A REFERENCE FOR PERIOPERATIVE MANAGEMENT OF PATIENTS ON WARFARIN

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(Lisa Tong PharmD, Joyce Lin Pharm D, Tracy Minichiello MD)

Dept. of Veterans Affairs
San Francisco, California
Anticoagulation & Thrombosis Service

	Low Thromboembolic Risk (< 2%/month) • Non-valvular atrial fibrillation with $CHADS_2$ score[1] of 0 to 2 (and no prior stroke or TIA) • Single VTE occurred >12 months ago • Mechanical bi-leaflet heart valve in aortic position without atrial fibrillation (AFIB) or other major risk factors for stroke (low EF, hypercoag state) **NO BRIDGING RECOMMENDED**	**Moderate Thromboembolic Risk (4-10%/mo)** • Non-valvular atrial fibrillation with $CHADS_2$ score[1] of 3 or 4 (and no prior stroke or TIA) • VTE within the past 3 to 12 months • Recurrent VTE(not while on anticoagulation) • Active cancer treated within 6 months • Bileaflet aortic heart valve with one or more of the following: AFIB, prior stroke/TIA, hypertension, diabetes, congestive heart failure, age >75 yr • Non-severe thrombophilic conditions (heterozygous carrier of factor V Leiden mutation or factor II mutation) **BRIDGING MAY BE CONSIDERED**	**High Thromboembolic Risk (> 10%/mo)** • Non-valvular atrial fibrillation with a $CHADS_2$ score[1] of 5 or 6, or prior stroke or TIA • Acute venous or arterial thromboembolic event < 3 months ago ***(Elective surgery should be delayed for 3 months. If surgery is necessary within 1 month of venous event, a temporary IVC filter may be indicated)*** • Mechanical heart valve in aortic position and history of CVA/TIA in past 6 months • Mechanical heart valve in mitral position • Caged ball or tilting disk aortic heart valve • > 1 prosthetic heart valve • Rheumatic mitral valve disease • Recurrent VTE while on anticoagulation • Severe thrombophilia (deficiency of protein C, protein S or antithrombin, antiphospholipid antibodies, or multiple thrombophilic abnormalities) **BRIDGING RECOMMENDED**
Low Bleeding Risk(major 2-day bleed risk 0-2%) Cholecystectomy Gastrointestinal endoscopy +/- biopsy, enteroscopy, biliary/pancreatic stent without sphincterotomy, endonosonography without fine-needle aspiration Simple dental extractions Carpal tunnel repair Shoulder/foot/hand surgery and arthroscopy Dilatation and curettage Skin cancer excision Abdominal hernia repair Hemorrhoidal surgery Axillary node dissection Hydrocele repair Cataract and noncataract eye surgery Noncoronary angiography Bronchoscopy +/- biopsy Central venous catheter removal Cutaneous/bladder/prostate/thyroid/breast/lymph node biopsies	**If acceptable do not interrupt anticoagulation for procedure. If anticoagulation must be interrupted:** **Before procedure:** • Stop warfarin 5 days prior to procedure (take last dose 6 days prior to procedure) • No bridging necessary • √ INR day of procedure to document value **After procedure:** • Resume/continue previous warfarin dose on the evening of surgery or when deemed safe • No bridging necessary • If the intervention increases the risk of thrombosis, administer prophylactic enoxaparin	**If acceptable do not interrupt anticoagulation for procedure. If anticoagulation must be interrupted:** **Before procedure:** • Stop warfarin 5 days prior to procedure (take last dose 6 days prior to procedure) • **Consider** bridging for CHADS2=4 or higher risk aortic valve based on patient preference, bleeding risk and renal function • For AFIB/MHV use full dose enoxaparin adjusted for renal function[2] • For VTE use prophylactic dosing of enoxaparin • Start bridge therapy about 36 hours after last warfarin dose • Last dose of enoxaparin should be given no sooner than 24 hours prior to procedure • √ INR day of procedure to document value **After procedure:** • Resume/continue previous warfarin dose on POD #0 or when deemed safe • Check CrCl to guide choice of post-op anticoagulant if inpatient • If patient not being bridged but the intervention increases the risk of thrombosis, administer prophylactic enoxaparin • If patient being bridged: Resume full dose bridge therapy with POD #1 or when deemed safe. Continue until INR is in therapeutic range.	**If acceptable do not interrupt anticoagulation for procedure. If anticoagulation must be interrupted:** **Before procedure:** • Stop warfarin 5 days prior to procedure (take last dose 6 days prior to procedure) • For AFIB/MHV/VTE use full dose enoxaparin adjusted for renal function[2] • Start bridge therapy about 36 hours after last warfarin dose • Last dose of enoxaparin should be given no sooner than 24 hours prior to procedure • √ INR day of procedure to document value **After procedure:** • Resume/continue previous warfarin dose on POD #0 or when deemed safe • Check CrCl to guide choice of post-op anticoagulant if inpatient • If patient being bridged: Resume full dose bridge therapy with enoxaparin on POD #1 or when deemed safe. Continue until INR is in therapeutic range.
High Bleeding Risk (major 2-day bleed risk 2-4%) Heart valve replacement/CABG AAA repair Neurosurgical/urologic/head and neck/abdominal/breast cancer surgery Knee/hip replacement Laminectomy Transurethral prostate resection Kidney biopsy Polypectomy, variceal treatment, biliary sphincterectomy, pneumatic dilatation PEG placement Endoscopically guided fine-needle aspiration Multiple tooth extractions Vascular and general surgery Pacemaker and cardiac defibrillator insertion Any major operation (procedure duration > 45 minutes)	Perform procedure when INR < 1.5: **Before procedure:** • Stop warfarin 5 days prior to procedure (take last dose 6 days prior to procedure) • No bridging necessary • √ INR day of procedure to document value **After procedure:** • Resume previous warfarin dose on the evening of surgery or when deemed safe • If the intervention increases the risk of thrombosis, administer prophylactic enoxaparin • No bridging necessary	Perform procedure when INR < 1.5: **Before procedure:** • Stop warfarin 5 days prior to procedure (take last dose 6 days prior to procedure) • **Consider** bridging based on patient preference, bleeding risk and renal function • For AFIB/MHV use full dose enoxaparin adjusted for renal function[2] • For VTE use prophylactic dosing of enoxaparin • Start bridge therapy about 36 hours after last warfarin dose • Last dose of enoxaparin should be given no sooner than 24 hours prior to procedure • √ INR day of procedure to document value **After procedure:** • Resume previous warfarin dose on the evening of surgery or when deemed safe • Check CrCl to guide choice of post-op anticoagulant if inpatient • If patient not being bridged but the intervention increases the risk of thrombosis, administer prophylactic enoxaparin • If patient being bridged: Resume full dose bridge therapy with enoxaparin adjusted for renal function NO SOONER THAN 48 – 72 hours after surgery when hemostasis achieved. Dose may be "stepped up," starting with prophylactic doses of heparin or enoxaparin. Continue until INR is in target range. • Note: Risk of full dose bridging may outweigh benefits	Perform procedure when INR < 1.5: **Before procedure:** • Stop warfarin 5 days prior to procedure (take last dose 6 days prior to procedure) • For AFIB/MHV/VTE use full dose enoxaparin adjusted for renal function[2] • Start bridge therapy about 36 hours after last warfarin dose • Last dose of enoxaparin should be given no sooner than 24 hours prior to procedure • √ INR day of procedure to document value **After procedure:** • Resume previous warfarin dose on the evening of surgery or when deemed safe • Check CrCl to guide choice of post-op anticoagulant if inpatient • Resume full dose bridge therapy with enoxaparin adjusted for renal function NO SOONER THAN 48 – 72 hours after surgery when hemostasis achieved. Dose may be "stepped up," starting with prophylactic doses of heparin or enoxaparin. Continue until INR is in target range • Note: Risk of full dose bridging may outweigh benefits

[1] **$CHADS_2$** score for assessment of stroke risk in atrial fibrillation patients

* Recent or current CHF?	[ ] 1 point
**Dx of hypertension?	[ ] 1 point
Age ≥ 75 years?	[ ] 1 point
**Dx of diabetes	[ ] 1 point
Hx of CVA and/or TIA	[ ] 2 points

* Ejection fraction of < 25% or have had a CHF exacerbation within 90 days.
** Score as YES in patients with this diagnosis, even if the problem is currently well-controlled with meds or diet.

[2] **Full intensity bridging dose of enoxaparin based on renal function**

	Full intensity bridging dose of enoxaparin	
Enoxaparin	Maintenance: dose adjust based on renal function:	
	Est. CrCl (ml/min)	**Fraction of usual daily dose**
	30-39	0.5 mg/kg/q12h
	40-49	0.6 mg/kg q12h
	≥ 50	1 mg/kg q12h

Notes:
- For patients with decreased creatinine clearance or who may require the need for immediate reversal of anticoagulant effect, consider IV unfractionated heparin (UFH) instead of enoxaparin.
- Do not bolus IV heparin in the post-op period.
- If once-daily LMWH is used for bridging, last dose should be given no sooner than 36 hours pre-op. Alternatively, patient can be transitioned to twice-daily dosing and receive last dose 24 hours pre-op.

A REFERENCE FOR PERIOPERATIVE MANAGEMENT OF PATIENTS ON NEW ORAL ANTICOAGULANTS	**Renal Function (CrCl)**	**Low Bleeding risk** *2 or 3 drug half-lives between last dose and surgery; aiming for mild to moderate residual anticoagulant effect at surgery(<12%-25% at surgery)*	**High Bleeding Risk** *4 or 5 drug half-lives between last dose and surgery; aiming for no or minimal residual anticoagulant effect (<3%-6%) at surgery*
DABIGATRAN* ($t_{1/2}$ 14-18 hrs)	CrCL > 50 ml/min CrCL 30-50 ml/min	last dose 2 days prior to procedure (skip 2 doses) last dose 3 days prior to procedure (skip 4 doses)	last dose 3-4 days prior to procedure (skip 4-6 doses) last dose 4-5 days prior to procedure (skip 6-8 doses)
RIVAROXABAN* ($t_{1/2}$ 8-10 hrs)	CrCL > 50 ml/min CrCL 30-50 ml/min CrCL 15-29.9 ml/min	last dose 2 days prior to procedure (skip 1 dose) last dose 2 days prior to procedure (skip 1 dose) last dose 3 days prior to procedure (skip 2 doses)	last dose 3 days prior to procedure (skip 2 doses) last dose 3 days prior to procedure (skip 2 doses) last dose 4 days prior to procedure (skip 3 doses)
APIXABAN* ($t_{1/2}$ 7-18 hrs)	CrCL > 50 ml/min CrCL 30-50 ml/min	last dose 2 days prior to procedure (skip 2 doses) last dose 3 days prior to procedure (skip 4 doses)	last dose 3 days prior to procedure (skip 4 doses) last dose 4 days prior to procedure (skip 6 doses)
*When to Resume		Resume on day after surgery (24 h post-op)	Resume no sooner than 2-3 days after surgery (48-72 h post-op)

*NOTE: The new oral anticoagulants are IMMEDIATELY effective, are not reversible, and cannot be measured by routine coagulation monitoring.

Examples of high bleeding risk procedures include (but are not limited to) cardiac surgery, neurosurgery, abdominal surgery, other surgery involving a major organ, other major surgery where complete hemostasis is required, or situations where patients are receiving spinal/epidural anesthesia. Other important factors that contribute to an increased bleeding risk include advancing age, co-morbidities (e.g., major cardiac, respiratory, or liver disease), or concomitant use of meds that increase bleeding risk (e.g., anti-platelet agents).

References

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