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Periprocedural Bridging Guidelines (Adult)

I. Purpose

A. The purpose of this clinical pharmacy agreement (CPA; see Clinical Pharmacy Agreements in Acute Care - OR Region) is to provide dosing and monitoring guidance on periprocedural anticoagulation for Oregon inpatient pharmacists.

1. In the outpatient setting: The Anticoagulation Clinic (ACC) pharmacist will follow the clinical practice agreement for management of perioperative anticoagulation management as per the ACC Operations Policies and Procedures.
2. In the inpatient setting: Pharmacists have the authority to order baseline and continuous labs, monitor therapy, and in consultation with the Licensed Independent Practitioners (LIP) adjust dosages to ensure safe treatment for all patients. Expansion of pharmacist scope to independently place, discontinue, or modify orders within this CPA is dependent on additional conditions outlined within this policy and other P&T approved guidelines.

II. Scope

Medications / Disease States:	Periprocedural Anticoagulation Management
Patients:	Adult patients ≥ 18 years of age
Clinical services:	Acute care and outpatient services
Ministries:	All acute care ministries and outpatient clinics in Oregon
Participating Pharmacists	Acute care and outpatient pharmacists
Practitioners	Acute care and outpatient practitioners
Exclusions	None
Related Policies	• Heparin Dosing Guideline • LMWH Dosing Guideline

	• Oral Anticoagulation Guidelines

III. Requirements

A. Inpatient setting only:

1. Initial Training
    a. The pharmacist shall complete the following courses located in HealthStream:
        i. PROVOR: Periprocedural Anticoagulation Management Certification for Pharmacists
        ii. PROVOR: Low-Molecular-Weight Heparin Certification for Pharmacists
        iii. PROVOR: Heparin Certification for Pharmacists
    b. The pharmacist shall pass the competency exams with a minimum score of 80% following each HealthStream module above.
2. Ongoing Maintenance
    a. The pharmacist shall complete the PROVOR: Pharmacist Annual Competency Update and Refresher course located in HealthStream every year.
    b. The pharmacist shall pass the competency exams with a minimum score of 80% following each HealthStream module above.

B. Outpatient (Anticoagulation clinic):

1. Please refer to the Oregon Anticoagulation Services Policy and Procedure

IV. Procedures:

A. Provider Responsibilities

i. The provider is best able to gauge the bleeding risk. A pharmacist-provider conversation should help guide co-management of periprocedural bleeding risks.

ii. Inpatient:

1. Order the appropriate pharmacy consult on EPIC:
    a. ERX 109605: "Warfarin per pharmacy"
    b. ERX 74701: "Heparin per pharmacy"
    c. ERX 109606: "Pharmacy Consult: Other Medications/Reasons".
2. The patient will be managed for the duration of the anticoagulation treatment until the pharmacy consult order is discontinued by the provider.

iii. Outpatient - Anticoagulation Services:

1. Anticoagulation clinic providers must complete referral to pharmacy as outlined

in the Oregon Anticoagulation Services Policy and Procedure.

B. Pharmacist Responsibilities

i. Often pharmacists are consulted regarding the best approach for managing oral anticoagulants in a patient planned to undergo an invasive procedure. Recommendations for anticoagulation in the perioperative period are based upon the risks related to the patient as well as risks related to the surgical procedure, e.g. bleeding and venous thromboembolism (VTE).

ii. Pharmacists will provide recommendations for periprocedural anticoagulation management as needed.

iii. In deciding the best perioperative approach to anticoagulation, the following questions need to be addressed:

1. What is the risk of bleeding associated with the procedure being performed?
2. What is the patient's risk of bleeding?
3. What is the risk of thrombosis from the procedure being performed (e.g. hip replacement)?
4. If anticoagulation is temporarily stopped, what is the patient's risk of thromboembolism?
5. Is the thromboembolic risk associated with stopping warfarin sufficient to warrant cross-coverage with unfractionated heparin (UFH) or low molecular-weight heparin (LMWH)?

C. Therapy Guidelines

i. Initiation of periprocedural therapy management:

1. Consider bleeding risk factors: *please refer to Appendix A and Appendix B at the end of this policy.*
    a. "Procedural Bleed Risks" - Appendix A
        i. Includes Table 1, which categorizes the bleeding risks of various procedures as a guidance to help determine a patient's bleed risk.
    b. "Patient-Specific Bleed Risks Determination" -Appendix B
        i. Includes Table 2, which categorizes patient-specific risk factors to consider and the HAS-BLED tool.
2. Consider thromboembolic risks: *please refer to Appendix C at the end of this policy.*
    a. "Risk for Thromboembolism" - Appendix C

- Includes Table 3, which attempts to stratify VTE risk for periprocedural anticoagulation.

D. Bridging In Atrial Fibrillation

i. Cardioversion procedures: provide oral anticoagulation therapy for at least 3 weeks before and at least 4 weeks after cardioversion in patients with atrial fibrillation or atrial flutter of 48 hours duration or longer.[19]

ii. Elective surgery or procedures:

1. Not recommended to bridge with heparin therapy in patients receiving VKA therapy for atrial fibrillation who require interruption for an elective surgery or procedure.[1,17]
2. Bridge therapy is not necessary for elective surgeries or procedures in patients with atrial fibrillation on direct oral anticoagulation.[1,12]
    a. Please see Table 6 for further guidance on when to interrupt and re-initiate direct oral anticoagulants based on renal function and bleeding risk of procedure.

iii. Invasive procedures:

1. Periprocedural bridging with LMWH or UFH is not recommended for patients at low to moderate risk of VTE who require interruption of VKA therapy for invasive procedures.[1,17]
2. Warfarin should be stopped 5 days prior to an invasive procedure.[14]
    a. In the typical patient, this results in subtherapeutic anticoagulation levels for ~2 days and no anticoagulation for 1-2 days prior to the procedure.
    b. If warfarin is resumed on the day of the procedure, the patient will generally continue to have no anticoagulation for 1 day and subtherapeutic anticoagulation for the next 3-4 days.

iv. For further details regarding the evidence of these recommendations, please refer to Appendix D: Bridging In Atrial Fibrillation – Evidence at the end of this policy.

E. Warfarin Therapy Management Perioperatively

Figure 1: Guideline for Managing Warfarin Therapy Perioperatively[1]

i. **Figure 1** provides guidelines for anticoagulation when warfarin is interrupted based upon an assessment of the potential bleeding risk and the thromboembolic risk.

ii. **Warfarin Bridging**

1. **For patients WITH high risk of bleeding:**

a. For patients with high risk of bleeding and high risk of thromboembolism undergoing therapeutic interruption of warfarin (Coumadin) therapy, anticoagulation bridging may be considered.

i. Bridge with therapeutic LMWH

a. Last dose given ~24 hours prior to the procedure

b. Elective procedures: Half the total daily dose of LMWH given ~24 hours prior to the procedure

ii. Prophylactic or intermediate LMWH doses may be considered based on patient specific factors and clinical judgment.

b. For patients with high risk of bleeding and with moderate risk for thromboembolism (and no history of stroke or TIA) undergoing therapeutic interruption of warfarin (Coumadin) therapy, anticoagulation bridging may be withheld as appropriate to the patient situation.

2. **For patients WITHOUT high risk of bleeding:**
    a. For patients without significant bleeding risk undergoing therapeutic interruption of warfarin (Coumadin), bridging should be considered in those with prior stroke or TIA.
    b. For patients without significant bleeding risk undergoing therapeutic interruption of warfarin (Coumadin), bridging should be withheld in those without prior stroke or TIA.

iii. **Options for Anticoagulation Cross-Coverage**

1. Based upon the recommendations provided by the guidelines in **Figure 1**, **Table 4** lists the options for both therapeutic and prophylactic cross-coverage with either unfractionated heparin or low molecular weight heparin.
2. Avoid fondaparinux for "bridge therapy" due to its long half-life.

Table 4: Options for Anticoagulation Cross-Coverage during Invasive Procedures[1,14]

Agent	Therapeutic Dose*	Prophylactic Dose**
Low-Molecular-Weight Heparin (LMWH) See LMWH Dosing Guideline for more information	**Pre-Procedure** Begin when INR is below goal range. Dose: **Enoxaparin 1 mg/kg SubQ q 12 hrs *or* 1.5 mg/kg q 24 hrs.**[a] Last dose ~24h hrs before procedure. May give half the total daily dose of LMWH for elective procedures with high-bleed risks. **Post-Procedure** For low/average risk of bleeding, begin 12-24 hrs post procedure. For high risk of bleeding, begin 48-72 hrs post-procedure. Dose: **Enoxaparin 1 mg/kg SubQ q 12 hrs *or* 1.5 mg/kg q 24 hrs.**[a] Continue until INR is within therapeutic range for 24 hours.	**Pre-Procedure** Begin when INR is below goal range. Dose: **Enoxaparin 30 mg SubQ q 12 hrs *or* 40 mg SubQ q24 hrs.**[a] Last dose ~24 hrs before procedure. **Post-Procedure** For low/average risk of bleeding, begin 12-24 hrs post procedure. For high risk of bleeding, begin 48-72 hrs post-procedure. Dose: **Enoxaparin 30 mg SubQ q 12 hrs *or* 40 mg SubQ q24 hrs.**[a] Continue until INR is within therapeutic range for 24 hours.
Unfractionated Heparin (UFH) See Heparin Dosing Guideline for more	**Pre-Procedure** Begin IV UFH 2 days pre-procedure, titrate to therapeutic APTT. Stop infusion 4-6 hrs before procedure. **Post-Procedure**	**Pre-Procedure** Begin 2 days before procedure (moderate thrombotic risk). Dose: **UFH 5,000 units SubQ q 8-12 hrs.** Last dose ~8-12 hrs before

information	Restart IV UFH without a loading dose 12-24 hrs of procedure when risk of bleeding determined to be safe. Begin 48-72 hrs post-procedure if high bleeding risk. Continue until INR is within therapeutic range for 24 hours.	procedure. **Post-Procedure** Begin 12-24 hrs post-procedure when risk of bleeding determined to be safe. Begin 48-72 hrs post-procedure if high bleeding risk. Dose: **UFH 5,000 units SubQ q 8-12 hrs.** Continue until INR is within therapeutic range for 24 hours.

[a]Dosing of enoxaparin depends on the type of surgery and renal function:

- 1 mg/kg q 12 hrs is preferred in high risk patients (e.g. obese, cancer, mechanical heart valve replacement, pregnancy).
- 1.5 mg/kg q 24 hrs may be used in low risk patients with CrCl > 30 ml/min who cannot tolerate twice daily injections.

*Therapeutic dosing should be used for most indications.

A prophylactic-dose (low dose) heparin regimen is known to prevent postoperative **venous thromboembolism, but its efficacy in preventing **arterial** thromboembolism is not established. Prophylactic dosing regimens are **not** recommended for arterial indications. Prophylactic or intermediate doses may be used in patients with high risk of thromboembolism and high risk for bleeding; if this is the case, discuss bridging regimen with the provider.

F. Anti-Platelet Therapy Management Perioperatively

i. **Table 5** provides guidance on the management of anti-platelets perioperatively based on the type of procedures.

ii. **Figure 2** provides guidance on the duration of withholding anti-thrombotics perioperatively.

Table 5. Perioperative management of antiplatelet therapies[1]

Type of procedure	Aspirin	P2Y12 Inhibitors
Elective non-cardiac procedures/surgery	Continue ASA without interruption. If interruption of ASA is required, stop ASA ≤ 7 days before surgery and resume ≤ 24 hours after surgery/ procedure.	- Clopidogrel: stop 5 days before surgery - Ticagrelor: stop 3 to 5 days before surgery - Prasugrel: stop 7 days before surgery

CABG	Continue ASA without interruption.	- Clopidogrel: stop 5 days before surgery - Ticagrelor: stop 3 to 5 days before surgery - Prasugrel: stop 7 days before surgery
Minor dental, dermatologic, or opthalmologic procedures	Continue ASA without interruption.	DAPT therapy: stop P2Y12 inhibitor - Clopidogrel: stop 5 days before surgery - Ticagrelor: stop 3 to 5 days before surgery - Prasugrel: stop 7 days before surgery P2Y12 inhibitor used as monotherapy: Continue without interruption.
Patients with coronary stents receiving dual anti-platelet therapy (DAPT) therapy undergoing elective procedure/surgery[a,b]	Stents placed 6-12 weeks ago:[c] Continue both ASA and P2Y12 inhibitor OR stop one antiplatelet 7-10 days before surgery.	
	Stents placed 3-12 months ago: Continue ASA without interruption.	Stents placed 3-12 months ago: Stop P2Y12 inhibitor 7-10 days before surgery.

[a] In patients with coronary stents who require interruption of antiplatelet therapy for an elective surgery or procedure, routine bridging is not recommended with a glycoprotein IIb/IIIa inhibitor, cangrelor, or LMWH. Bridging may be considered in select high-risk patients whom received a coronary stent in a critical location within the past 3 months.

[b] Consider delaying an elective surgery/procedure for patients with coronary stents who require continued DAPT therapy.

[c] There are several factors to consider for whether to continue DAPT therapy or interrupt one agent, including:

timing of stent (closer to 6 weeks or 12 weeks post-operatively), type of stent (drug-eluting or bare-metal), location of stent (dominant coronary artery or not), and number and length of stents implanted.

Figure 2: Durations for Withholding Anti-thrombotics Perioperatively[1]

Perioperative Management of Antithrombotic Therapy - CHEST

G. Direct-Acting Oral Anticoagulant (DOAC) Therapy Management during Invasive Procedures

i. The strategy for interrupting anticoagulation therapy should be based upon an assessment of thromboembolic risk, bleeding risk, drug interactions, and severity of renal impairment.[1]
    1. **Table 6** and **Table 7** provides guidelines for interrupting direct-acting oral anticoagulant therapy based procedural bleed risks and renal function.[1]

ii. There may be selected patients in whom a longer duration of pre-operative DOAC interruption may be required, irrespective of the DOAC used. This may include patients with severely impaired renal function (CrCl < 30 mL/min) or hepatic function, and in those who are taking drugs that, through inhibition of CYP3A4 or P-glycoprotein pathways, may interfere with DOAC clearance.
    1. For patients with a CrCl < 30 mL/min, the interruption of DOACs before an elective procedure can follow a pharmacokinetic-based approach, as outlined in **Table 7**. [1]
    2. **Table 8** provides DOAC pharmacokinetic information of estimated elimination half-lives based on patient-specific CrCl.

Table 6: Perioperative Management of Direct Oral Anticoagulants[1,13]

Executive Summary - CHEST

Table 7. Pre-procedural Management of Apixaban, Rivaroxaban, and Edoxaban for Patients with CrCl <30 mL/min[1]

Procedural Risks	CrCl > 30 mL/min	CrCl < 30 mL/min
Low/Moderate Bleed Risk	Refer to table 6	Pre-procedural interruption interval corresponding to approximately 3 elimination half-lives of each DOAC should result in residual anticoagulant effect, which is acceptable clinically for lower bleed risk procedures.
High Bleed Risk	Refer to	Pre-procedural interruption interval corresponding to 4-5 elimination

	Table 6	half-lives of each DOAC should result in minimal to no residual anticoagulation effect at the time of surgery.

Table 8: Estimated DOAC half-lives based on patient-specific CrCl

	Apixaban, Edoxaban, Rivaroxaban			Dabigatran				
Creatinine Clearance (mL/min)	≥ 30	15–29	≤ 15	≥ 80	50–79	30–49	15–29	< 15
Half-life (hours)	6 – 15	Apixaban: 17 Edoxaban: 17 Rivaroxaban: 9	Apixaban: 17 (off dialysis) Edoxaban: 10-17 (off dialysis) Rivaroxaban: 13 (off dialysis)	13	15	18	27	30 (off dialysis)

H. Antiplatelet and Anticoagulant Management in Neuraxial and Peripheral Pain Procedures

The following section is based on recommendations from the ASRA Guidelines Committee consisting of the American Society of Regional Anesthesia and Pain Medicine, the European Society of Regional Anaesthesia and Pain Therapy, the American Academy of Pain Medicine, the International Neuromodulation Society, the North American Neuromodulation Society, and the World Institute of Pain.

Table 9: Neuraxial Procedure Classification According to the Potential Risk for Serious Bleed[4,18,20]

High-Risk Procedures	Intermediate-Risk Procedures*	Low-Risk Procedures*
- SCS trial and implant - Intrathecal catheter and pump implant - Vertebral augmentation (vertebroplasty and kyphoplasty) - Epiduroscopy and epidural decompression	- Interlaminar ESIs (C, T, L, S) - Transforaminal ESIs (C, T, L, S) - Facet MBNB and RFA (C, T, L) - Paravertebral block (C, T, L) - Intradiscal procedures (C, T, L) - Sympathetic blocks (stellate, thoracic, splanchnic, celiac, lumbar, hypogastric) - Peripheral nerve stimulation trial and implant - Pocket revision and IPG/ITP replacement	- Cervical medial branch blocks - Peripheral nerve blocks - Peripheral joints and musculoskeletal injections - Trigger point injections including piriformis injection - Sacroiliac joint injection and sacral lateral branch blocks
*Patients with high risk for bleeding undergoing low- or intermediate-risk procedures should be treated as intermediate or high risk, respectively. Patients with high risk for bleeding may include old age, history of bleeding tendency, concurrent uses of other anticoagulants/antiplatelets, liver cirrhosis or advanced liver disease, and advanced renal disease **C** indicates cervical; **L**, lumbar; **MBNB**, medical branch nerve block; **RFA**, radiofrequency ablation; **S**, sacral; **T**, thoracic.		

Table 10: Peri-procedural management of anticoagulants and antiplatelet medications in neuraxial procedures[18, 21]

ANTICOAGULANT DRUGS	WHEN TO STOP		WHEN TO RESTART
	Intermediate- to high-risk procedures	**Low-risk procedures**	
Warfarin	5 days or until INR normalizes	-No -Shared assessment and risk stratification	24 hours
Acemocoumarol	3 days, normal INR	-No -Shared assessment and risk stratification	24 hours
IV heparin	4-6 hours	4-6 hours	1-2 hours
Subcutaneous heparin, 5,000 units BID & TID	4-6 hours	4-6 hours	1-2 hours after low risk procedures 6-8 hours after medium/high risk pain procedures
Subcutaneous heparin, 7,500-10,000 units BID	12 hours	12 hours	Not established; risk versus benefit
Subcutaneous heparin, >20,000 units total daily dose	24 hours	24 hours	Not established; risk versus benefit
LMWH: prophylactic	12 hours	12 hours	4 hours after low risk procedures 12-24 hours after medium/high risk pain procedures
LMWH: therapeutic	24 hours	24 hours	4 hours after low risk procedures 12-24 hours after medium/high risk pain procedures
DIRECT-ACTING ORAL ANTICOAGULANTS (DOACs)	**WHEN TO STOP**		**WHEN TO RESTART**
	Intermediate- to high-risk procedures	**Low-risk procedures**	
Dabigatran	CrCl ≥ 80mL/min: 3 days CrCl 50-79 mL/min: 4 days CrCl 30-49 mL/min: 5 days	Shared assessment and risk stratification**	24 hours postoperatively 6 hours after neuraxial catheter removal

Rivaroxaban	3 days	Shared assessment and risk stratification**	24 hours postoperatively 6 hours after neuraxial catheter removal
Apixaban	3 days	Shared assessment and risk stratification**	24 hours postoperatively 6 hours after neuraxial catheter removal
ANTIPLATELET AGENTS	**WHEN TO STOP**		**WHEN TO RESTART**
	Intermediate- to high-risk procedures	**Low-risk procedures**	
Salicylates			
ASA and ASA combinations	Follow ASA recommendations Intermediate risk procedures: • Shared assessment and risk stratification High risk procedures: • Primary prophylaxis: 6 days • Secondary prophylaxis: shared assessment and risk stratification	No	24 hours
P2Y12 inhibitors			
Clopidogrel	5-7 days	No	24 hours
Prasugrel	7-10 days	No	24 hours
Ticagrelor	5-7 days	No	24 hours
Glycoprotein IIb/IIIa inhibitors			
Abciximab	2-5 days	2-5 days	8-12 hours
Eptifibatide	8-24 hours	8-24 hours	8-12 hours
Tirofiban	8-24 hours	8-24 hours	8-12 hours
Phosphodiesterase Inhibitors			
Cilostazol	2 days	No	24 hours
Dipyridamole	2 days	No	6 hours
MISCELLANEOUS AGENTS	**WHEN TO STOP**		**WHEN TO RESTART**
	Intermediate- to high-risk procedures	**Low-risk procedures**	
Fibrinolytic agents	48 hours	48 hours	48 hours

Fondaparinux	4 days		Shared assessment and risk stratification	24 hours
NSAIDS	**WHEN TO STOP**			**WHEN TO RESTART**
	High-risk procedures	**Intermediate-risk procedures**[#]	**Low-risk procedures**	
Diclofenac	1 day	Continue periprocedurally	Continue periprocedurally	24 hours
Ketorolac	1 day			
Ibuprofen	1 day			
Etodolac	2 days			
Indomethacin	2 days			
Naproxen	4 days			
Meloxicam	4 days			
Nabumetone	6 days			
Oxaprozin	10 days			
Piroxicam	10 days			

*If a moderate or high risk procedure had a large amount of blood loss, then a 24 hours interval should be observed.

#Consideration should be given to the discontinuation of aspirin or NSAIDS for certain intermediate risk procedures including interlaminar cervical epidural steroid injections and stellate ganglion blocks where specific anatomical configurations may increase the risk and consequences of procedural bleeding.

**For low-risk procedures, a shared assessment, risk stratification, and management decision in conjunction with the treating physician should guide whether these new anticoagulants should be stopped. A 2 half-life interval may be considered.

† If a patient has an elevated thrombotic risk, holding a DOAC 2 to 3 half-lives prior to the procedure or bridging with parenteral LMWH (with last dose 24h prior to procedure) to keep the risk of a thromboembolism low may be discussed. The pharmacist must discuss this deviation for high TE risk plans with the proceduralist and treating physician and document.

i. **<u>Herbal/Alternative Therapies with Neuraxial Procedures</u>**

1. Agents most likely to cause bleeding or interactions with anticoagulants:
    a. Garlic *(Allium sativum)*
    b. Gingko biloba
    c. Ginseng *(Panax quinquefolius)*
    d. Asian ginseng *(Parnax ginseng)*
    e. Danshen *(Radix Salvia miltiorrhiza)*
    f. Dong quai *(Radix Angelica sinenis)*

g. Fish oil
h. Turmeric

2. Timing of cessation is variable, but a 7-10 day period may be appropriate given that many agents pose risks due to effects on platelet aggregation and warfarin therapy.
3. INR should be checked in patients taking warfarin and dong quai or warfarin and danshen.

V. Communication & Reportable Events to Providers

A. Pharmacists will use clinical judgment in evaluating when to communicate with the provider erring on the more communication than less. Situations warranting communication with the ordering provider may include, but is not limited to:
    1. Contraindications or bleeding risk concerns
    2. Clarifying procedural bleed risks and patient-specific bleeding risk factors
    3. Addition of interacting medication that either may affect or be affected by bridging therapy
    4. Active bleeding or other suspected adverse events

VI. Documentation

A. Deviation from the guidelines is allowed based upon individual patient response. However, the pharmacist will chart all variations and discuss with the prescriber as necessary.
B. Inpatient setting only:
    1. Pharmacy will document in iVents within EPIC when periprocedural anticoagulation management is initiated and for any discussions with the provider to ensure appropriate follow-up.
    2. Orders for adjustment will be entered by the pharmacist in EPIC.
C. Outpatient (Anticoagulation clinic):
    1. Please refer to the Oregon Anticoagulation Services Policy and Procedure

VII. References

1. Douketis JD, Spyropoulos AC, Murad MH, et al. Perioperative Management of Antithrombotic Therapy: An American College of Chest Physicians Clinical Practice Guideline. Chest. 2022;162(5):e207-e243. doi:10.1016/j.chest.2022.07.025
2. Burnett AE, Mahan CE, Vazquez SR, et al. Guidance for the practical management of the direct oral anticoagulants (DOACs) in VTE treatment. J Thromb Thombolysis. 2016; 41:206-32.

3. Steffel J, Verhamme P, Potpara TS, et al. The 2018 European heart rhythm association practical guide on the use of non-vitamin K antagonist oral anticoagulants in patients with atrial fibrillation. European Society of Cardiology. 2018; 39(16): 1330-1393
4. Narouze S, Benzon HT, Provenzano D, et al. Interventional spine and pain procedures in patients on antiplatelet and anticoagulant medications. Interventional spine and pain procedures in patients on antiplatelet and anticoagulant medications (second edition): Guidelines From the American Society of Regional Anesthesia and Pain Medicine, the European Society of Regional Anaesthesia and Pain Therapy, the American Academy of Pain Medicine, the International Neuromodulation Society, the North American Neuromodulation Society, and the World Institute of Pain. Reg Anesth Pain Med. 2018. 43(3): 225-262
5. Pate IJ, Rahim S, Davidson JC, et al. Society of Interventional Radiology Consensus Guidelines for the Periprocedural Management of Thrombotic and Bleeding Risk in Patients Undergoing Percutaneous Image-Guided Interventions - Part II: Recommendations. 2019. 30(8): 1168-1184.
6. Abraham NS, Barkun AN, Sauer BG, et al. American College of Gastroenterology-Canadian Association of Gastroenterology Clinical Practice Guideline: Management of Anticoagulants and Antiplatelets During Acute Gastrointestinal Bleeding and the Periendoscopic Period. Am J Gastroenterol. 2022;117(4):542-558. doi:10.14309/ajg.0000000000001627
7. Herranz-Heras JC, Alcalde-Blanco L, Cañas-Zamarra I, Mencía-Gutiérrez E, Ferro-Osuna M, Pérez-Trigo S. Update on the perioperative management of antiplatelets and anticoagulants in ophthalmic surgery. Arch Soc Esp Oftalmol (Engl Ed). 2021;96(8):422-429. doi:10.1016/j.oftale.2020.11.001
8. Pisters R, Lane DA, Nieuwlaat R, De vos CB, Crijns HJ, Lip GY. A novel user-friendly score (HAS-BLED) to assess 1-year risk of major bleeding in patients with atrial fibrillation: the Euro Heart Survey. Chest. 2010;138(5):1093-100.
9. Kearon C, Hirsh J. Management of anticoagulation before and after elective surgery. NEJM 1997; 336:1506-11.
10. Hornor MA, Duane TM, Ehlers AP, et al. American college of surgeons' guidelines for the perioperative management of antithrombotic medication. Journal of the American College of Surgeons. 2018. 227(5): 521-536.
11. Witt DM, Nieuwlaat R, et al. American Society of Hematology 2018 guidelines for management of venous thromboembolism: optimal management of anticoagulation therapy. Blood Advances, 2018. 2(22): 3257-3291.
12. Douketis JD, Spyropoulos AC, Duncan J, et al. Perioperative management of patients with atrial fibrillation receiving a direct oral anticoagulant. JAMA. 2019. 179(11): 1469-1478
13. LaRue K, Frye A, Tang VW, et al. RX Hot Topics. PMG - Oregon Clinical Pharmacy Department. 2020. 4: 1-6.
14. Doherty JU, Gluckman TJ, Hucker WJ, et al. 2017 ACC Expert Consensus decision pathway for periprocedural management of anticoagulation in patients with nonvalvular atrial fibrillation. A Report American College of Cardiology Clinical Expert Consensus Document Task Force. J Am Coll Cardiol. 2017;69(7):871-898.
15. Baron TH, Kamath PS, and McBane RD. Management of antithrombotic therapy in patients undergoing invasive procedures. N Engl J Med. 2013; 368:2113-2124.
16. Nishimura RA, Otto CM, Bonow RO, et al. 2017 AHA/ACC focused update of the 2014 AHA/ACC guideline for the management of patients with valvular heart disease: a report of the American

College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines.Circulation. 2017;135(25):e1159-e1195. DOI: 10.1161/CIR.0000000000000503.

17. Douketis JD, Spyropoulos AC, Kaatz S, et al. Perioperative bridging anticoagulation in patients with atrial fibrillation. N Engl J Med. 2015;373:822-33.
18. Horlocker TT, Vandermeuelen E, Kopp SL, et al. Regional Anesthesia in the Patient Receiving Antithrombotic or Thrombolytic Therapy. American Society of Regional Anesthesia and Pain Medicine Evidence-Based Guidelines (Fourth Edition). Reg Anesth Pain Med 2018;43: 263–309.
19. January CT, Wann LS, Calkins H, et al. 2019 AHA/ACC/HRS focused update of the 2014 AHA/ACC/HRS guideline for the management of patients with atrial fibrillation: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society. J Am Coll Cardiol 2019; 19: S0735-1097.
20. Haewon L, Babaria V, McCormick ZL. Anticoagulants and Antiplatelet Agents for Cervical Medial Branch Blocks. Spine Intervention Society FactFinders for Patient Safety. https://cdn.ymaws.com/www.spineintervention.org/resource/resmgr/factfinder/21/11.ff.cmbb.anticoag.pdf. Published November 2021.
21. Ashken T, West S. Regional anaesthesia in patients at risk of bleeding [published correction appears in BJA Educ. 2021 Jul;21(7):278]. BJA Educ. 2021;21(3):84-94. doi:10.1016/j.bjae.2020.11.004
22. Kearon C, Akl EA, Ornelas J, et al. Antithrombotic Therapy for VTE Disease: CHEST Guideline and Expert Panel Report [published correction appears in Chest. 2016 Oct;150(4):988]. Chest. 2016;149(2):315-352. doi:10.1016/j.chest.2015.11.026
23. Palareti G, Antonucci E, Mastroiacovo D, et al. The American College of Chest Physician score to assess the risk of bleeding during anticoagulation in patients with venous thromboembolism. J Thromb Haemost. 2018;16(10):1994-2002. doi:10.1111/jth.14253

VIII. Appendix A: Procedural Bleed Risks

A. The risk of bleeding is related to patient's risk factors, the type of surgery or invasive procedure being performed, and the intensity of anticoagulation at the time of the procedure.

B. Table 1 categorizes the bleeding risks of various procedures as a guidance to help determine the patient's bleed risk.

Table 1. Procedural Bleeding Risks[1-7]

Minimal bleed risk surgery/ procedures (30-d risk of major bleed ~0%) No interruption needed	**Low-to-moderate** bleed risk surgery/procedures (30-d risk of major bleed ~0%-2%) Requiring 2-3 drug half-life interruption of anticoagulant therapy	**High** bleed risk procedures requiring interruption of anticoagulant therapy (30-d risk of major bleed >2%) Requiring 4-5 drug half-life interruption of anticoagulant therapy
- Cardiac:	- Abdominal hernia repair - Abdominal hysterectomy	- Any major surgery (procedure duration >45 min)

• Pacemaker • ICD implantation • Cardiac resynchronization therapy defibrillator in the setting of complex anatomy (i.e., congenital heart disease) - Central venous catheter removal - Dental procedures (minor): • Extraction of 1-2 teeth • Restorations • Periodontal surgery • Incision of abscess • Implant positioning • Dental cleanings • Fillings - Dialysis access interventions - Endoscopy without surgery - Ophthalmology: • Cataract procedures - Superficial surgery: • Abscess incision • Minor dermatologic procedures (Excision of basal and squamous cell skin cancers, actinic keratoses, premalignant or cancerous skin nevi)	- Carpal tunnel repair - Cholecystectomy - Dental procedures: • Extraction of 3 or more teeth - Dilatation and curettage - Electrophysiological study or radiofrequency catheter ablation for supraventricular tachycardia (including left-sided ablation via single transseptal puncture) - Endoscopy with biopsy or tissue removal - Gastrointestinal procedures: • endoscopy + biopsy • enteroscopy • biliary/pancreatic stent without sphincterotomy • endosonography without fine-needle aspiration - Hemorrhoidal surgery - Hydrocele repair - IVC filter placement and uncomplicated removals - Non-coronary angiography bronchoscopy + biopsy - Ophthalmology: • Non-cataract eye surgery - Prostate or bladder biopsy - Shoulder/foot/hand surgery and arthroscopy	- Abdominal and gastrointestinal procedures: • Bowel resection • Biliary sphincterectomy • Endoscopic retrograde cholangiopancreatography • PEG placement • Pneumatic dilatation • Polypectomy > 1 cm * • Variceal treatment - Abdominal aortic aneurysm repair - Cancer surgery: • Solid tumor resection (lung, esophagus, gastric, colon, hepatobiliary, pancreatic) - Cardiac surgeries: • Coronary artery bypass • Complex left-sided ablation (pulmonary vein isolation, VT ablation) • Heart valve replacement - Dorsal root ganglion stimulation - Endoscopically guided fine-needle aspiration - Head or neck surgery - IVC filter removal (complex) - Major orthopedic surgery: • Joint replacement/ arthroplasty • Prosthetic revision -Neuraxial anesthesia: • Spinal and epidural anesthesia • Other neuraxial (e.g., pain management) intervention - Neurosurgeries - Plastic surgery:

		• Major reconstructive surgery - Spinal surgeries or procedures • Laminectomy • Lumbar diagnostic puncture - Surgery in highly vascular organs (kidneys, liver, spleen) • Splenic surgeries or procedures • Hepatic surgeries and procedures including liver biopsy and portal vein interventions - Thoracic surgery - Urologic surgeries or procedures: • Kidney biopsy • Bladder resection • Nephrectomy • Stone removal • Transurethral prostate resection • Urologic cancer surgery or tumor ablation - Vascular and general surgeries

* In patients receiving VKA therapy who require VKA interruption for a colonoscopy with anticipated polypectomy, the guidelines suggest against heparin bridging during the period of VKA interruption[1]

IX. Appendix B: Patient-Specific Bleeding Risk Determination

A. Patient-specific risk factors for bleeding with anticoagulant therapy:[22-23]
   - Age
     - >65 years old
     - >75 years old (counted as 2 risk factors)

- History of major bleeding
- Cancer
- Renal failure
- Liver failure
- Thrombocytopenia
- Previous stroke or TIA
- Anemia
- <60% in therapeutic range in patients on warfarin by INR
- Comorbidity and reduced functional capacity
    - Diabetes
    - Chronic obstructive pulmonary disease (COPD)
    - Coronary artery disease (CAD)
    - Peripheral artery disease (PAD)
- Recent surgery
- Frequent falls
- Alcohol abuse
- Interacting medications

B. Table 2 shows estimated risk categories for major bleeding, derived from a cohort of patients on anticoagulation (predominantly warfarin) for the treatment of VTE. Careful considerations should be used when applying this risk stratification tool in different populations. [22-23]

Table 2. Major bleeding categorization and estimation[22]

Major Bleeding Risk Categorizations			
Risk Category	***Low Risk***	***Moderate Risk***	***High Risk***
Number of risk factors	0 risk factors	1 risk factor	≥ 2 risk factors
Estimated Risk of Major Bleeding (%/year)			
Length of Anticoagulation	***Low Risk***	***Moderate Risk***	***High Risk***
0-3 months	1.6	3.2	12.8
>3 months	0.8	1.6	≥ 6.5

C. Bleeding Risk: HAS-BLED Score[8]

1. Providers weigh the risk of thrombosis against the risk of bleeding when initiating and monitoring anticoagulants.
2. The HAS-BLED scoring tool (shown below) can be used to assist in determining bleeding

risk for **patients with atrial fibrillation on warfarin therapy**. This risk stratification tool is not validated for other disease states.

	Condition	Points
H	Hypertension (SBP > 160 mmHg)	1
A	Abnormal renal^ / liver function[#] (1 point each)	1 or 2
S	Stroke	1
B	Bleeding	1
L	Labile INRs	1
E	Elderly (> 65 yo)	1
D	Current drug[*] or alcohol use (1 point each)	1 or 2
Total Points		(max 9)

Total Points	Bleeds per 100 patient-years	Major Bleed Risk Category
0	1.13	Low
1	1.02	Low
2	1.88	Intermediate
3	3.74	High
4	8.70	High
5	12.50	High

Scores > 3 indicate high risk of bleeding

*Including concomitant anti-platelet use
^ SCr >2.6 mg/dL
# AST/ALT/AlkPhos >3 times upper limit of normal and cirrhosis. Bilirubin >2x normal upper limit of normal

X. Appendix C: Risk of Thromboembolism

A. Table 3 attempts to provide additional information to help categorize the risk of thromboembolism to assist in determining the need for periprocedural anticoagulation when oral anticoagulant therapy is temporarily interrupted.

Table 3. Suggested VTE Risk Stratification for Perioperative Thromboembolism[1,10]

Risk Stratum	Indication for VKA Therapy		
	Mechanical Heart Valve[*]	Atrial Fibrillation	VTE*
High (>10% per year risk of ATE or VTE) Bridging suggested	- Any mechanical mitral valve with major risk factors for stroke[b] - Any caged-ball or tilting disc valve prosthesis - Recent (< 3 mo) stroke or TIA	- Annualized stroke risk >10%: • CHA_2DS_2-VASC score of ≥ 7 OR • $CHADS_2$ score	- Recent (within 3 mo VTE) - Severe thrombophilia: • protein C or S deficiency • antithrombin deficiency

	- Other high-risk stroke situations[c]	of 5-6 - Recent (< 3 mo) stroke or transient ischemic attack - Rheumatic valvular heart disease	• homozygous factor V Leiden • prothrombin gene mutation • multiple thrombophilias - Antiphospholipid antibodies - Active cancer associated with high VTE risk[a]
Moderate (4-10% per year of ATE or VTE) Individualized assessment	Bileaflet aortic valve prosthesis with 1 or more major risk factors for stroke[b]	- Annualized stroke risk 5-10%: • CHA_2DS_2-VASC score of 5-6 OR • $CHADS_2$ score of 3-4 - History of stroke, TIA, or thromboembolism >3 months ago - Prior TE ≥3 mo ago	- VTE within past 3-12 mo - Recurrent VTE - Non-severe thrombophilia (e.g., heterozygous factor V Leiden or prothrombin gene mutation) - Active cancer (treated within 6 mo or palliative) - Recent history of cancer (within 5 years, excluding non-melanoma skin cancer)
Low (<4% per year of ATE or VTE) Bridging not suggested	Bileaflet aortic valve prosthesis without major risk factors for stroke[b]	- Annualized stroke risk < 5%: • CHA_2DS_2-VASC score of 1-4 OR • $CHADS_2$ score of 0-2 - No prior TE or TIA/ stroke	VTE > 12 mo previous and no other risk factors

ATE = arterial thromboembolism; CHADS2 = congestive heart failure (1 point), hypertension (1 point), age > 75 years (1 point), diabetes mellitus (1 point), prior stroke or transient ischemic attack (2 points); CHA2DS2-VASc = congestive heart failure (1 point), hypertension (1 point), age ≥ 75 years (2 points), diabetes mellitus (1 point), and stroke or transient ischemic attack (2 points), vascular disease (1 point), age ≥ 65 years (1 point), female sex (1 point); TIA = transient ischemic attack; VKA = vitamin K antagonist; VTE = venous thromboembolism.

*In patients receiving VKA therapy for a mechanical heart valve or VTE who require VKA interruption for an elective surgery/procedure, the guidelines suggest against heparin bridging.

[A] Includes pancreatic cancer, myeloproliferative disorders, primary brain cancer, gastric cancer, and esophageal cancer

[B] Risk factors for thromboembolic events (AF, prior stroke or TIA, previous thromboembolism, LV dysfunction, or hypercoagulable conditions) or an older-generation mechanical AVR (such as ball and cage)[10]

[C] Atrial fibrillation, prior stroke or TIA, hypertension, diabetes, congestive heart failure, and age > 75 years

XI. Appendix D: Bridging In Atrial Fibrillation – Evidence

A. The 2015 BRIDGE trial addressed the necessity of bridging anticoagulation in patients with atrial fibrillation who needed an interruption in warfarin treatment for an elective operation or other elective invasive procedure.[1,17]
    1. Patients with CHADS2 scores ranging from 1-6 (mean 2.3) were randomized to either receive bridging anticoagulation therapy with LMWH or no bridging anticoagulation.
        a. Patients with CHADS2 4-6, stroke, TIA, and mitral stenosis were underrepresented.
    2. Forgoing bridging anticoagulation was found to be non-inferior to perioperative bridging with LMWH for prevention of arterial thromboembolism.
    3. Forgoing bridging anticoagulation was found to significantly reduce the rate of bleeding.
    4. These findings should not be extrapolated to patients with valvular heart disease, history of thromboembolism, or multiple TE risks.

B. The 2018 PAUSE trial evaluated the interruption of direct oral anticoagulants (apixaban, rivaroxaban, and dabigatran) in patients with atrial fibrillation requiring elective surgeries or procedures stratified by bleed risk (low versus high).[1, 12]
    1. Patients with a mean CHA2DS2VASc of 2.1 and mean modified HAS-BLED score of 1.9 were enrolled based on low or high-risk bleeding surgeries or procedures.
        a. Low bleed risk: anticoagulants held 1 day before and after surgeries or procedures.
        b. High bleed risk: anticoagulants held 2 days before and 2-3 days after surgeries or procedures.
    2. Patients with a CrCl < 25 mL/min (apixaban) and < 30 mL/min (dabigatran/rivaroxaban) were excluded. Patients on dabigatran with a CrCl < 50 mL/min had longer interruptions in therapy prior to surgeries or procedures.
    3. Bridge therapy is not necessary for elective surgeries or procedures in patients with atrial fibrillation on direct oral anticoagulation.
    4. Please see Table 4 for further guidance on when to interrupt and re-initiate direct oral anticoagulants based on renal function and bleeding risk of procedure.

C. The American Society of Hematology and the 2012 ACCP Guidelines state that for patients at low to moderate risk of VTE who require interruption of VKA therapy for invasive procedures,

periprocedural bridging with LMWH or UFH is not recommended.[1,17]

D. The American College of Chest Physician (ACCP) and American College of Cardiology (ACC) Expert Consensus Decision Pathway for Periprocedural Management of Anticoagulation in Patients with Nonvalvular Atrial Fibrillation recommends that warfarin should be stopped 5 days prior to an invasive procedure.[14]
    1. In the typical patient, this results in subtherapeutic anticoagulation levels for ~2 days and no anticoagulation for 1-2 days prior to the procedure.
    2. If warfarin is resumed on the day of the procedure, the patient will generally continue to have no anticoagulation for 1 day and subtherapeutic anticoagulation for the next 3-4 days.

E. The 2019 AHA/ACC/HRS focused update recommends oral anticoagulation therapy for at least 3 weeks before and at least 4 weeks after cardioversion in patients with atrial fibrillation or atrial flutter of 48 hours duration or longer.[19]

F. The 2022 CHEST Perioperative Management Guidelines recommend against heparin bridging in patients receiving VKA therapy for atrial fibrillation who require interruption for an elective surgery or procedure.[1]

Revised by: AJ, CH, JO, EL 5/2017. AU, CH 5/2019. SP, CH 3/2021. KT, WH 4/2023.

Approved by OR Region P&T June 2019, March 2021

Attachments

- Bridging In Atrial Fibrillation - Evidence.docx
- Patient-Specific Bleed Risks Determination.docx
- Procedural Bleed Risks.docx
- Risk of Thromboembolism.docx
- Switching Between Anticoagulants.pdf

Approval Signatures

Step Description	Approver	Date
Oregon Service Area Directors (sign after Review Committee approval)	Anthony Lucchi: Director Clinical Pharmacy	08/2024

Oregon Service Area Directors (sign after Review Committee approval)	Kit Thomson: Director Clinical Pharmacy	08/2024
Oregon Service Area Directors (sign after Review Committee approval)	Taben Main: Director Clinical Pharmacy	08/2024
Policy Owner	Andrew Jarrell: Manager Clinical Pharmacy	08/2024

Applicability

OR - Credena Health, OR - Providence Ctr for Medically Fragile Children, OR - Providence Health Oregon Labs, OR - Providence Hood River Memorial Hospital, OR - Providence Medford MC, OR - Providence Medical Group, OR - Providence Milwaukie Hospital, OR - Providence Newberg MC, OR - Providence Portland MC, OR - Providence Seaside Hospital, OR - Providence St. Vincent MC, OR - Providence Willamette Falls MC

Standards

No standards are associated with this document