Interventional Radiology:
Pre-Procedural Management Guidelines

Background:

Appropriate pre-procedural management of patients undergoing percutaneous image-guided interventions is complicated by many factors including:

- Wide range of procedures
- Heterogeneous patient population
- Absence of strong evidence surrounding this setting
- New and changing medications

In patients taking long-term antithrombotic medications, the risk of a cardiovascular or thromboembolic event must be weighed against the risk of bleeding for a given patient undergoing a specific procedure. In general, it is preferred to confirm absence of residual antithrombotic drug activity by performing objective laboratory coagulation parameters; however when these are unavailable (e.g. for Direct Oral Anticoagulants such as apixaban or rivaroxaban), a time lapse of five half lives of a particular drug is used as a measure of normalized bleeding risk.

Caution: Half-lives of antithrombotic medications differ, and increase with worsening renal function, affecting when the drug should be stopped prior to procedure.

NOTE: Because of variability in patient thrombosis and bleeding risks, as well as the paucity of prospective data and varied clinical opinion, this area remains controversial and individual physician-patient decisions may differ from the suggested guidelines below.

Objectives:

1. To provide effective, safe, and efficient management of patients undergoing **elective** percutaneous image-guided procedures
2. To summarize appropriate holding times for commonly prescribed antithrombotic medications, prior to **elective** percutaneous image-guided procedures

Prepared by: Interventional Radiology, Electronic Order Set Team (February 2022). Reviewed by: Drs. Patrick Kennedy, Ryan Margau Margau, Irvine Jacobs, Hassan Deif, and Ben Bell, Katie Johnson, Scott Ball, Jennifer Zadravec, Arzina Remtulla, Jenny Chiu, P & T Committee (February to April 2022) Approved by:

Interventional Radiology: Pre-Procedural Management Guidelines

Table 1: Interventional Radiology Procedures and Preparation Instructions

See Table 2 for detailed management recommendations for procedures categorized as either **Category 1** or **Category 2** bleeding risk. If the proposed procedure is not listed below the interventional radiologist will determine pre-procedure management based on current guidelines if applicable, available evidence, and the specific clinical scenario.

Vascular Procedures	
Embolization (e.g. uterine artery/fibroid embolization, angiomyolipoma embolization, varicocele embolization)	- Follow **Category 1** recommendations for routine embolizations - Follow **Category 2** recommendations in the following scenarios: arterial sheath size ≥ 7 French, acute bleeding, or aneurysm embolization - Patient must be able to lay flat for duration of procedure, and for four hours post-procedure if transfemoral access is planned - For pre-procedure antibiotics, refer to NYGH Surgical Prophylaxis Guidelines
Tunneled central venous access device (e.g. Port-a-Cath, Hickman line, tunneled dialysis catheter)	- Follow **Category 1** recommendations - Can be used immediately unless otherwise directed by the radiologist or referring physician - For pre-procedure antibiotics, refer to NYGH Surgical Prophylaxis Guidelines
IVC filter insertion	- Follow **Category 1** recommendations - Should only be placed in patients with acute pulmonary embolism or acute proximal DVT with contraindications for anticoagulation - If filter is placed, a planned removal date should be set prior to insertion if possible
IVC filter removal	- Follow **Category 1** recommendations if simple removal is anticipated (i.e. dwell time < 1 year and first attempted removal) - Follow **Category 2** recommendations if complex removal is anticipated (i.e. dwell time > 1 year or previous unsuccessful removal) - Patient must have a CT venogram with contrast performed within 2 weeks reviewed by the interventional radiologist prior to removal to ensure no large clot burden within filter
Angioplasty and stenting	- Follow **Category 1** recommendations for routine lower extremity angioplasty and stenting - Follow **Category 2** recommendations in the following scenarios: arterial sheath size ≥ 7 French or iliac, celiac, or superior mesenteric artery angioplasty/stenting
Drainages and Tube Insertions	
Paracentesis	- Follow **Category 1** recommendations - If patient requires a large volume paracentesis due to liver disease, referring physician to arrange albumin infusion
Thoracentesis	- Follow **Category 1** recommendations - Bilateral thoracenteses to be performed on two separate days
Abscess drainage	- Follow **Category 1** recommendations if superficial (e.g. palpable, breast, abdominal wall, extremity) - Follow **Category 2** recommendations if deep (e.g. lung, abdominal, pelvic, retroperitoneal)

Prepared by: Interventional Radiology, Electronic Order Set Team (February 2022). Reviewed by: Drs. Patrick Kennedy, Ryan Margau Margau, Irvine Jacobs, Hassan Deif, and Ben Bell, Katie Johnson, Scott Ball, Jennifer Zadravec, Arzina Remtulla, Jenny Chiu, P & T Committee (February to April 2022) Approved by:

Interventional Radiology: Pre-Procedural Management Guidelines

Chest tube insertion	- Follow **Category 1** recommendations - Timed chest radiograph may be ordered post-procedure
Catheter exchange (any non-vascular catheter change or reinsertion through an existing tact, including gastrostomy-to-gastrojejunostomy conversion)	- Follow **Category 1** recommendations - For enteric tube exchanges, hold feeds for 4 hours
Gastrostomy or gastrojejunostomy tube insertion	- Follow **Category 2** recommendations - Gastroenterology consultation should be obtained first regarding potential for endoscopically placed tube - Nasogastric tube required - NPO at midnight - For pre-procedure antibiotics, refer to NYGH Surgical Prophylaxis Guidelines
Biliary intervention (transhepatic biliary drainage and cholecystostomy)	- Follow **Category 2** recommendations - For transhepatic biliary drainage, ensure internal drainage by ERCP has been considered or attempted first - For cholecystostomy, ensure surgical consultation has been obtained - For pre-procedure antibiotics, refer to NYGH Surgical Prophylaxis Guidelines
Urinary tract intervention (nephrostomy, nephroureterostomy via new puncture, suprapubic catheter insertion)	- Follow **Category 2** recommendations - Ensure urology consultation has been obtained - For pre-procedure antibiotics, refer to NYGH Surgical Prophylaxis Guidelines
Biopsies	
Superficial biopsy (cervical/axillary/inguinal lymph node, palpable lesion, soft tissue, thyroid, breast)	- Follow **Category 1** recommendations - Must be done prior to 1300 hours if querying lymphoma
Deep non-organ biopsy (e.g. retroperitoneal/intra-abdominal lymph node, deep pelvic mass, bone)	- Follow **Category 2** recommendations - Must be done prior to 1300 hours if querying lymphoma
Liver biopsy	- Follow **Category 2** recommendations for transabdominal liver biopsy - Follow **Category 1** recommendations for transjugular liver biopsy, EXCEPT transfuse if platelets ≤ 30 x 10^9/L - Transjugular liver biopsy should only be performed if transabdominal liver biopsy is contraindicated
Lung biopsy	- Follow **Category 2** recommendations - Timed chest radiograph may be required post-lung biopsy
Kidney biopsy	- Follow **Category 2** recommendations - If random biopsy, must have nephrology consult prior and must be done before 1200 hours
Other solid organ biopsy (e.g. pancreas, spleen, prostate)	- Follow **Category 2** recommendations

Prepared by: Interventional Radiology, Electronic Order Set Team (February 2022). Reviewed by: Drs. Patrick Kennedy, Ryan Margau Margau, Irvine Jacobs, Hassan Deif, and Ben Bell, Katie Johnson, Scott Ball, Jennifer Zadravec, Arzina Remtulla, Jenny Chiu, P & T Committee (February to April 2022) Approved by:

Interventional Radiology:
Pre-Procedural Management Guidelines

Other Fluoroscopic Procedures	
Lumbar puncture	- Follow **Category 1** recommendations, EXCEPT transfuse if platelets < 50 x 10^9/L - Should be attempted at bedside prior to ordering image-guided puncture - Referring physicians must give clinical history and specify tests to be performed on specimens
Other spine interventions	- Follow **Category 1** recommendations for procedures without risk of spinal or epidural hematoma (e.g. lumbar facet joint injection) - Follow **Category 2** recommendations for procedures with risk of spinal or epidural hematoma (e.g. cervical facet joint injection, epidural steroid injection, selective nerve root block) - Performed Wednesdays and Fridays unless requested by referring physician
Superficial injection, aspiration, or pain intervention	- Follow **Category 1** recommendations - Performed Wednesdays and Fridays unless requested by referring physician
Gastrointestinal Contrast Studies	**- No significant bleeding risk** - Only performed Wednesdays and Fridays - Patient must be NPO from midnight the night before - Barium will be used unless requested otherwise - Barium Series may delay other abdominal imaging by up to one week (e.g. CT Abdomen/Pelvis)
Cystogram	- **No significant bleeding risk** - Patient needs Foley catheter in place prior to the procedure - Foley will be left in place unless requested otherwise

Prepared by: Interventional Radiology, Electronic Order Set Team (February 2022). Reviewed by: Drs. Patrick Kennedy, Ryan Margau Margau, Irvine Jacobs, Hassan Deif, and Ben Bell, Katie Johnson, Scott Ball, Jennifer Zadravec, Arzina Remtulla, Jenny Chiu, P & T Committee (February to April 2022) Approved by:

Interventional Radiology: Pre-Procedural Management Guidelines

Table 2: Interventional Radiology Patient Preparation According to Bleeding Risk

Category 1 (Low) Bleeding Risk: Procedures that are expected to rarely have bleeding complications or are occurring in areas where bleeding is easy to diagnose and control	
Consent: To be signed in IR by Patient/SDM with IR staff. Translator to come with patient if required.	**Patient Prep:** Patient to be dressed in hospital gown. NPO not required unless sedation is planned. To be transported to department by stretcher, unless otherwise directed by IR staff.
Pre-procedure Lab Work: INR: not routinely recommended[a] Platelets: not routinely recommended[b] Creatinine: required for select angiography patients[c] Fibrinogen: recommended for patients with chronic liver disease[d]	**Correction of Hematological Parameters:** INR: correct to ≤ 3.0 (for arterial access, < 1.8 for femoral arterial access, < 2.2 for radial arterial access, < 2.0 for tunneled catheters) PT: no consensus PTT: no consensus Platelets ≤ 20 x 10^9/L: recommend platelet transfusion Antithrombotics to be held as per SIR guidelines[e]
Category 2 (High) Bleeding Risk: Procedures that may be expected to have bleeding complications or are occurring in areas where bleeding will be difficult to diagnose and control	
Consent: To be signed in IR by Patient/SDM with IR staff. Translator to come with patient if required.	**Patient Prep:** Patient to be dressed in hospital gown. NPO 4 hours. To be transported by stretcher unless otherwise directed by IR staff. Saline lock in place.
Pre-procedure Lab Work: INR: routinely recommended Platelets: routinely recommended Creatinine: required for select angiography patients[c] Fibrinogen: recommended for patients with chronic liver disease[d]	**Correction of Hematological Parameters:** INR: correct to ≤ 1.5 PTT: no consensus (trend towards correcting if ≥ 1.5x control) Platelets ≤ 50 x 10^9/L: Recommend platelet transfusion Antithrombotics to be held as per SIR guidelines[e]

[a] May be requested if patient has known coagulopathy, liver dysfunction, or is on antithrombotic.

[b] May be requested if patient has known liver dysfunction, thrombocytopenia, or is on antithrombotic.

[c] See Policy "Management of patients receiving IV iodinated contrast for exams/procedures" for criteria.

[d] See Table 3 for suggested laboratory thresholds for patient with chronic liver disease.

[e] See Table 4 and Reference 1. Exceptions may apply to angiography patients.

Table 3: Suggested Laboratory Thresholds for Patients with Chronic Liver Disease

Procedure Type	INR[a]	Platelets[b]	Fibrinogen
Category 1 Bleeding Risk	Not applicable	> 20 x 10^9/L	> 1 g/L
Category 2 Bleeding Risk	< 2.5	> 30 x 10^9/L	> 1 g/L

[a] Recommend vitamin K infusion if INR is above suggested threshold.

Prepared by: Interventional Radiology, Electronic Order Set Team (February 2022). Reviewed by: Drs. Patrick Kennedy, Ryan Margau Margau, Irvine Jacobs, Hassan Deif, and Ben Bell, Katie Johnson, Scott Ball, Jennifer Zadravec, Arzina Remtulla, Jenny Chiu, P & T Committee (February to April 2022) Approved by:

Interventional Radiology: Pre-Procedural Management Guidelines

[b]Recommend platelet transfusion in patients with splenomegaly if platelet count is below suggested threshold.

	Suggested Holding and Reinitiation Times (holding includes dose on the day of the procedure)	
Medication: Generic name (**Brand name**)	**Category 1 Bleeding Risk Procedure**	**Category 2 Bleeding Risk Procedure (CrCl units: mL/min)**
Antiplatelets		
Aspirin	Do not hold	Hold 5 days Reinitiation: next day
Clopidogrel (**Plavix®**)	Do not hold	Hold 5 days Reinitiation: 6 hours for 75 mg dose, 24 hours for 300-600 mg dose
Ticagrelor (**Brilinta®**)	Do not hold	Hold 5 days Reinitiation: next day
ORAL Anticoagulants		
Apixaban (**Eliquis®**)	Do not hold	Hold 2 days (4 doses) if CrCl ≥ 50 Hold 3 days (6 doses) if CrCl < 50 Reinitiation: 24 hours
Dabigatran (**Pradaxa®**)	Do not hold	Hold 2 days (4 doses) if CrCl ≥ 50 Hold 3 days (6 doses) if CrCl < 50 Reinitiation: 24 hours
Edoxaban (**Lixiana®**)	Do not hold	Hold 2 days (2 doses) Reinitiation: 24 hours
Rivaroxaban (**Xarelto®**)	Do not hold	Hold 2 days (2 doses) if CrCl ≥ 30 Hold 3 days (3 doses) if CrCl < 30 Reinitiation: 24 hours
Warfarin (**Coumadin®**) Patients at high thrombosis risk of may require bridging with LMWH; consult internal medicine.	Target INR ≤ 3.0, i.e. do not hold if INR is therapeutic; hold if supratherapeutic (> 3.0) until target reached Reinitiation: N/A or same day	Hold 5 days with target INR ≤ 1.8 Reinitiation: next day
INJECTABLE Anticoagulants		
Fondaparinux (**Arixtra®**)	Do not hold	Hold 3 days (3 doses) if CrCl ≥ 50 Hold 5 days (5 doses) if CrCl < 50 Reinitiation: 24 hours
LMWH: dalteparin (**Fragmin®**)	Do not hold	Hold 1 dose (prophylactic or therapeutic) Reinitiation: 12 hours
LMWH: enoxaparin (**Lovenox®**)	Do not hold	Hold 1 day (1 dose if once daily dosing, 2 doses if twice daily dosing) Reinitiation: 12 hours
Unfractionated heparin	Do not hold	IV: hold 4 hours and check aPTT SC: hold 6 hours Reinitiation: 8 hours

Table 4: Management Recommendations for Anticoagulation and Antiplatelet Medications[a]

[a] The above guidelines are intended for elective procedures, and assessment of bleeding risk and clotting risk must be individualized according to patient-specific factors. For emergent/urgent procedures, the interventional radiologist and referring physician/surgeon will weigh risks of

Prepared by: Interventional Radiology, Electronic Order Set Team (February 2022). Reviewed by: Drs. Patrick Kennedy, Ryan Margau Margau, Irvine Jacobs, Hassan Deif, and Ben Bell, Katie Johnson, Scott Ball, Jennifer Zadravec, Arzina Remtulla, Jenny Chiu, P & T Committee (February to April 2022) Approved by:

procedural delay against potential bleeding risk. In patients unable to safely discontinue anticoagulation (e.g. recently implanted coronary or cerebrovascular stents), management may be modified and individualized. For complete list of medications, please refer to Reference 2.

References

1. Davidson JC, Rahim S, Hanks SE, 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 I: Review of Anticoagulation Agents and Clinical Considerations. J Vasc Interv Radiol 2019; 30: 1155-1167. https://doi.org/10.1016/j.jvir.2019.04.016.
2. Patel 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. J Vasc Interv Radiol 2019; 30: 1168-1184. https://doi.org/10.1016/j.jvir.2019.04.017.
3. Patel IJ, Davidson JC, Nikolic B, et al. Consensus Guidelines for Periprocedural Management of Coagulation Status and Hemostasis Risk in Percutaneous Image-guided Interventions. J Vasc Interv Radiol 2012; 23: 727-736. https://doi.org/10.1016/j.jvir.2012.02.012.
4. Patel IJ, Davidson JC, Nikolic B, et al. Addendum of Newer Anticoagulants to the SIR Consensus Guideline. J Vasc Interv Radiol 2013; 24: 641-645. http://doi.org/10.1016/j.jvir.2012.12.007.
5. UpToDate. Accessed March 28, 2021. https://www.uptodate.com/.
6. Thrombosis Canada. NOACS/DOACS*: Perioperative Management. Date of Version: May 15, 2020. Accessed March 28, 2021.
7. Thrombosis Canada. Unfractionated Heparin, Low Molecular Weight Heparin and Fondaparinux. Date of Version: September 6, 2020. Accessed March 28, 2021.
8. Douketis JD, Spyropoulos FA, Spencer M, et al. Perioperative Management of Antithrombotic Therapy: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. Chest 2012; 141: e326S-e350S. http://doi.org/10.1378/chest.11-2298.
9. Spyropouulos AC, Douketis JD. How I treat anticoagulated patients undergoing an elective procedure or surgery. Blood 2012; 120: 2954-62. http://doi.org/10.1182/blood-2012-06-415943.
10. Raval AN, Cigarroa JE, Chung MK, et al. Management of Patients on Nonvitamin K Antagonist Oral Anticoagulants in the Acute Care and Periprocedural setting: a Scientific Statement from the American Heart Association. Circulation 2017; 135:e604–e633. http://doi.org/10.1161/CIR.0000000000000477.
11. North York General Hospital: Interventional Radiology Pre-Procedural Management Guidelines. Date of Version: August 2, 2017.

Prepared by: Interventional Radiology, Electronic Order Set Team (February 2022). Reviewed by: Drs. Patrick Kennedy, Ryan Margau Margau, Irvine Jacobs, Hassan Deif, and Ben Bell, Katie Johnson, Scott Ball, Jennifer Zadravec, Arzina Remtulla, Jenny Chiu, P & T Committee (February to April 2022) Approved by: