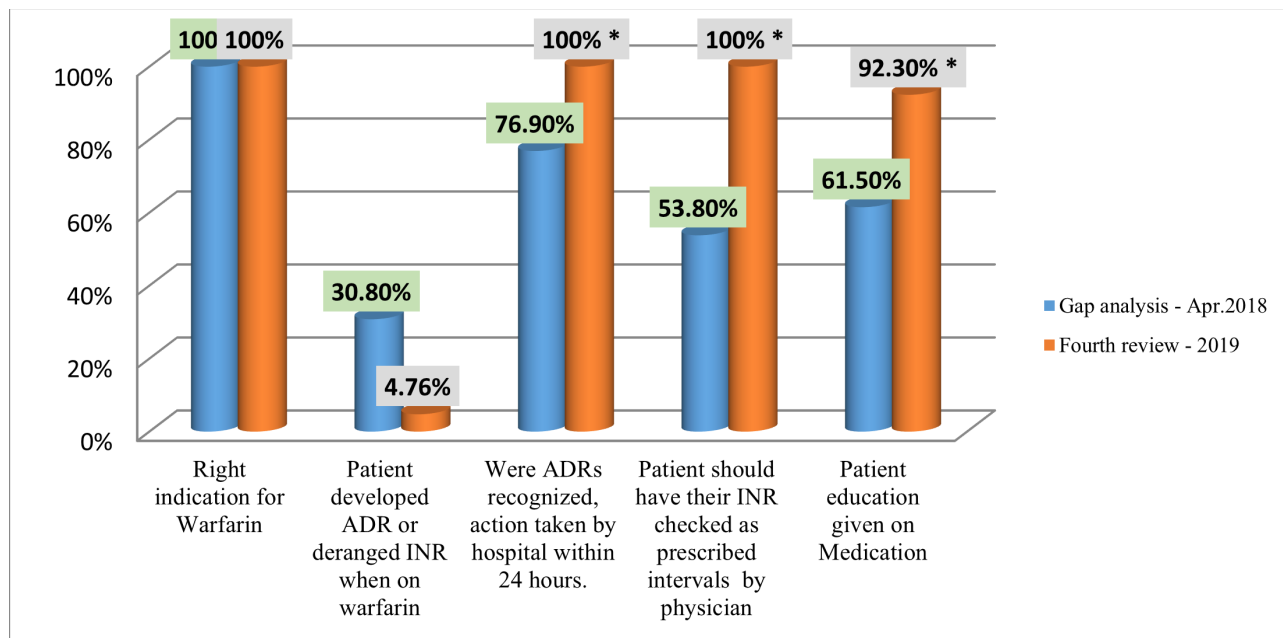


Figure 2: Comparative analysis of Warfarin clinical audit criteria before and after interventions. * $p<0.05$ after comparing values before and after intervention using Chi square test.

Table 2: Action plan prepared after gap analysis for Warfarin clinical audit at study site.

Sl. No.	Observation	Action plan	Responsibility
1	Clinicians not fully aware about rational use of warfarin.	Training of clinicians and residents.	Pharmacologist
2	Dietician unaware about food-drug interaction with warfarin.	To make food-drug interaction list and train Dieticians.	Pharmacologist
3	Patient counselling on INR monitoring and ADR reporting found deficient.	To provide counselling to patients based on the leaflet To strengthen clinical pharmacy department by establishing Department of Clinical Pharmacy and Pharmacovigilance.	Clinical Pharmacists and Clinicians
4	No structured patient educational material available in hospital.	To prepare bilingual patient education leaflet on Warfarin.	Clinical Pharmacists
5	Consideration to drug-drug interactions not done by Clinician while prescribing warfarin.	To make list of drug-drug interactions and train Clinicians.	Pharmacologist
6	Preventive action on repeated adverse drug reactions to warfarin not existing.	To improve clinician awareness about stringent monitoring of INR to prevent harm to the patient.	Pharmacologist

DISCUSSION

A team of Pharmacologist, Clinical Pharmacist along with Quality manager planned and conducted a clinical audit to improve high alert medication safety with warfarin in a tertiary care teaching hospital from April 2018 to April 2019. Majority of the patients were above 50 years of age and prescribed warfarin for deep vein thrombosis and cerebral venous sinus thrombosis in most of the cases while least common was atrial fibrillation. In contrast to this, study by Al Omari *et al.* and Tadesse *et al.* mention most common indications for Warfarin as aortic and mitral valves replacement and atrial fibrillation.

Even if the sample size (13 case files) was small for the initial review, warfarin being a high-risk medicine, needed to be prescribed rationally and the awareness as well as management of its adverse reactions to be streamlined for patient safety. Gap analysis (April-May 2018) during the study revealed that nearly 31% of the in-patients on Warfarin either had deranged INR or developed adverse effect of bleeding due to the drug which reduced to 4.7% within one-year period. Rational use of medicine not only includes prescribing it for right indication but also considers the follow up of laboratory parameters, informing patients about the frequency of monitoring, common adverse reactions, drug-drug and drug-food interactions and situations where patient needs to report back to the doctor for opinion. We a team of Pharmacologist, Clinical Pharmacist and Quality manager decided to include all these points for rational use of warfarin. Even if the Figure 2 shows that in gap analysis, 100% clinicians had prescribed warfarin for right indication, the case file review and patient interview revealed that doctors were not aware about the importance of INR monitoring and action to be taken in case of deranged INR. Also, patients were not counselled satisfactorily about INR monitoring, signs of adverse

drug reactions and drug interactions with warfarin. Education of patients on warfarin about importance of monitoring of INR significantly improved their adherence of INR checking from 53.8% to 100% patients ($p < 0.001$) within one-year study period. Study by Omari *et al.*⁴ also mentions the benefit of educational session and warfarin booklet given to patients that most of them reached their target INR within 8 weeks and did not need hospitalization or emergency visits during the study period of 9 months. Kagansky *et al.* also mentioned that better methods of oral anticoagulant therapy education may further reduce bleeding complications.

Patient's awareness about drug-drug and food-drug interactions also significantly improved from 61.5% to 100% ($p < 0.01$) by the end of one year due to the educational intervention and counselling by clinicians and dieticians. Clinicians as well as patients should understand that there are many drugs, herbs as well as food items which interfere with the action of warfarin and may result in increased risk of bleeding or thromboembolism and/or affect International Normalized Ratio (INR) reading due to the interaction with warfarin. Tan *et al.* in their systematic review have mentioned that most food items, herbs and supplements can be safely taken in moderate amount but healthcare professionals should be aware of the increased risk of bleeding with warfarin with several foods and herbs. Patients should inform about this anticoagulant therapy to any clinician who is consulted for other ailments and care should be taken to avoid self-medication. Kuruvilla *et al.* and Park *et al.* are also of the opinion that patient counselling for purpose and method of taking warfarin, its adverse effects and drug-drug and drug-food interactions is crucial but is not always optimized. Colet *et al.* conclude through their study that patients on warfarin therapy should be followed up properly and regularly for drug-drug interactions with the

aim of controlling adverse effects and also to promote a safe and effective anticoagulant therapy with warfarin.

CONCLUSION

At the study site, bilingual warfarin education leaflets are given to all patients on warfarin therapy by clinicians and patient counselling is done by clinical pharmacists during their clinical rounds. Marked improvement has been observed in the patients' awareness on drug-drug and food-drug interactions as well as INR monitoring; ADR reporting by clinicians and clinical intervention to prevent harm to the patient is also enhanced.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

INR: International Normalized Ratio; **ADR:** Adverse Drug Reaction.

SUMMARY

A clinical audit for safe and effective anticoagulation with warfarin was planned at a tertiary care teaching hospital by a team of Pharmacist, Clinical Pharmacist along with Quality manager. Criteria for audit were defined and measurable standards set before the initial data collection. Gap analysis revealed the reasons responsible for the unmet criteria of Warfarin clinical audit and

action plan was developed to improvise the process of warfarin anticoagulation. Interventions were planned and implemented and quarterly report of audit was presented in front of the audit committee. Team work by all healthcare professionals involved and designing and implementation of appropriate interventions improved the process of anticoagulation with warfarin to achieve the set criteria within one-year period.

REFERENCES

1. Wadhwa RK, Russell CE, Piazza G. Cardiology patient page. Warfarin versus novel oral anticoagulants: how to choose? *Circulation*. 2014;130(22):e191-3. doi: 10.1161/CIRCULATIONAHA.114.010426, PMID 25421049.
2. Ansell J, Hirsh J, Dalen J, Bussey H, Anderson D, Poller L, *et al.* Managing oral anticoagulant therapy. *Chest*. 2001; 119(1);Suppl:22S-38S. doi: 10.1378/chest.119.1_suppl.22s, PMID 11157641.
3. Hirsh J, Fuster V, Ansell J, Halperin JL, American Heart Association, American College of Cardiology Foundation. American Heart Association/American College of Cardiology Foundation guide to warfarin therapy. *Circulation*. 2003;107(12):1692-711. doi: 10.1161/01.CIR.0000063575.17904.4E, PMID 12668507.
4. Chopra S, Kakkar N. An audit of management of patients on oral anticoagulant therapy with international normalized ratio (INR) five or above. *Indian J Hematol Blood Transfus*. 2013;29(1):11-6. doi: 10.1007/s12288-011-0137-4, PMID 24426326.
5. Al-Omari NA, Al-Momany NH, Ibrahim DA, Ayesb RB, Al-Sarayreh HA, Al-Haqesh HS. An audit evaluating anticoagulation clinic managed by clinical pharmacists in Jordan. *Egypt J Hosp Med*. 2016;62(1):89-94.
6. Tadesse TA, Alebachew M, Woldu A. Prevalence of warfarin drug interaction and warfarin education practice in outpatient setups of university teaching hospital: a retrospective chart review and an observational study. *J Basic Clin Pharm*. 2019;10(1).
7. Kagansky N, Knobler H, Rimon E, Ozer Z, Levy S. Safety of anticoagulation therapy in well-informed older patients. *Arch Intern Med*. 2004;164(18):2044-50. doi: 10.1001/archinte.164.18.2044, PMID 15477441.
8. Tan CSS, Lee SWH. Warfarin and food, herbal or dietary supplement interactions: A systematic review. *Br J Clin Pharmacol*. 2021;87(2):352-74. doi: 10.1111/bcp.14404, PMID 32478963.
9. Kuruvilla M, Gurk-Turner C. A review of warfarin dosing and monitoring. *Med Cent Proc*. 2001;14(3):305-6. doi: 10.1080/08998280.2001.11927781, PMID 16369639.
10. Park S, Jang I. Factors affecting medication adherence in patients with mechanical heart valves taking warfarin: the role of knowledge on warfarin, medication belief, depression, and self-efficacy. *Int J Environ Res Public Health*. 2021;18(10):5214. doi: 10.3390/ijerph18105214, PMID 34068932.
11. Colet CD, Amador TA, Heineck I. Drug interactions and adverse events in a cohort of warfarin users attending public health clinics. *Int J Cardiovasc Sci*. 2018;32:110-7. doi: 10.5935/2359-4802.20180091.

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