

## TRA IR Anticoagulation Guidelines

*Adapted for TRA from the 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. (J Vasc Interv Radiol 2019; 30:1168–1184)*

PROCEDURE	LOW BLEEDING RISK PROCEDURE	HIGH BLEEDING RISK PROCEDURE
		ARTERIAL ANGIOGRAM/INTERVENTIONS SHEATH ≤ 6 F, EMBOLOTHERAPY
	AV FISTULA/GRAFT EVALUATION/INTERVENTION	BILIARY INTERVENTIONS (INCLUDING CHOLECYSTOSTOMY TUBE PLACEMENT)
	BACLOFEN PUMP STUDY	CATHETER DIRECTED THROMBOLYSIS (DVT, PE, PORTAL VEIN)
	BILIARY CATHETER REMOVAL/EXCHANGE	DEEP ABSCESS DRAINAGE (I.E. LUNG PARENCHYMA, ABDOMINAL, PELVIC & RETROPERITONEAL COMPARTMENTS)
	BONE BIOPSY (SUPERFICIAL; EXCLUDES VERTEBRAL BODY)	DEEP NON-ORGAN BIOPSIES (I.E. SPINE, SOFT TISSUE IN INTRAABDOMINAL, RETROPERITONEAL & PELVIC COMPARTMENTS)
	BONE MARROW BIOPSY	DEEP PERCUTANEOUS DRAIN PLACEMENT (I.E. ABSCESS DRAIN)
	CENTRAL LINE OR PORT EVALUATION/INJECTION	DEEP SOFT TISSUE BIOPSY/ASPIRATION/DRAINAGE (INTRATHORACIC OR INTRA ABDOMINAL)
	CHECK/EXCHANGE PERCUTANEOUS CATHETER DRAIN (I.E. ABSCESS DRAIN)	FACET JOINT INJECTION (CERVICAL)
	CHEST TUBE NON-TUNNELED/TUNNELED	GASTROSTOMY/JEJUNAL/GASTRIC-JEJUNAL FEEDING TUBE ORIGINAL PLACEMENT
	DOUBLE J URETERAL STENT PLACEMENT W/ PRE-EXISTING ACCESS	INTRA ABDOMINAL SOLID ORGAN BIOPSY (LIVER, SPLEEN BIOPSY)
	FACET JOINT INJECTION (NON-CERVICAL)	IVC FILTER REMOVAL COMPLEX
	GASTROSTOMY/GASTROJEJUNAL/JEJUNAL TUBE REMOVAL/EXCHANGE (MATURE TRACT)	PORTAL VEIN INTERVENTIONS
	IVC FILTER PLACEMENT/REMOVAL (ROUTINE)	SOLID ORGAN BIOPSIES (LIVER, KIDNEY, SPLEEN, LUNG)
	JOINT ASPIRATION AND JOINT INJECTIONS (ARTHROGRAM AND ARTHROCENTESIS)	SPINE PROCEDURES WITH RISK OF SPINAL OR EPIDURAL HEMATOMA (I.E. LP, KYPHOPLASTY, VERTEBROPLASTY, EPIDURAL INJECTIONS, FACET BLOCKS CERVICAL SPINE)
	NEPHROSTOGRAM, LOOPOGRAM OR NEPHROSTOMY TUBE REMOVAL (MATURE TRACK)	TRANSJUGULAR INTRAHEPATIC PORTOSYSTEMIC SHUNT
	NEPHROSTOMY REMOVAL/EXCHANGE	URINARY TRACT INTERVENTIONS (INCLUDING NEPHROSTOMY TUBE PLACEMENT, URETERAL DILATION, STONE REMOVAL)
	NON-TUNNELED CENTRAL LINE PLACEMENT AND REMOVAL	VENOUS INTERVENTIONS: INTRATHORACIC AND CNS INTERVENTIONS
	NON-TUNNELED DIALYSIS LINE PLACEMENT AND REMOVAL	
	PARACENTESIS	
	PICC LINE PLACEMENT	
	PORT PLACEMENT	
	PORT REMOVAL	
	SI JOINT STEROID INJECTION	
	SUPERFICIAL SOFT TISSUE BIOPSY/ASPIRATION/DRAINAGE (NOT INTRATHORACIC OR INTRA ABDOMINAL; PALPABLE LESION, LYMPH NODE, SOFT TISSUE, BREAST,)	
	THORACENTESIS	
	THYROID BIOPSY	
	TRANSFORAMINAL SELECTIVE NERVE ROOT STEROID INJECTION CERVICAL/THORACIC/LUMBAR	
	TRANSJUGULAR LIVER BIOPSY	
	TUNNELED CATHETER PLACEMENT (DIALYSIS/CENTRAL LINE)	
	TUNNELED CATHETER REMOVAL	
	VENOGRAM/VENOUS INTERVENTIONS: PELVIS AND EXTREMITIES; NOT INTRATHORACIC OR CNS)	

### Pre Procedure Screening Coagulation Laboratory Test

	Low Bleeding Risk Procedures	High Bleeding Risk Procedures
PT/INR	Not routinely recommended	Recommended
HEMAGLOBIN	Not routinely recommended	Recommended
PLATELET	Not routinely recommended	Recommended
INFO	<b>INR:</b> Correct to range of 2.0 - 3.0/ <b>Platelet:</b> Transfuse for < 20,000	<b>INR:</b> Correct to within range of ≤ 1.5–1.8/ <b>Platelet:</b> Transfuse if < 50

### Suggested Laboratory Thresholds for Performance of a Procedure in Patients with **Chronic Liver Disease**

INR	NA	< 2.5
Platelet	> 20,000	> 30,000
Fibrinogen (mg/dL)	> 100,000	> 100,000

*The suggested laboratory thresholds and strategies for correction are based on expert opinion. The addition of a **fibrinogen level** to laboratory testing for patients with chronic liver disease who plan to undergo a procedure may be helpful.*

**Recommendation low platelets:** administer a dose of platelets in patients with a large spleen if platelet count is below suggested thresholds.

**Recommendation for low fibrinogen:** administer 1 dose (body weight < 80 kg) or 2 doses (body weight > 80 kg) of cryoprecipitate.

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### Management Recommendations for Anticoagulant and Antiplatelet Agents

Medication	Low Bleeding Risk Procedures	High Bleeding Risk Procedures
<b>Anticoagulants</b>		
<b>Unfractionated Heparin</b>		
Withholding	Do not withhold	Withhold IV heparin for 4–6 h before procedure; check aPTT or anti-Xa level; for BID or TID dosing of SC heparin, procedure may be performed 6 h after last dose
Reinitiation	NA	6–8 h
<b>LMWH: enoxaparin (Lovenox), dalteparin (Fragmin)</b>		
Withholding	Do not withhold	<b>Enoxaparin:</b> withhold 1 dose if prophylactic dose is used; withhold 2 doses or 24 h before procedure if therapeutic dose is used; check anti-Xa level if renal function impaired; <b>Dalteparin:</b> withhold 1 dose before procedure
Reinitiation	NA	12 h
<b>Fondaparinux (Arixtra)</b>		
Withholding	Do not withhold	Withhold 2-3 d (CrCl ≥ 50 mL/min) or 3–5 d (CrCl ≤ 50 mL/min)
Reinitiation	NA	24 h
<b>Argatroban (Acova)</b>		
Withholding	Do not withhold	Withhold 2–4 h before procedure; check aPTT
Reinitiation	NA	4–6 h
<b>Bivalirudin (Angiomax)</b>		
Withholding	Do not withhold	Withhold 2–4 h before procedure† ; check aPTT
Reinitiation	NA	4-6 h
<b>Warfarin (Coumadin)</b>		
Withholding	Target INR ≤ 3.0; consider bridging for high thrombosis risk cases	Withhold 5 d until target INR ≤ 1.8; consider bridging for high thrombosis risk cases; if STAT or emergent, use reversal agent
Reinitiation	NA or same-day reinitiation for bridged patients	Resume day after procedure; high thrombosis risk cases may benefit from bridging with LMWH and multidisciplinary management especially if reversal agent used along with vitamin K
<b>Apixaban (Eliquis)</b>		
Withholding	Do not withhold	Withhold 4 doses (CrCl ≥ 50 mL/min) or 6 doses (CrCl < 30–50 mL/min); if procedure is STAT or emergent, use reversal agent (andexanet alfa); consider checking anti-Xa activity or apixaban level especially with impaired renal function
Reinitiation	NA	24h
<b>Betrixaban (Bevyxxa)</b>		
Withholding	Do not withhold	Withhold for 3 doses; if procedure is STAT or emergent, use reversal agent (andexanet alfa); consider checking anti-Xa activity especially with impaired renal function
Reinitiation	NA	24h
<b>Dabigatran (Pradaxa)</b>		
Withholding	Do not withhold	Withhold 4 doses (CrCl 50 ≥ mL/min) or 6–8 doses (CrCl < 30–50 mL/min); if procedure is STAT or emergent, use reversal agent (idarucizumab); consider checking thrombin time or dabigatran level with impaired renal function
Reinitiation	NA	24h
<b>Edoxaban (Savaysa)</b>		
Withholding	Do not withhold	Withhold for 2 doses; if procedure is STAT or emergent, use reversal agent (andexanet alfa); consider checking anti-Xa activity especially with impaired renal function

Reinitiation	NA	24h
<b>Rivaroxaban (Xarelto)</b>		
Withholding	Do not withhold	Defer procedure until off medication for 2 doses (CrCl ≥ 50 mL/min), 2 doses (CrCl < 30–50 mL/min), or 3 doses (CrCl < 15–30 mL/min); if procedure is STAT or emergent, use reversal agent (andexanet alfa); consider checking anti-Xa activity or rivaroxaban level especially with impaired renal function
Reinitiation	NA	24h
<b>Antiplatelet agents: thienopyridines</b>		
<b>Clopidogrel (Plavix)</b>		
Withholding	Do not withhold	Withhold for 5 d before procedure
Reinitiation	NA	Reinitiation can occur 6 h after procedure if using 75-mg dose but should occur 24 h after procedure if using a loading dose (300–600 mg)
<b>Ticagrelor (Brilinta)</b>		
Withholding	Do not withhold	Withhold for 5 d before procedure
Reinitiation	NA	Resume day after the procedure
<b>Prasugrel (Effient)</b>		
Withholding	Do not withhold	Withhold for 7 d before procedure
Reinitiation	NA	Resume the day after procedure
<b>Cangrelor (Kengreal)</b>		
Withholding	Defer procedure until off medication; if procedure is emergent, withhold 1h before procedure; <b>multidisciplinary discussion with</b>	
Reinitiation	Patients receiving cangrelor are undergoing PCI or are within immediate periprocedural period from cardiac intervention;	
<b>Antiplatelet agents: NSAIDs</b>		
<b>Aspirin</b>		
Withholding	Do not withhold	Withhold 3–5 d before procedure
Reinitiation	NA	Resume the day after procedure
<b>Aspirin/dipyridamole (Aggrenox)</b>		
Withholding	Do not withhold	Withhold 3–5 d before procedure
Reinitiation	NA	Resume the day after procedure
<b>Short-acting NSAIDs (half-life 2–6 h): ibuprofen, diclofenac, ketoprofen, indomethacin, ketorolac</b>		
Withholding	Do not withhold	No recommendation
Reinitiation	NA	NA
<b>Intermediate-acting NSAID (half-life 7–15 h): naproxen, sulindac, diflunisal, celecoxib</b>		
Withholding	Do not withhold	No recommendation
Reinitiation	NA	NA
<b>Long-acting NSAIDs (half-life &gt; 20 h): meloxicam, nabumetone, piroxicam</b>		
Withholding	Do not withhold	No recommendation
Reinitiation	NA	NA
<b>Antiplatelet agents: glycoprotein IIb/IIIa inhibitors: Long-acting</b>		
<b>abciximab (ReoPro)</b>		
Withholding	Withhold 24h before procedure	Withhold 24 h before procedure
Reinitiation	Patients receiving glycoprotein IIb/IIIa inhibitor are undergoing PCI or within immediate periprocedural period from cardiac	
<b>Antiplatelet agents: glycoprotein IIb/IIIa inhibitors: Short-acting/tirofiban (Aggrastat)</b>		
<b>eptifibatide (Integrilin),</b>		
Withholding	Withhold 4–8 h before procedure	Withhold 4–8 h before procedure
Reinitiation	Patients receiving glycoprotein IIb/IIIa inhibitor are undergoing PCI or within immediate periprocedural period from cardiac	
<b>Other</b>		
<b>Cilostazol (Pletal)</b>		
Withholding	Do not withhold	Do not withhold
Reinitiation	NA	NA

### Summary of Commonly Used Blood Components

Blood Component	Approximate Volume of 1 Dose (mL)	Expected Degree of Correction	Other Considerations
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<b>PRBCs</b>	300	1 U PRBC increases hemoglobin by 1 g/dL in normal-sized adult	Patients receiving chronic transfusions (eg, sickle-cell anemia) may develop multiple alloantibodies, making it difficult to identify matched unit
<b>Plasma</b>	250	Any plasma can be used to treat multiple factor deficiency; adequate dose of plasma 10–15 mL/kg to manage coagulopathy	FVIII reduced significantly except in FFP; contraindicated for VKA reversal due to availability of 4F-PCC
<b>Platelets</b>	250–300	One dose of platelets increases the platelet count by 25,000–50,000 in normal-sized patient <b>without splenomegaly</b>	
<b>Cryoprecipitate</b>	100–200	Adult dose provides 3 g of fibrinogen and can increase fibrinogen by 100 mg/dL in normal sized person; 1 dose of cryoprecipitate also contains ~1,000 U of VWF and factor VIII	Rich source of fibrinogen (2–4 g per dose)