

High Bleeding Risk Procedures for High Thromboembolic Risk Patients – Bridging

Table 1: Recommended Bridging Schedule

Please be aware that this schedule is not FDA-approved and there are no randomized controlled trials that have studied the efficacy of this schedule. An individual's history of thromboembolism will assist with the decision-making. In general, plan to skip 4

Days Before Procedure	Warfarin	INR	LMWH * or Therapeutic UFH
5 days prior to procedure	Last dose	Check if not done within 2 weeks prior	4-5 days before procedure, start after first missed warfarin dose
4 days prior to procedure	None	None	4-5 days before procedure, start after first missed warfarin dose
3 days prior to procedure	None	None	AM and PM dose
2 days prior to procedure	None	None	AM and PM dose
1 day prior to procedure	None	Check INR 1-2.5 mg by mouth Vit K as needed if INR greater than 1.5	AM dose only – at least 18 hours between dose and procedure
Procedure	Resume at regular dose that evening	None	Start at least 12 hours post procedure – see Annotation#19 of guideline
1 day after procedure	Regular dose	As indicated – may be skipped	Restart if hemostasis achieved
2 days after procedure	Regular dose	As indicated	Restart if hemostasis achieved
3 days after procedure	Regular dose	As indicated	Continue until INR greater than minimum acceptable x 2day
4 days after procedure	Regular dose	Daily until INR greater than 2.0 then as indicated	Discontinue

If enoxaparin (Lovenox®) is used as the LMWH, dosing is every 12 hours (a.m. and p.m.) once-a-day dosing is used if the LMWH is tinzaparin (Innohep®) or dalteparin (Fragmin®).

*Perioperative Management of Antiplatelet Agents

Patients receiving anti-platelet agents should have these agents stopped 2-10 days prior to a procedure:

- Plavix 7 days prior to surgery
- ASA 7-10 days prior to surgery
- Ibuprofen 2 days prior to surgery
- Pletal 5 days prior to surgery

Perioperative Anticoagulation (Including Bridging)

Patient Thromboembolic Risk	Procedure Bleeding Risk	Perioperative Anticoagulation
Low	Low	Continue Coumadin
Low	High	Hold Coumadin 4 days prior to procedure (see Table 1)
High	Low	Continue Coumadin
High	High	Bridging Required

Risk of Thrombotic Complications in the Absence of Anticoagulation Therapy

Condition Risk*	%Thrombotic
Atrial Fibrillation (lone)	1
Atrial Fibrillation (average risk)	5
Atrial Fibrillation (high risk)	12
Aortic Valve Prosthesis (dual-leaflet – St. Jude)	10-12
Aortic Valve Prosthesis (single-leaflet – Bjork-Shiley)	23
Mitral Valve Prosthesis (dual-leaflet – St. Jude)	22
Multiple Prosthesis (St. Jude)	91

*Annualized

*Low Bleeding Risk Procedures

For dental procedures, a review of the literature has shown that in most cases no change in warfarin is needed. It may be reasonable to allow the patient to "drift" to the lowest effective INR prior to a dental procedure. Local bleeding may be controlled with a variety of techniques including pressure, biting on tea bags, gelatin sponges and topical thrombin. Other means of local hemostasis control include tranexamic acid mouthwash or epsilon aminocaproic acid packing. Other examples of procedures with low bleeding risk include skin biopsies and cataract surgery. Patients who have procedures that are of low bleeding risk can be continued on warfarin anticoagulation without interruption.

*Low Thromboembolic Risk Patients

Patients with low thromboembolic risk, such as patients with atrial fibrillation without prior CVA or other thromboembolic event, may stop warfarin 4 doses prior to the procedure and resume warfarin the evening of surgery. Low thromboembolic risk patients undergoing procedures that require perioperative UFH or LMWH for VTE prophylaxis should receive the recommended prophylaxis in addition to resumption of warfarin.

Patients with Mechanical Heart Valves who are Pregnant or are Attempting Pregnancy – Management by an Anticoagulation Expert

Patients with mechanical heart valves and who are pregnant are at high risk and should be managed by an anticoagulation expert. A study has shown that two pregnant patients with mechanical heart valves had thrombotic complications when treated with LMWH. Because of this, the FDA and manufacturer have warned that enoxaparin is not presently indicated for use in prophylaxis for heart valve patients who are pregnant.

DOSAGE ADJUSTMENT ALGORITHMS For target INR of 2.0 to 3.0, no bleeding:*

INR	< 1.5	1.5 to 1.9	2.0 to 3.0	3.1 to 3.9	4.0 to 4.9	≥ 5.0
Adjustment	Increase dose 10 to 20%; consider extra dose	Increase dose 5 to 10%†	No change	Decrease dose 5 to 10%†	Hold for 0 to 1 day then decrease dose 10%	See Below
Next INR	4 to 8 days	7 to 14 days	No. of consecutive in-range INRs x 1 wk (max: 4 wks)‡	7 to 14 days	4 to 8 days	See Below

For target INR of 2.5 to 3.5, no bleeding:*

INR	< 1.5	1.5 to 2.4	2.5 to 3.5	3.6 to 4.5	4.5 to 6.0	> 6.0
Adjustment	Increase dose 10 to 20%; consider extra dose	Increase dose 5 to 10%§	No change	Decrease dose 5-10% consider holding 1 dose§	Hold for 1 to 2 days then decrease dose 5 to 15%	See reverse side.
Next INR	4 to 8 days	7 to 14 days	No. of consecutive in-range INRs x 1 wk (max: 4 wks)‡	7 to 14 days	2 to 8 days	See reverse side.

* - See reverse side for further guidance.

† - If INR is 1.8 to 1.9 or 3.1 to 3.2, consider no change with repeat INR in seven to 14 days.

‡ - For example, if a patient has had three consecutive in-range INR values, recheck in 3 weeks.

§ - If INR is 2.3 to 2.4 or 3.6 to 3.7, consider no change with repeat INR in seven to 14 days.

ANTICOAGULATION DECISION SUPPORT

Indication	Target INR	Duration of therapy	SORT
DVT or PE1			
First episode, transient risk factor	2.0 to 3.0	3 months	A
First episode, idiopathic DVT	2.0 to 3.0	6 to 12 months*	A
First episode, patient with cancer	2.0 to 3.0	LMWH for 3 to 6 months, then warfarin (Coumadin); treat until cancer is resolved*	A
First episode and single risk factor†	2.0 to 3.0	6 to 12 months*	A
First episode, antiphospholipid antibodies or at least two risk factors†	2.0 to 3.0	12 months*	B
Recurrent DVT	2.0 to 3.0	Indefinitely	B
Atrial fibrillation2	2.0 to 3.0	Indefinitely‡	A
Valvular disease3			
Rheumatic mitral valve and atrial fibrillation or previous emboli	2.0 to 3.0	Indefinitely	B
Rheumatic mitral valve disease, normal sinus rhythm, and left atrial diameter > 5.5 cm	2.0 to 3.0	Indefinitely	B
Aortic St. Jude Medical bileaflet valve	2.0 to 3.0	Indefinitely	A
Mitral tilting disk valves and bileaflet mechanical valves	2.5 to 3.5	Indefinitely	B
Aortic CarboMedics bileaflet or Medtronic Hall tilting disk valves, normal sinus rhythm, and no LAE	2.0 to 3.0	Indefinitely	B
Mechanical valves with risk factors (atrial fibrillation, myocardial infarction, LAE, endocardial damage, low ejection fraction)	2.5 to 3.5	Indefinitely,* low-dose aspirin	B
Caged ball or disk valve	2.5 to 3.5	Indefinitely,* low-dose aspirin	B
Mechanical valve with breakthrough embolism despite INR 2.0 to 3.0	2.5 to 3.5	Indefinitely,* low-dose aspirin	B
Bioprosthetic valve (mitral)	2.0 to 3.0	3 months after placement	B
Bioprosthetic valve (aortic)	2.0 to 3.0	3 months of warfarin or aspirin	B

Management of Significantly Elevated INR With or Without Bleeding4

INR 5.0 to 8.9, no significant bleeding: Omit 1-2 doses; reduce dose 10-20%; monitor frequently. Alternately consider vit. K1 1 to 2.5 mg orally.

INR ≥ 9.0, no significant bleeding: Hold warfarin therapy; give vit. K1 5-10 mg orally; monitor frequently. Resume at lower dose when INR is therapeutic.

Serious bleeding, any INR: Hold warfarin; give vitamin K1 10 mg slow intravenous (IV) plus fresh plasma or prothrombin complex concentrate, depending on urgency; repeat vitamin K1 every 12 hours as needed.

Life-threatening bleeding, any INR: Hold warfarin; give prothrombin complex concentrate (or recombinant factor VIIa as an alternate) supplemented with vitamin K1 (10 mg slow IV); repeat as needed.

INR = International Normalized Ratio; SORT = Strength-of-Recommendation Taxonomy; DVT = deep vein thrombosis; PE = pulmonary embolism; LMWH = low-molecular-weight heparin; LAE = left atrial enlargement; A = consistent, good-quality patient-oriented evidence; B = inconsistent or limited-quality patient-oriented evidence; C = consensus,