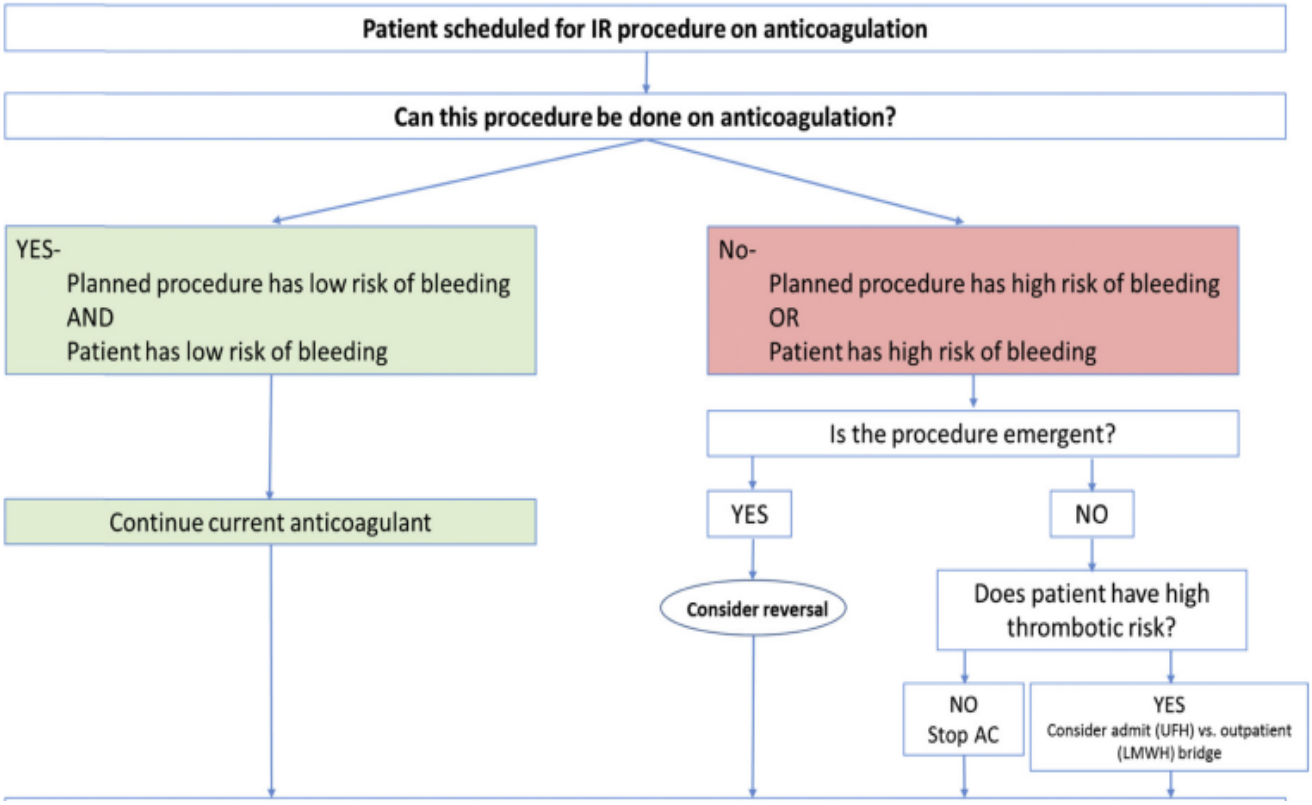
Society of Interventional Radiology (SIR) Consensus 2019 Guidelines for the Periprocedural Management of Thrombotic and Bleeding Risk in Patients Undergoing Percutaneous Image-Guided Interventions

The approach before an interventional procedure depends on the patient's overall clinical status, thromboembolic and bleeding risks, and the procedure-associated bleeding risk.



The first step is to determine the bleeding risk associated with the interventional procedure and patient bleeding risk.

1. **Procedure-Associated Bleeding Risk Categorization**

Low Bleeding Risk Procedures

- Thoracentesis and paracentesis
- Nontunneled chest tube placement
- Nontunneled venous access and removal
- Tunneled venous catheter placement/removal (including ports)
- Dialysis access interventions
- IVC filter placement and removal
- Trans jugular liver biopsy
- Lumbar puncture
- Catheter exchanges (gastrostomy/gastrojejunostomy, biliary, nephrostomy, abscess)

- Diagnostic arteriography and arterial interventions: peripheral, sheath <6F, embolotheraphy
- Diagnostic venography and select venous interventions
- Peripheral nerve blocks, joint, and musculoskeletal injections
- Superficial abscess drainage or biopsy of palpable lesions

High Bleeding Risk Procedures

- Ablations: solid organs, bone, soft tissue, lung
- Arterial interventions: > 7-F sheath, aortic, pelvic, mesenteric, CNS
- Biliary interventions (including cholecystostomy tube placement)
- Catheter directed thrombolysis (DVT, PE, portal vein)
- Deep abscess drainage (e.g., lung parenchyma, abdominal, pelvic, retroperitoneal)
- Deep nonorgan biopsies (e.g., spine, soft tissue in intraabdominal, retroperitoneal, pelvic compartments)
- Gastrostomy/gastrojejunostomy placement
- IVC filter removal complex
- Portal vein interventions
- Solid organ biopsies
- Spine procedures with risk of spinal or epidural hematoma (e.g., kyphoplasty, vertebroplasty, epidural injections, facet blocks cervical spine)
- Transjugular intrahepatic portosystemic shunt
- Urinary tract interventions (including nephrostomy tube placement, ureteral dilation, stone removal) Venous interventions: intrathoracic and CNS interventions

2. Assessment of Patient Bleeding Risk

a. **Clinical Assessment:**

Although, there are currently no well validated scoring systems that can be used to assess bleeding risk across interventional radiologic procedures, the VTE-BLEED and the HAS-BLED score are often used in clinical practice as a general guide.

VTE -BLEED score:

- Hx of cancer
- Male with uncontrolled HTN
- Anemia
- Hx od bleeding
- GFR <60

Score ≥2: higher bleeding risk

HAS-BLED Score (Score > 3 Predictive of Bleeding Events)

Criteria	Points
Hypertension (systolic BP > 160 mm Hg)	1
Abnormal renal function (dialysis, renal transplantation, serum Cr > 200 µmol/L)	1
Abnormal liver function (cirrhosis or bilirubin > 2× ULN, AST or ALT > 3× ULN)	1
Prior stroke	1
History of major bleeding or predisposition to bleeding (anemia)	1
Labile INR (VKA) defined as time in therapeutic range < 60%	1
Age > 65 y	1
Concomitant use of antiplatelet agent or NSAID	1
History of alcohol or drug use (> 8 drinks per week)	1

Other Risk Factors for Bleeding

- Prior bleeding within 3 mo
- Prior bleeding with similar type of procedu
- Platelet abnormality
- INR above therapeutic range at time of procedure (VKA)
- Prior bleeding with bridging therapy
- Mechanical mitral heart valve
- Active cancer

b. **Laboratory Parameters for Bleeding Risk Procedures:**

Low Bleeding Risk Procedures

- Screening coagulation laboratory testing are not routinely recommended but should be considered for patients with high risk factors for bleeding or those receiving coumadin or heparin drip.
    - Maintain INR to within range of ≤ 2.0-3.0. Low bleeding risk procedures involving percutaneous and venous access have been performed safely at INRs within the range of 2.0-3.0. The varying degrees of bleeding risk within procedural categories should be taken into consideration to target <2 or <3.
    - For procedures that require arterial access, the recommended INR thresholds are < 1.8 for femoral access and < 2.2 for radial access.
    - Transfuse platelet if count lower than 20.000.

High Bleeding Risk Procedures

- Screening coagulation laboratory testing are recommended.
    - Maintain INR to within range of ≤1.5-18. The varying degrees of bleeding risk within procedural categories should be taken into consideration (i.e., an INR < 1.8 may be acceptable for a liver biopsy but an INR < 1.5 may be preferred before an aortic intervention.
    - Transfuse platelet if count lower than 50.000.

Cirrhosis

Because of the physiology of rebalanced hemostasis of anticoagulation and procoagulation in cirrhosis, studies have repeatedly documented that abnormal screening coagulation test results, such as prolonged PT/INR and thrombocytopenia, do not correlate with bleeding in these patients.

As a result of consensus opinion, the SIR recommends the following thresholds for patients with cirrhosis:

- For low risk procedures
    - Do not monitor INR
    - Target Platelets >20.000 and fibrinogen >100

- For high risk procedures

- Target INR <2.5, Platelets >30.000 and fibrinogen >100

DOACs

Routine laboratory monitoring is not required for patients receiving DOACs.
All DOACs may affect routine coagulation test results in a variable manner, but not in ways that allow for reliable quantitative measurement of the anticoagulation effect.

Management Recommendations for Anticoagulant and Antiplatelet Agents

For low bleeding risk procedures and patient with low risk for bleeding

- Do not withhold anticoagulants such as heparin, enoxaparin, fondaparinux, argatroban, or bivalirudin.
- If patient is on coumadin and INR >3, withhold coumadin targeting INR ≤3.
- Do not withhold DOACs.
- Do not withhold most antiplatelets except for:
  - Long-acting abciximab (ReoPro): withhold 24 h before procedure
  - Short-acting: eptifibatide (Integrilin), tirofiban (Aggrastat): withhold 4-8 h before procedure

For high risk bleeding risk procedures or patient with high risk for bleeding

- Heparin: withhold IV heparin for 4-6 h before procedure; for BID or TID dosing of SC heparin, procedure may be performed 6 h after last dose. Reinitiate 6-8 h after procedure.
- Enoxaparin (Lovenox): withhold 1 dose if prophylactic dose is used; withhold 2 doses or 24 h before procedure if therapeutic dose is used. Reinitiate 12 h after procedure.
- Argatroban: withhold 2-4 h before procedure. Reinitiate 4-6 h after procedure.
- Coumadin: withhold 5 d until target INR ≤1.8; consider bridging for high thrombosis risk cases.
- Apixaban (Eliquis): withhold 4 doses (CrCl 50 mL/min) or 6 doses (CrCl < 30–50 mL/min)4. Reinitiate 24 h after procedure.
- Ribaroxaban (Xarelto): withhold 2 doses (CrCl 50 mL/min), or 3 doses (CrCl < 15–30 mL/min). Reinitiate 24 h after procedure.
- Clopidogrel (Plavix): withhold for 5 d before procedure. Reinitiate 6 h after procedure if using 75-mg dose but should occur 24 h after procedure if using a loading dose (300–600 mg).
- Ticagrelor (Brilinta): withhold for 5 d before procedure. Reinitiate the day after procedure.
- Prasugrel (Effient): withhold for 7 d before procedure. Reinitiate the day after procedure.
- Cangrelor (Kengreal): withhold 1 h before procedure. Shared decision making recommended for reinitiating.