

Management of Warfarin Therapy During Invasive Procedures and Surgery

Scope

This guideline describes the management of warfarin therapy when the patient requires medical or surgical procedures. It applies only to adults 19 years of age and over. A summary of this document in flow chart format appears in Appendix 1.

This is one of four related documents to be published concurrently. See also:

- *Initiation and Maintenance of Warfarin Therapy*
- *Treatment of Patients Overanticoagulated with Warfarin*
- *Warfarin: A Guide for Patients*

RECOMMENDATION 1: Urgent or emergent surgery/procedure

Whenever possible, surgery in a chronically anticoagulated patient should be undertaken on an elective basis to allow for planned anticoagulant reversal. However, in situations where an urgent or emergent surgery/procedure is required and warfarin reversal is indicated, proceed as follows:

a) Surgery/procedure to be done in < 24 hours:

Discontinue warfarin and administer intravenous vitamin K₁ or frozen plasma.

In extreme circumstances, other blood products such as recombinant factor VIIa or prothrombin complex concentrate could be considered upon specialist consultation. Monitor INR closely.

a) Surgery/procedure to be done in 24 - 96 hours:

Discontinue warfarin, administer vitamin K₁ (2-3 mg orally) and monitor INR every 8 to 24 hours.

RECOMMENDATION 2: Considerations for anesthesia: elective, urgent, or emergent surgery/procedure

- Local and general anesthesia can be safely administered to a patient on warfarin.
- Avoid intramuscular route.
- Neuraxial blocks, e.g. epidural analgesia and spinal anesthesia, should not be performed on patients on warfarin.
- If central venous access is needed, a compressible site is preferred.
- Nasogastric tube should be avoided.

RECOMMENDATION 3: Elective surgery/procedure – Determine bleeding risk

Assess the risk of bleeding from the procedure with the assistance of the anesthetist and surgeon.

- All major surgery or surgery in which a body cavity is entered should be considered high risk.
- Percutaneous needle procedures in non-compressible sites, including organ biopsies, should be considered high risk.
- Any type of prostatic surgery should be considered high risk.
- Surgery in sites where minor bleeding can cause significant morbidity should be considered high risk, e.g. central nervous system and some eye procedures.

Low risk of bleeding: Discontinuation of warfarin is not necessary.

Low risk procedures include percutaneous needle procedures in readily compressible sites (e.g. venous access), many skin procedures and routine dental procedures (hygiene, simple extractions, restorations, endodontics, prosthetics).⁴

High risk of bleeding: Proceed to Recommendation 4.

Note: If in doubt about the risk associated with a particular procedure, consult with the surgeon and anesthetist.

RECOMMENDATION 4: Elective surgery/procedure – Determine risk of thrombosis

Assess the risk of thrombosis from both pre-existing conditions and procedure, then proceed to Recommendation 5. Assess the risk of thrombosis from the procedure with the assistance of the anesthetist and surgeon.

Risk of Thrombosis from Pre-existing Conditions

Low risk conditions

- Newer model prosthetic aortic valves and any tissue valves.
- Atrial fibrillation without additional risk factors for stroke.
- DVT/PE occurring more than three months ago.
- Hypercoagulable state without recent thrombotic episode, recurrent thrombosis or history of life-threatening thrombosis.

High risk conditions

- Prosthetic mitral valve & old model aortic prosthesis (ball, Bjork-Shiley, Lillehei-Kaster).
- Atrial fibrillation plus, either a history of stroke or additional risk factors for stroke
- DVT/PE occurring within past three months.
- Hypercoagulable state with recent thrombotic episode, recurrent thrombosis or history of life-threatening thrombosis.

RECOMMENDATION 5:**Management based on risk of thrombosis****a) Low risk of thrombosis (including risk associated with procedure)**

1. Discontinue warfarin 5 days prior to surgery and ensure no inadvertent/ongoing use of aspirin
2. Check INR the day before procedure to ensure it adequately falls into the near-normal range (usually < 1.5). If INR > 1.5, discuss with practitioner performing procedure.
3. Restart warfarin at pre-op dose as soon as hemostasis assured or at the end of procedure-related anticoagulation.

b) High risk of thrombosis (including risk associated with procedure)

1. Discontinue warfarin at least 5 days prior to surgery and ensure no inadvertent/ongoing use of aspirin.
2. If indicated, start therapeutic dose of unfractionated heparin (UFH) or low molecular weight heparin (LMWH) 48 hours after discontinuing warfarin.
3. Check INR the day before procedure to ensure it adequately falls into the near-normal range (usually < 1.5).
4. Timing of the UFH infusion or last LMWH dose will depend on the type and amount of the specific agent and procedure-specific antithrombotic requirements.
5. In the absence of an indicated procedure-specific antithrombotic regimen, start therapeutic dose UFH or LMWH 12 hours after surgery/procedure provided hemostasis assured. Restart warfarin at pre-op dose as soon as hemostasis assured.
6. Maintain UFH/LMWH and warfarin overlap until the INR is in therapeutic range for two consecutive days.

Rationale

The management of warfarin therapy in patients undergoing surgery or other invasive procedures involves a fine balance between the risk of hemorrhage if the procedure were performed while on warfarin, and the risk of thrombosis if warfarin were discontinued. The thrombotic risk in perioperative patients depends on pre-existing conditions, the time since the last episode of thrombosis, and the thrombotic effect of surgery.¹⁻⁵

The risk of hemorrhage in the peri-operative period depends on the patient's age, associated medical conditions, the type of procedure, approach, site, expected amount of bleeding, type of incision and closure, and the method of administration of anesthesia and analgesia. The anesthetist and the surgeon should always be consulted in determining the hemorrhagic risk.

Preoperative management of warfarin therapy consists of timely discontinuation of warfarin and replacement with UFH or LMWH as necessary. Patients with a higher steady-state INR and the elderly will require a longer period of anticoagulation withdrawal before surgery. Almost all patients will achieve an INR of < 1.5 within 4-5 days of stopping warfarin.⁶ Patients with a high risk of thromboembolism require UFH or LMWH during this period, either as outpatients (subcutaneously) or inpatient (intravenously).

Postoperative management of warfarin therapy consists of reinitiation of anticoagulation. Postoperative anticoagulation increases the rate of major bleeding by approximately 3%.¹ Restarting the anticoagulant therapy may be delayed in neurosurgical patients or in patients who are bleeding. For patients at high risk of thrombosis, either UFH by infusion or LMWH by injection is given concurrently with warfarin and the overlap is maintained for two days after a therapeutic INR has been reached. LMWH used postoperatively may allow earlier discharge of the patient.

If urgent or emergent procedures are to be undertaken in < 4-5 days and warfarin reversal is required, it may be satisfactory to give 1-3 mg of Vitamin K₁ orally in order to reverse the effect of warfarin. When reversal of anticoagulation is more urgent, intravenous Vitamin K₁, recombinant factor VIIa⁷ and the administration of frozen plasma may be required.

Issues related to anesthesia include type of anesthesia, site of administration, and other invasive procedures related to anesthesia. Most anesthetics do not interact with warfarin. Needling procedures involving high risk (especially CNS) or noncompressible sites, should be avoided in the anticoagulated patient.⁴

References

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Sponsors

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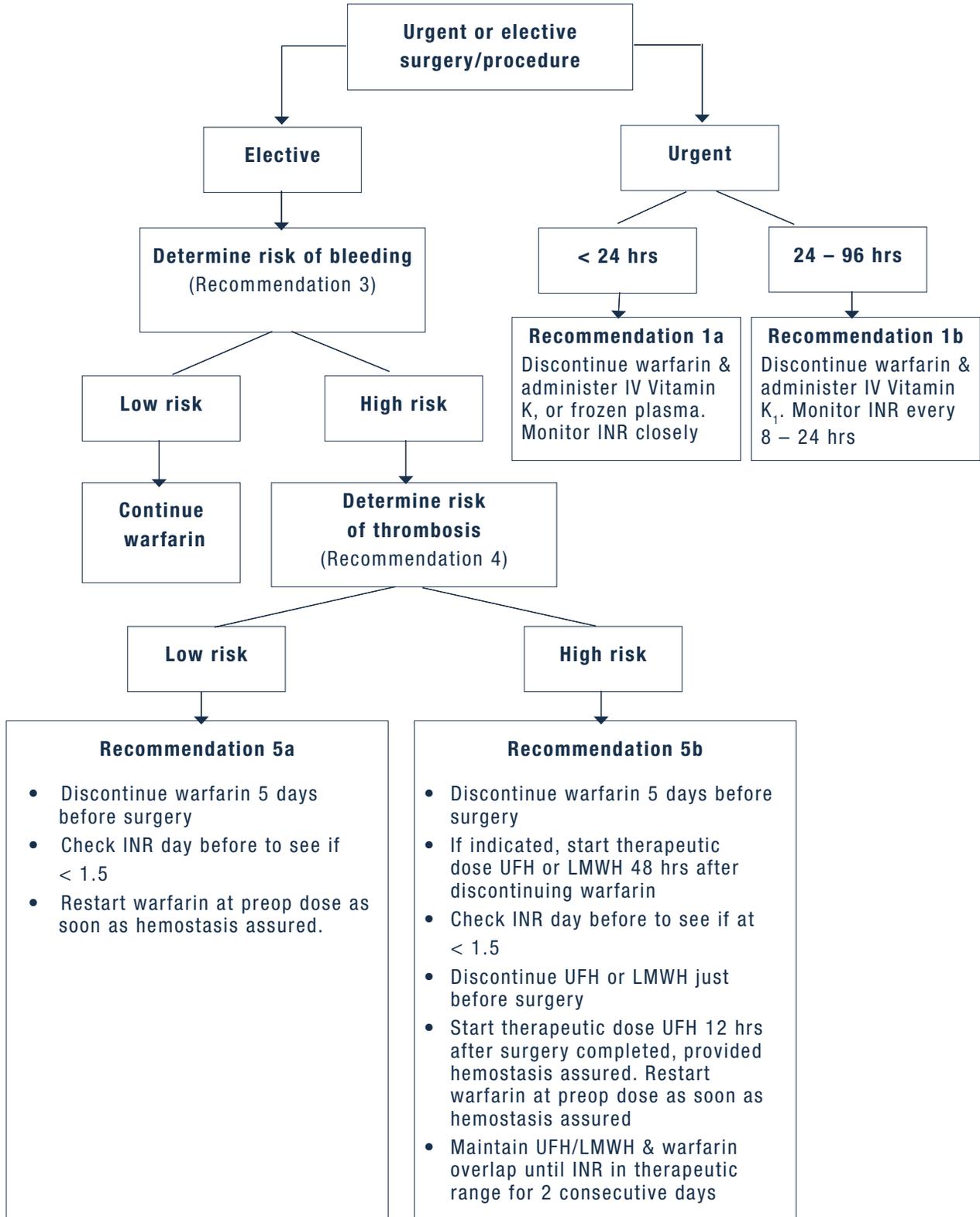
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Appendix 1: Management of Warfarin Therapy During Invasive Procedures and Surgery*



*See Recommendation 2 for anesthesia considerations