VHA CPPO Pharmacy Benefits Management (PBM) Strong Practice Recommended Warfarin Management Algorithm (Maintenance Phase of Therapy)

Disclaimer: This algorithm is for ongoing management of warfarin. As with any algorithm or guideline, the final decision must always rest with the clinical judgment of the responsible provider.

Goal of INR 2.0-3.0

INR	Action
≤ 1.5	Increase weekly dose by 10-15%; repeat INR within 7 days.
1.51-1.79	If falling or low on two or more occasions, increase weekly dose by 5-10%; repeat INR in 7-14 days.
1.80-1.99	Consider not changing the dose unless a consistent pattern has been observed;[1] repeat INR in 7-14 days.
2.00-3.00 (in-range)	No change in dose. Follow-up within 28 days. If INR has been in-range 3X consecutively, follow-up within 42 days.[2]
3.01-3.20	Consider not changing the dose unless a consistent pattern has been observed;[1] repeat INR in 7-14 days.
3.21-3.69	Do not hold warfarin. If rising or high on two or more occasions, decrease weekly dose by 5-10%; repeat INR in 7-14 days.
3.70-4.99	Hold for 1 day and decrease weekly dose by 5-10%; repeat INR determination within 7 days.
5.00-9.99	Hold warfarin. Check INR within 5 days. When INR is therapeutic, restart at lower dose (decrease weekly dose by 10-15%). Check INR at least weekly until stable.
≥ 10.0 (without bleeding)	Hold warfarin and give oral vitamin K, 2.5 mg. Check INR at least weekly until stable.
Serious Bleeding Regardless of INR	Hold warfarin and refer patient to emergency department immediately.

Goal of INR 2.5-3.5

INR	Action
≤ 1.5	Increase weekly dose by 10-15%; repeat INR within 7 days.
1.51-1.99	If falling or low on two or more occasions, increase weekly dose by 10-15%; repeat INR in 7-14 days.
2.00-2.29	If falling or low on two or more occasions, increase weekly dose by 5-10%; repeat INR in 7-14 days.
2.30-2.49	Consider not changing the dose unless a consistent pattern has been observed;[1] repeat INR in 7-14 days.
2.50-3.50 (in-range)	No change in dose. Follow-up within 28 days. If INR has been in-range 3X consecutively, follow-up within 42 days.[2]
3.51-3.70	Consider not changing the dose unless a consistent pattern has been observed;[1] repeat INR in 7-14 days.
3.71-4.19	Do not hold warfarin. If rising or high on two or more occasions, decrease weekly dose by 5-10%; repeat INR in 7-14 days.
4.20-4.99	Hold for 1 day and decrease weekly dose by 5-10%; repeat INR determination within 7 days.
5.00-9.99	Hold warfarin. Check INR within 5 days. When INR is therapeutic, restart at lower dose (decrease weekly dose by 10-15%). Check INR at least weekly until stable.
≥ 10.0 (without bleeding)	Hold warfarin and give oral vitamin K, 2.5 mg. Check INR at least weekly until stable.

Serious Bleeding Regardless of INR	Hold warfarin and refer patient to emergency department immediately.

Disclaimer/Guide to Use: In a well-designed before and after trial, the use of this algorithm improved percent time in range (TTR) by 6%.[3] While clinicians will override these recommendations at times, they should keep in mind that when this algorithm was tested, patients whose management conformed most closely to the algorithm had the best TTR.

Additional Recommendation: In addition to this algorithm, ACC clinicians are urged to avoid non-standard target INR ranges such as 2-2.5 or 1.8-2.5. The 2012 CHEST Guidelines state that there should be two target ranges in clinical practice: 2.5-3.5 for patients with mitral prosthetic valves and 2-3 for everyone else.[4] In some instances, practitioners may chose a goal of 2.5-3.5 for patients with aortic prosthetic valves with additional risk factors. This is the recommendations from the most recent AHA guidelines and may be used at the recommendation of a referring provider.[5] Other target ranges do not provide additional benefit and place patients at higher risk, and should be avoided.

References
1.   Rose AJ, Ozonoff A, Berlowitz DR, Henault LE, Hylek EM. Warfarin dose management affects INR control. *J Thromb Haemost.* Jan 2009;7(1):94-101.
2.   Rose AJ, Ozonoff A, Berlowitz DR, Ash AS, Reisman JI, Hylek EM. Reexamining the recommended follow-up interval after obtaining an in-range international normalized ratio value: results from the Veterans Affairs study to improve anticoagulation. *Chest.* Aug 2011;140(2):359-365.
3.   Kim YK, Nieuwlaat R, Connolly SJ, et al. Effect of a simple two-step warfarin dosing algorithm on anticoagulant control as measured by time in therapeutic range: a pilot study. *J Thromb Haemost.* Jan 2010;8(1):101-106.
4.   Whitlock RP, Sun JC, Fremes SE, Rubens FD, Teoh KH. Antithrombotic and thrombolytic therapy for valvular disease: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. *Chest.* Feb 2012;141(2 Suppl):e576S-600S.
5.   Nishimura RA, Otto CM, Bonow RO, et al. 2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Circulation.* Jun 10 2014;129(23):e521-643.