

## WARFARIN: PERI-OPERATIVE MANAGEMENT



Thrombosis Canada

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### OBJECTIVE:

- To provide an approach to the perioperative management of warfarin-treated patients who require an elective or urgent surgery/procedure.
- To provide an approach for bridging anticoagulation, if needed, during warfarin interruption.

### BACKGROUND:

Bridging anticoagulation refers to giving a short-acting anticoagulant, typically a low molecular weight heparin (LMWH), before and after surgery or invasive procedure to minimize the time that warfarin-treated patients are not anticoagulated. This is different from providing routine thromboprophylaxis in the post-operative setting.

### INDICATIONS FOR BRIDGING ANTICOAGULATION:

There are no strong evidence-based indications for bridging anticoagulation; bridging is suggested in patients at high risk for thromboembolism, not suggested in low-risk patients and optional in intermediate-risk patients based on individual patient characteristics.

### BRIDGING ANTICOAGULATION OPTIONS:

Pre- and post-operative dosing:

- Subcutaneous (SC) therapeutic-dose LMWH: enoxaparin 1 mg/kg twice daily or 1.5 mg/kg once daily; dalteparin 100 IU/kg twice daily or 200 IU/kg once daily; or tinzaparin 175 IU/kg once daily.
- Intravenous (IV) unfractionated heparin (UFH) to achieve a therapeutic activated partial thromboplastin time (aPTT) defined according to local laboratory parameters is not commonly used.

Alternative post-operative dosing:

- In patients having a high-bleeding-risk surgery/procedure, an alternate post-operative management option is a prophylactic dose of SC LMWH: enoxaparin 40 mg once daily; dalteparin 5000 IU once daily; or tinzaparin 4500 IU once daily.
- In patients having a very-high-bleeding-risk surgery/procedure, post-operative therapeutic-dose LMWH bridging should be avoided; alternate options are low-dose LMWH, delaying anticoagulation until the high bleeding risk decreases or resuming warfarin alone.

### MONITORING:

There is no need for laboratory monitoring with SC LMWH bridging. Monitoring of the aPTT is required for bridging with IV UFH.

## ADVERSE EFFECTS:

Bridging is associated with a 3% risk for major bleeding and a 10-15% risk for minor bleeding. Bridging should be used carefully to minimize this bleeding risk.

## PERI-PROCEDURE MANAGEMENT QUESTIONS AND ANSWERS:

### Is peri-procedure warfarin interruption always needed?

Deciding if warfarin interruption is needed is based on the bleeding risk of the surgery/procedure (see **Table 1**). Most major procedures require warfarin interruption but minor procedures (e.g. dental, cataract surgery, minor skin procedures) do not need warfarin interruption.

### TABLE 1. PATIENT STRATIFICATION FOR BLEEDING RISK

#### HIGH:

- Any procedure involving neuraxial anesthesia
- Neurosurgery (intracranial or spinal surgery)
- Cardiac surgery (e.g. CABG, heart valve replacement)
- Major vascular surgery (e.g. aortic aneurysm repair, aortofemoral bypass)
- Major urological surgery (e.g. prostatectomy, bladder tumour resection)
- Major lower limb orthopaedic surgery (e.g. hip/knee joint replacement surgery)
- Lung resection surgery
- Intestinal anastomosis surgery
- Selected procedures (e.g. kidney biopsy, prostate biopsy, cervical cone biopsy, pericardiocentesis, colonic polypectomy)
- Major intra-abdominal surgery
- Extensive cancer surgery (eg, pancreas, liver)
- Reconstructive plastic surgery

#### MODERATE:

- Other intra-abdominal surgery (eg, laparoscopic cholecystectomy, hernia repair)
- Other intrathoracic surgery (eg, breast)
- Other orthopaedic surgery
- Other vascular surgery
- Laparoscopic cholecystectomy
- Laparoscopic inguinal hernia repair
- Other dermatologic procedures
- Non-cataract ophthalmologic procedures
- Coronary angiography

- Gastroscopy or colonoscopy with biopsies
- Selected procedures (e.g. bone marrow biopsy, lymph node biopsy, thoracentesis, paracentesis, arthrocentesis)
- Complex dental procedure (eg, multiple tooth extractions)

**LOW (NON-DENTAL):**

- Minor eye procedure (cataract extraction)
- Minor dermatologic procedure (eg. biopsy)
- Gastroscopy or colonoscopy without biopsies
- Coronary angiography
- Permanent pacemaker insertion or internal defibrillator placement (if bridging anticoagulation is not used)
- Selected procedures (eg, thoracentesis, paracentesis, arthrocentesis)

**LOW (DENTAL):**

- Up to 2 tooth extractions
- Biopsies
- Peridontal surgery
- Root canal
- Subgingival scaling

**Is bridging anticoagulation needed during warfarin interruption?**

The need for bridging is driven by patients' estimated risk for thromboembolism (see **Table 2**).

**TABLE 2. PATIENT STRATIFICATION FOR THROMBOEMBOLISM RISK**

**HIGH THROMBOEMBOLIC RISK (*BRIDGING ANTICOAGULATION SUGGESTED*):**

- any mechanical prosthetic mitral valve
- older generation (cage-ball, tilting disc) mechanical aortic valve
- chronic atrial fibrillation (valvular or non-valvular) with a CHADS<sub>2</sub> score\* of 4-6
- recent (within 3 months) arterial thromboembolism (stroke, systemic embolism, transient ischemic attack [TIA])
- recent (within 3 months) venous thromboembolism (deep vein thrombosis, pulmonary embolism)†
- prior arterial or venous thromboembolism during appropriate interruption of warfarin
- severe thrombophilia with history of venous thromboembolism (e.g. deficiency of protein C, protein S or antithrombin, antiphospholipid syndrome)
- rheumatic valvular heart disease

**INTERMEDIATE THROMBOEMBOLIC RISK (BRIDGING ANTICOAGULATION OPTIONAL AND BASED ON INDIVIDUAL PATIENT CHARACTERISTICS):**

- newer generation (bileaflet) mechanical aortic valve
- prior arterial or venous thromboembolism within last 3-12 months

**LOW-RISK (BRIDGING ANTICOAGULATION IS NOT RECOMMENDED):**

- chronic atrial fibrillation (valvular or non-valvular) with a CHADS<sub>2</sub> score\* of 0-3
- prior venous thromboembolism over 12 months ago
- bioprosthetic heart valve

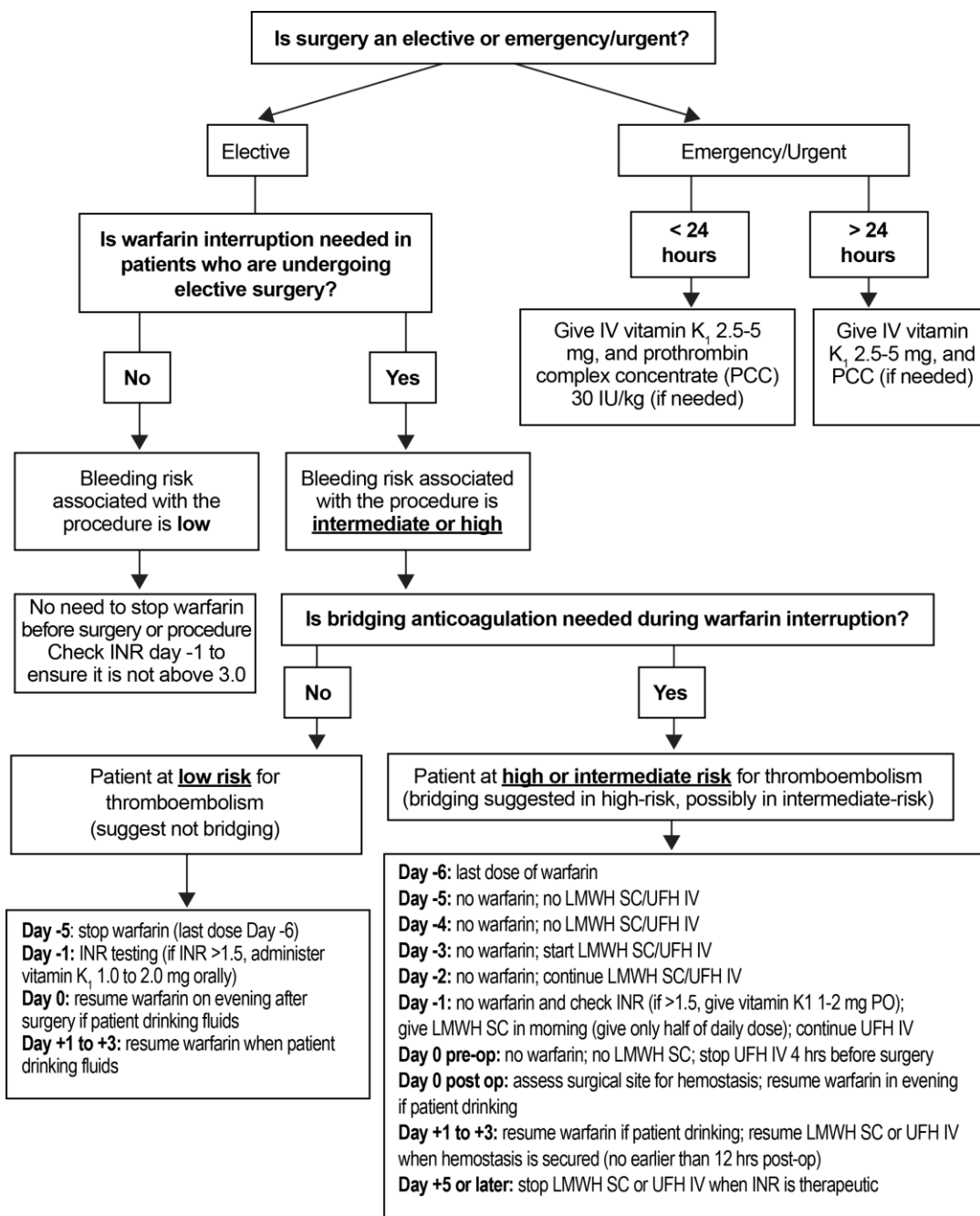
\*CHADS<sub>2</sub> score estimates the risk of stroke in patients with non-valvular atrial fibrillation. The score is the total points for the presence of congestive heart failure (1), hypertension (1), age  $\geq$  75 yrs (1), diabetes (1), stroke, transient ischemic attack or systemic embolism (2).

†Consider a temporary inferior vena cava filter to be inserted after warfarin interruption and prior to surgery for patients in whom surgery is necessary within 1 month of a proximal DVT; filter can be left *in situ* for 1-2 weeks until therapeutic anticoagulation is re-established. Elective surgery within 3 months after a diagnosis of deep vein thrombosis or pulmonary embolism should generally be avoided.

**What is the peri-operative anticoagulant management after warfarin interruption?**

A suggested management algorithm is shown in the **Figure below**.

**FIGURE. PERI-OPERATIVE MANAGEMENT OF WARFARIN-TREATED PATIENTS BEFORE AND AFTER SURGERY/PROCEDURE**



**When is it safe to resume bridging anticoagulation after surgery/procedure?**

The timing of post-procedure resumption of bridging depends on:

- a) the bleeding risk of the procedure (see **Table 1**),
- b) whether there has been adequate post-operative hemostasis (based on wound inspection and drainage tubes to detect bleeding), and

c) the class of anticoagulant used.

Minimizing bleeding is important because of associated morbidity; a delay in warfarin resumption because of bleeding also exposes patients to an increased thromboembolic risk.

### TABLE 3. POST-OPERATIVE RESUMPTION OF BRIDGING ANTICOAGULATION

Resumption of therapeutic doses of any anticoagulant should not occur earlier than the time periods suggested below.

#### LOW BLEEDING RISK PROCEDURE:

- therapeutic-dose LMWH/UFH, starting 12-24 hours after surgery (i.e. day after surgery)

#### MODERATE BLEEDING RISK PROCEDURE:

- therapeutic-dose LMWH/UFH, starting 24-48 hours after surgery

#### HIGH BLEEDING RISK PROCEDURE:

- therapeutic-dose LMWH/UFH, starting 48-72 hours after surgery
- *alternate management*: low-dose LMWH, starting 12-24 hours after surgery (i.e. day after surgery) or resume warfarin alone with no post-operative LMWH/UFH

### SPECIAL CONSIDERATIONS:

**Dental procedures:** In patients having 1-2 dental extractions or endodontic (root canal) procedures, warfarin can be safely continued. To reduce the incidence of gingival bleeding, patients can take oral tranexamic acid mouthwash (5 mL just before the procedure, and 2-3 times daily after the procedure until bleeding subsides).

**Eye procedures:** In patients having a cataract extraction, especially if done with topical and not retrobulbar anesthesia, warfarin can be safely continued. For other eye procedures, warfarin is generally interrupted but consultation with an ophthalmologist is advised.

**Colonoscopy & gastroscopy:** Warfarin interruption will be needed for most patients who undergo colonoscopy because the potential for biopsies and/or polyp removal cannot always be determined beforehand. Caution is warranted after removal of large (>1 cm) polyps since bleeding can occur 2-7 days after polypectomy due to dislodgement of eschar. Polyp-related bleeding may be reduced with endoscopic application of clips to the polyp stalk.

**Diagnostic or other procedures:** Caution is warranted with anticoagulation after selected diagnostic tests (e.g. biopsy of kidney, liver or prostate; endoscopic retrograde cholangiopancreatography [ERCP] with sphincterotomy) or minor surgeries (e.g. pacemaker placement) when excessive bleeding can lead to serious complications.

#### Peri-operative management of patients receiving antiplatelet therapy:

Please see the specific guides on ASA, clopidogrel, ticagrelor, and prasugrel, as well as the 2012 Canadian Cardiovascular Society Guidelines on Antiplatelet Therapy, which discusses peri-operative management [[www.ccsguidelineprograms.ca/](http://www.ccsguidelineprograms.ca/)].

**Pediatrics:** Pediatricians with expertise in thromboembolism should manage, where possible, pediatric patients on warfarin. Adult guidelines are appropriate in children although holding warfarin 3 days instead of 5 days is usually sufficient. Consultation with an experienced pediatric hematologist and cardiologist (as appropriate) is recommended to determine the need for bridging anticoagulation.

**OTHER RELEVANT THROMBOSIS CANADA CLINICAL GUIDES:**

- Warfarin
- Unfractionated Heparin, Low Molecular Weight Heparin and Fondaparinux

**REFERENCES:**

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**Date of version:** 2017May24

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