

SMDC Disease Management Guidelines
Anticoagulation Bridging Guidelines for Patients on Long-Term Warfarin
Anticoagulation

by Michael P. Gulseth, Pharm. D., BCPS
Sarah M. Westberg, Pharm.D., BCPS

Background

It is a frequent occurrence that patients who are on long-term warfarin therapy will need a temporary discontinuation of therapy to facilitate invasive procedures. Literature recently published on this subject give us some new guidance on how this should be done.

Which Patients Should Receive Bridging Therapy?

A frequent misconception is that all patients who have sub-therapeutic INRs need anticoagulation bridge therapy. On the other hand, it is also common for clinicians not to bridge any patients who take warfarin to prevent strokes from atrial fibrillation. Neither, of these types of “cookbook” approaches are appropriate when deciding whether to use or not to use bridge therapy. On the contrary, clinicians must weigh the risk of bridge therapy (bleeding) versus the risk of thrombosis and its potentially devastating consequences for each patient. In other words, the patient must be treated as an individual, not as a population.

The following tables are meant to offer some guidance to clinicians to accomplish this difficult task. The charts help identify which patient should be bridged and how they should be bridged. They are derived from other health-system recommendations that have been published in the literature. **Please note these are guidelines only and it is quite possible and likely that deviation from these guidelines may be necessary and appropriate when caring for an individual patient. Please also note these guidelines are NOT for use for patients undergoing cardiac surgery or patients who have had cardiac surgery in the previous 7 days. If the patient’s procedure will be at Saint Mary’s Medical Center or Miller Dwan Medical Center, please call 218-786-4097 to notify the Department of Pharmacy so they can help assure continuity of care. Please leave a message with the patient name, date of birth, and surgery date.**

Table 1. Guidelines for Perioperative Management of Patients with Noncardiac Disease Who Receive Oral Anticoagulation

Acute Episode	Before Surgery	After Surgery ^g
Venous thromboembolism ^a		
Within 2 wks	Consider retrievable IVC filter ^b + IV UFH ^c	Consider retrievable IVC filter ^b + IV UFH ^c
Within 1 mo	IV UFH ^c	IV UFH ^c
Within 2-3 mo		
High risk ^d	IV UFH ^c	IV UFH ^c
Moderate risk ^e	IV UFH ^c or Enoxaparin 1 mg/kg sc bid or Enoxaparin 1.5 mg/kg sc daily	IV UFH ^c or Enoxaparin 1 mg/kg sc bid or Enoxaparin 1.5 mg/kg sc daily
Low risk ^f	None	IV UFH ^c or Enoxaparin 1 mg/kg sc bid or Enoxaparin 1.5 mg/kg sc daily
> 3 months	None	sc UFH 5000 units q 8 or 12 hours or Enoxaparin 40 mg sc daily or 30 mg sc bid +/- GPS or IPS
Arterial thromboembolism ^a		
Within 1 mo	IV UFH	IV UFH ^c , only if low bleeding risk
> 1 mo	None	sc UFH 5000 units q 8 or 12 hours or Enoxaparin 40 mg sc daily or 30 mg sc bid +/- GPS or IPS
IVC = inferior vena cava; UFH = unfractionated heparin; GPS = graduated compression stockings; IPS = intermittent pneumatic compression		
^a Elective surgery should be avoided in the first month after a venous or arterial thromboembolic event.		
^b Consider IVC filter also if risk of perioperative bleeding with IV UFH is high during the first month of acute thromboembolic episode; call radiology for all IVC filter questions		
^c IV Heparin per standard SMDC inpatient infusion orders		
^d High risk indicates patients with multiple episodes of venous thromboembolism, a hereditary or acquired hypercoagulable state, or active cancer.		
^e Moderate risk indicates patients with other risk factors for thromboembolism (e. g., chronic heart failure, renal failure, acute illness.)		
^f Low risk indicates all other patients		
^g Post-operative anticoagulation should not be started until 12-24 hours after the procedure when hemostasis is achieved when bleeding risk is low. In contrast, if the bleeding risk of the procedure is felt to be high (ie craniotomy, spinal surgery, partial organ removals, etc.), consideration should be given to administering reduced doses of LMWH or UFH or holding therapy until the bleeding risk subsides. It is strongly recommended to discuss the appropriate time to restart therapy with the surgeon.		

Table 2. Guidelines for Perioperative Management of Patients with Cardiac Disease Who Receive Oral Anticoagulation

Disease	Before Surgery	After Surgery ^c
Atrial Fibrillation		
High Risk ^a	IV UFH or Enoxaparin 1 mg/kg sc bid	IV UFH or Enoxaparin 1 mg/kg sc bid
Low Risk ^b	None	sc UFH 5000 units q 8 or 12 hours or Enoxaparin 40 mg sc daily or 30 mg sc bid +/- GPS or IPS
Heart Valves		
Mechanical prosthesis		
Caged-ball, any position	IV UFH or Enoxaparin 1 mg/kg sc bid	IV UFH or Enoxaparin 1 mg/kg sc bid
Mitral valve position	IV UFH or Enoxaparin 1 mg/kg sc bid	IV UFH or Enoxaparin 1 mg/kg sc bid
Mitral and aortic valves	IV UFH or Enoxaparin 1 mg/kg sc bid	IV UFH or Enoxaparin 1 mg/kg sc bid
Aortic position with LVD	IV UFH or Enoxaparin 1 mg/kg sc bid	IV UFH or Enoxaparin 1 mg/kg sc bid
Aortic position with atrial fibrillation	IV UFH or Enoxaparin 1 mg/kg sc bid	IV UFH or Enoxaparin 1 mg/kg sc bid
Aortic position in NSR, no LVD, and left atrium is of normal size	None or IV UFH or Enoxaparin 1 mg/kg sc bid	None or IV UFH or Enoxaparin 1 mg/kg sc bid
Bioprosthesis (either position)	None	sc UFH 5000 units q 8 or 12 hours or Enoxaparin 40 mg sc daily or 30 mg sc bid +/- GPS or IPS
With associated atrial fibrillation	IV UFH or Enoxaparin 1 mg/kg sc bid	IV UFH or Enoxaparin 1 mg/kg sc bid
UFH = unfractionated heparin; GPS = graduated compression stockings; IPS = intermittent pneumatic compression; LVD = left ventricular dysfunction		
^a High risk indicates patients with severe LVD (ejection fraction < 25%), clinically significant rheumatic heart disease, previous thromboembolic events within 6 months, status post cardioversion, or severe left atrial enlargement		
^b Low risk includes all other patients		
^c Post-operative anticoagulation should not be started until 12-24 hours after the procedure when hemostasis is achieved when bleeding risk is low. In contrast, if the bleeding risk of the procedure is felt to be high (ie craniotomy, spinal surgery, partial organ removals, etc.), consideration should be given to administering reduced doses of LMWH or UFH or holding therapy until the bleeding risk subsides. It is strongly recommended to discuss the appropriate time to restart therapy with the surgeon.		

Table 3

Other Considerations
<p>Enoxaparin needs to be dose adjusted for estimated creatinine clearance (CrCl) < 30 ml/min to 1 mg/kg sc daily or unfractionated heparin should be used. To estimate CrCl from serum creatinine (SrCr):</p> <ol style="list-style-type: none">1. Estimate lean body weight (LBW). Men→$50 + 2.3 (\text{inches} > \text{in height than } 60) = \text{LBW}$; Women →$45.5 + 2.3 (\text{inches} > \text{in height than } 60) = \text{LBW}$2. Estimate clearance. Men→$[(140 - \text{age}) \text{LBW}] / [(72)(\text{SrCr}^*)] = \text{CrCl}$; Women→$(\text{Men's result})(0.85) = \text{CrCl}$3. Call a pharmacist at St. Mary's Medical Center if you need assistance with this calculation (218-786-4501) <p>*In patients older than 65, use 1 for SrCr if it is < 1 to avoid overestimating clearance.</p>
<p>Heparin may also be used subcutaneous in therapeutic doses, but aPTTs need to be drawn and the dose adjusted based on these results. A typical dose would be 500 units/kilogram/day in three divided doses with aPPT checked 4-6 hours after each dose and then daily when in range. The therapeutic aPPT range depends on the lab; check with the lab for their recommended range. Please call hematology/oncology for assistance with these patients.</p>
<p>Heparin and low molecular weight heparin should NOT be used for bridging patients with a history of heparin-induced thrombocytopenia. Please call hematology/oncology for specific recommendations in these patients.</p>
<p>According to the American Society of Regional Anesthesia, "Indwelling (spinal) catheters should be removed prior to initiation of LMWH thromboprophylaxis." Prophylactic doses of heparin are considered compatible with neuraxial analgesia.</p>

Dosing Schedules Relative to Surgery (these guidelines are not intended for cardiac surgery or patients who have had cardiac surgery in the previous 7 days)

Once patient is classified into a risk group and their bridging therapy of choice is decided, it is time to determine the dosing schedule.

If a patient is on aspirin therapy, it should be discontinued 7 days before the surgery, and warfarin should then be discontinued 4-5 days prior. An INR should be checked 24 to 48 hours after the warfarin is stopped, and prior to starting the LMWH or UFH. From this INR, clinicians will be able to estimate when the INR will start to be subtherapeutic. This will likely be 2 or 3 days prior to surgery, and the LMWH or UFH should be started at that time, according to the appropriate therapeutic doses listed in the table above. If it is difficult to predict when the INR will be low, a daily INR should be checked to determine the start date of LMWH or UFH.

One day prior to surgery, the INR should be checked. If it is still >1.5 , vitamin K may need to be administered to reverse the anticoagulant effects. Please refer to the Warfarin Reversal Guidelines on the SMDC intranet for dosing guidelines of vitamin K.

If patient is receiving enoxaparin as an outpatient, the patient should administer the last dose 12-24 hours (24 hours for 1.5 mg/kg enoxaparin dose) prior to surgery. If the surgery is scheduled for early morning, the evening dose the day prior should be held. If patient is receiving UFH as an inpatient, the heparin should be discontinued 5 hours prior to surgery.

After surgery, if patient has achieved adequate hemostasis, warfarin should be restarted the evening after surgery at the patient's previously determined maintenance dose. If the bleeding risk is low, LMWH or UFH should be restarted at the dose provided above at 12-24 hours after surgery if hemostasis is achieved. **However, if the bleeding risk of the procedure is high, consideration should be given to administering reduced doses of LMWH or UFH or holding therapy until the bleeding risk subsides.** LMWH or UFH should be discontinued when INR is >2.0 for at least 2 days.

Table 4: Timeline for dosing of warfarin and enoxaparin in relationship to surgery

Timeline	Treatment action
7 days prior to surgery	Stop aspirin or other antiplatelets (clopidogrel, ticlopidine, etc)
4-5 days prior to surgery	Stop warfarin
24 to 48 hours after stopping warfarin	Check INR
2-3 days prior to surgery (or when INR is sub-therapeutic)	Start enoxaparin or UFH at appropriate dose
1 day prior to surgery	Give last pre-op enoxaparin dose 12-24 (24 hours for 1.5 mg/kg enoxaparin dose) hours prior to surgery (patients with morning surgeries will need to hold their evening dose the night before), or stop UFH at least 5 hours prior to surgery. INR should be checked to determine if vitamin K will need to be given
Surgery Day	INR should be re-checked if it was above surgery goal the day prior. Start warfarin in the evening at maintenance dose, if hemodynamically stable
1 day after surgery	Start enoxaparin or UFH dosing 12-24 hours after surgery, if bleeding risk is low. In contrast, if the bleeding risk of the procedure is felt to be high (ie craniotomy, spinal surgery, partial organ removals, etc.), consideration should be given to administering reduced doses of LMWH or UFH or holding therapy until the bleeding risk subsides. It is strongly recommended to discuss the appropriate time to restart therapy with the surgeon.
5-6 days after surgery	Stop enoxaparin or UFH after INR is >2 for 2 days.

References:

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