

## University of Wisconsin Coagulation/Medication Guidelines

The following guidelines are intended to represent the best practices based upon a review of the data available in the current medical literature when deciding upon the need for evaluating and subsequently correcting abnormal coagulation parameters prior to interventional radiology procedures in the Abdominal Imaging Section. These represent recommendations and can be modified at the discretion of the attending radiologist based upon the clinical information pertinent to any individual patient. For the purposes of the guidelines, the procedures will be divided into 2 categories: Low Risk and Elevated Risk. The recommendations within each category will be determined based upon the best evidence regarding risk of hemorrhagic complications for those procedures.

### **Procedural Risk Categories**

#### **Low risk:**

Paracentesis

Thoracentesis

FNA/core of non-solid organ deep or intraperitoneal structures

FNA/core of superficial structures (e.g. thyroid, lymph node, etc)

Aspiration of fluid collection

#### **Elevated risk:**

FNA/core of visceral solid organ (targeted or random)

FNA/core of the lung

Image-guided tumor ablation.

### **Pre-procedural Lab Evaluation**

All patients should be screened for history of unexplained bleeding disorders, anticoagulant medications and risk factors associated with bleeding such as DIC, renal failure, dialysis, etc. These risk factors should be discussed with the attending physician prior to the procedure.

- No labs are required prior to low risk procedures
  - o Exception if there are significantly abnormal lab values already documented in the medical record (INR >3, platelets < 25,000). These patients may need labs prior to the procedure at the discretion of the attending radiologist
  
- INR and platelets should be evaluated prior to elevated risk procedures as follows:

	Critical coagulation value
INR	<2.0
Platelets	>25,000

Inpatients: INR and platelet count within 1 week or day of procedure if on warfarin.  
 Outpatients: INR and platelet count within 6 months if previously normal, or within 30 days if previously abnormal. INR day of procedure if on warfarin.

Note that anemia, while not a risk factor for hemorrhagic complications, can be problematic if such a complication occurs. Therefore, should consider evaluating a Hemoglobin in patients with a history of anemia prior to high risk procedures. This is purely at the discretion of the attending radiologist.

If coagulation values fall outside of these parameters, then should consider correction prior to the procedure. Note that transfusion of platelets and plasma do have their own risks, the most common of which is transfusion-related acute lung injury, which can occur in up to 8% of patient, with an associated mortality of 5-10%. Thus, any correction of abnormal coagulation values should be weighed against this risk.

**Medication Management**

The below recommendations are intended to cover the majority of medications. Note that they pertain only to elective procedures as urgent/emergent procedures may require either a shorter hold, or not discontinuing the medication. Note that discontinuing anticoagulation after coronary/cardiac stent placement can be associated with a significant risk of cardiopulmonary event and even death. Therefore, those patients should be managed in consultation with the managing physician and if the procedure is deemed necessary, those patients should either continue their anticoagulation, or be bridged to the procedure. Minimum safe window prior to holding these medications in these patients is 2-4 weeks after angioplasty, 1 month for a bare metal stent, and 12 months for a drug eluting stent.

Medication	Low risk hold	Elevated risk hold
Aspirin	No	3 days (less if urgent)
<b>ADP Inhibitors:</b> Plavix (clopidogrel) Effient (prasugrel) Brilinta (ticagrelor)	5 days (less if urgent)	5 days (less if urgent)
<b>Phosphodiesterase inhibitors:</b> Persatine (dipyridamole) Pletal (cilostazol) Trental (pentoxifyline)	3 days (less if urgent)	3 days
<b>Vitamin K antagonists:</b> Coumadin, Jantoven (warfarin)	No (unless supra-therapeutic)	3-5 days to bring INR < 2.0

		Should coordinate with patient's prescribing provider as needed	
<b>Heparins:</b> Heparin IV	4-6 hours	4-6 hours	
Heparin sub Q	No	6-8 hours	
Low Molecular Weight Heparin (LMWH) : (Enoxaparin, (Lovenox), Dalteparin, (Fragmin), Tinzaparin	12 hours (less if urgent)	12 hours (less if urgent)	
Fondaparinux (Arixtra )	3 days	3 days	
<b>Direct thrombin inhibitors:</b> Pradaxa (dabigatran)	No	2 days (4 days if EGFR < 50)	
Argatroban, bivalirudin	4 hours	4 hours	
<b>Factor Xa inhibitors:</b> fondaparinux (Arixtra), rivaroxaban (Xarelto), apixaban (Eliquis)	No	3-4 days	
edoxaban (Svaysa)	No	CrCl ≥ 50 ml/min	CrCl < 50 ml/min
		48 hours	72 hours
<b>IIb/IIIa antagonists:</b> Aggrastat (Tirofiban) Abciximab (Reopro) Eptifibatide (Integrelin) Lamifiban	These medications are generally utilized acutely for coronary interventions and thus, are generally IMC/ICU patients. Any alteration should be coordinated and discussed with the care team.		
<b>Platelet aggregation inhibitor:</b> Ticlid (ticlopidine)	10 days (less if urgent)	10 days	
<b>Thrombin receptor inhibitors:</b> Vorapaxar (Zontivity)	6 weeks (less if urgent)	6 weeks	

Please see the below reference for any further information on any of these medications and realize that these medications are constantly evolving and individual cases may need to be managed on a case-by-case basis. Reversal agents are available for some of these medications and elucidated in the below reference,

but should be reserved for emergent situations and only given in consultation with the referring team.

Atwell, T. D., Wennberg, P. W., McMenemy, B. P., Murthy, N. S., Anderson, J. R., Kriegshauser, J. S., & McKinney, J. M. (2017). Peri-procedural use of anticoagulants in radiology: an evidence-based review. *Abdominal Radiology*, 1-10. DOI: 10.1007/s00261-016-1027-x

**Restarting anticoagulants after a procedure:**

There are no exact guidelines on when it is safe to restart anticoagulants after a procedure, but in general, one should wait a minimum of 12 hours and preferably at least 24 hours. This may require discussion with the referring physician.

**Other medications:**

There are numerous other medications that can impact bleeding risk. In our patient population, the most pertinent are chemotherapeutic drugs (e.g. EGFR inhibitors like Avastin), antibiotics like sulfonamides, and H2 blockers like Pepcid. However, most of these have minimal effect and should not be an indication to alter procedural planning.

**Special considerations**

- Do not stop heparin, aspirin, plavix or any other anticoagulant drug on a Neuroendovascular patient for any procedure, either inpatient, or outpatient, without first consulting with the Neuroendovascular attending.
- Please consult with the attending radiologist for any patient on anticoagulation that can't be held according to the guidelines prior to scheduling the procedure.
- Note that patients who have renal insufficiency, or are on dialysis are at increased risk of bleeding. Depending on other factors, may consider DDAVP in these patients in consultation with the referring provider.
- In general, patients with cirrhosis and chronic liver disease have balanced coagulation and anticoagulation factors that result in a lower bleeding risk than would be suspected based upon the INR and platelets. These patients do not require correction of abnormal lab values. Acute liver failure is different and these patients do often require correction of abnormal lab values.