GI Tables For Anticoagulation Discontinuation 2023, Coagulation in Cirrhosis, IR Bleeding Risk Guidelines, H. Pylori Therapy, Hemostasis Settings & Colonoscopy Screening and Surveillance 2020

Class	Agent	Peak (hour)	Half-life (hour)	Bio-availability (%)	Dosing	Reversal agents (see below for HASHTI)	Recommendations to discontinue before procedure
Vitamin K antagonist	Warfarin	72–96	20–60	100	Daily	1. Vitamin K (IV/PO) 1–10 mg (Takes 6 (IV) to 24 (PO) hours to reverse) 2. Prothombin Complex Concentrates (Kcentra) 25–50 units/kg IV if URGENT; reverses in 2-4 hours INR 2 to <4: 25 units/kg; not to exceed 2500 units INR 4-6: 35 units/kg; not to exceed 3500 units INR >6: 50 units/kg; not to exceed 5000 units	**Discontinue 5 days before procedure**
Xa inhibitor	Rivaroxaban (Xarelto)	2.5–4	5–9 (9–13 if elderly)	80	Daily or b.i.d.	1. Supportive Treatment 2. Factor VIIa 3. Prothombin Complex Concentrates (Kcentra) 50 units/kg IV; reverses in 2-4 h	**Discontinue 24 h before procedure (GFR >90), 2 days (GFR 60-90), 3 days (GFR 30-59), 4 days (GFR 15-29).**
	Apixaban (Eliquis)	3	8–13	~66	b.i.d.	1. Supportive Treatment 2. Factor VIIa 3. Prothombin Complex Concentrates (Kcentra) 50 units/kg IV; reverses in 2-4 hours	**Discontinue 24 h before procedure (GFR >60), 3 days (GFR 30-59), 4 days (GFR 15-29)**
	Edoxaban (Savaysa)	1-2	8.5-9.5 17 if (GFR<30)			1. Supportive Treatment 2. Factor VIIa 3. Prothombin Complex Concentrates (Kcentra) 50 units/kg IV; reverses in 2-4 hours	**Discontinue at least 24 h before procedure (GFR > 15); If GFR < 15 there is no data.**
Direct thrombin inhibitor	Dabigatran (Pradaxa)	2–3	13–27 (Depending on CrCl— See table on right	6.5	Daily or b.i.d.	1. Supportive Blood Products/HASHTI 2. Prothombin Complex Concentrates (Kcentra) 50 units/kg IV; reverses in 2-4 hours 3. Consider rVIIa 4. Hemodialysis	
	Bivalirudin (Angiomax)	0.5–3	0.5	100	Intravenous	1. Supportive Blood Products/HASHTI 2. Consider rVIIa (90 mcg/kg for up to 2 doses) 3. Hemodialysis	**Discontinue before induction of anesthesia in a patient with normal renal function**
	Argatroban	1–3	39–51 min	100	Intravenous	1. Supportive Blood Products/HASHTI 2. Prothombin Complex Concentrates 3. Consider rVIIa 4. Hemodialysis	**Discontinue 4–6 h before induction of anesthesia in a patient with normal hepatic function**

Renal Clearance (mL/min)	Half Life (h)	Standard Bleeding Risk*	High Bleeding Risk*
> 80	13 (11-22)	24 h	2 – 4 days
50 - 80	15 (12-34)	24 h	2 – 4 days
30 - 50	18 (13-23)	>/= 48 h	4 days
< 30	27 (22-35)	2 – 5 day	> 5 days

HASHTI
1. Hold further doses of anticoagulant
2. Consider Antidote
3. Supportive treatment: volume resuscitation, inotropes as needed
4. Local or surgical Hemostatic measures: topical agents (aminocaproic acid, tranexamic acid)
5. Transfusion (red cells, platelets, FFP as indicated)
6. Investigate for bleeding source

Class	Agent	Peak (hour)	Half-life (hour)	Bio-availability (%)	Dosing	Reversal agents (see below for HASHTI)	Recommendations to discontinue before procedure
Glycoprotein IIB/IIIA inhibitors	Abciximab (ReoPro)	2	0.5	100	Intravenous	1. HASHTI 2. Platelet Transfusion	**24 h before procedure**
	Eptifibatide (Integrilin)	4–6	2.5	100	Intravenous	1. HASHTI 2. Platelet Transfusion	**4 h before procedure**
	Tirofiban (Aggrastat)	2	2	100	Intravenous	1. HASHTI 2. Platelet Transfusion 3. Dialysis	**Can be stopped at the moment of skin incision without harmful effects**
Low-molecular weight heparin	Enoxaparin (Lovenox) Dalteparin (Fragmin)	3–5	2.2	87	Subcutaneous	1. HASHTI 2. Protamine sulfate (1 mg/100 units Dalteparin in previous 8 h) 3. Consider rVIIa	**Last dose should be given 24 h before procedure**
	Tinzaparin (Innohep)	4–5	3.9	90 for Xa 67 for IIa	Subcutaneous	1. HASHTI 2. Protamine sulfate (1 mg/100 units Tinzaparin in previous 8 h) 3. Consider rVIIa	**Last dose should be given 24 h before procedure**
	Fondaparinux (Arixtra)	2	17–21	100	Subcutaneous	1. HASHTI 2. Protamine sulfate 3. Consider rVIIa	**Last dose should be given 36-48 h before procedure and resume 6 h after procedure**

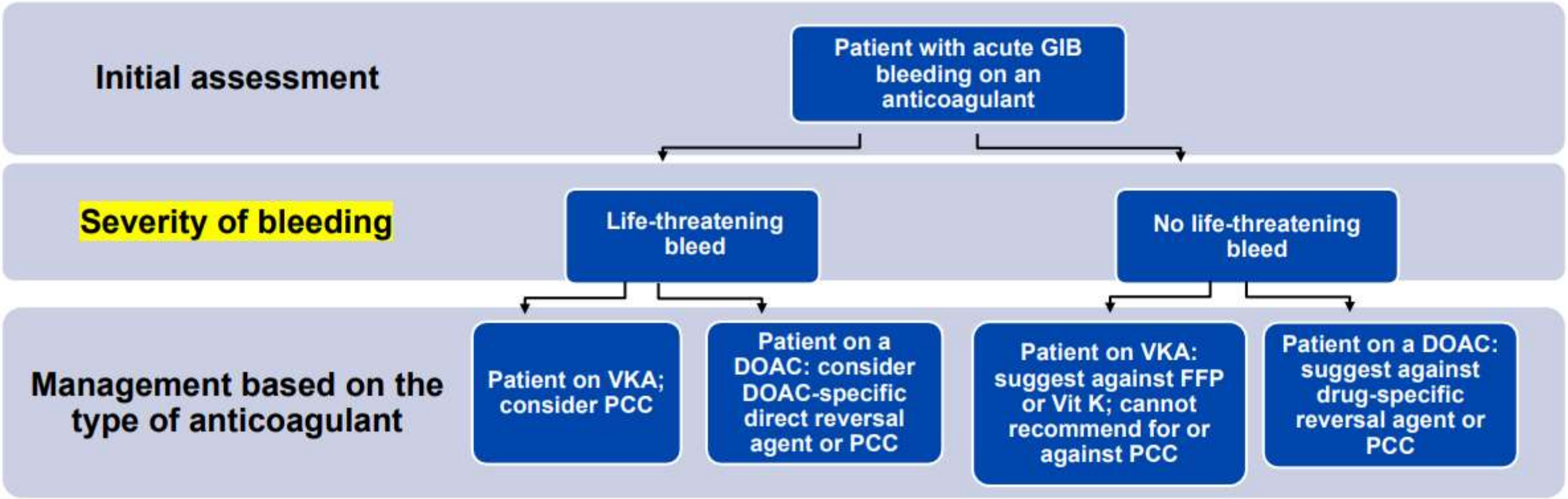
HASHTI
1. Hold further doses of anticoagulant
2. Consider Antidote
3. Supportive treatment: volume resuscitation, inotropes as needed
4. Local or surgical Hemostatic measures: topical agents (aminocaproic acid, tranexamic acid)
5. Transfusion (red cells, platelets, FFP as indicated)
6. Investigate for bleeding source

Class	Agent	Peak (hour)	Half-life (hour)	Bio-availability (%)	Dosing	Reversal agents (see below for HASHTI)	Recommendations to discontinue before procedure
Thienopyridine antiplatelet agent	Clopidogrel (Plavix)	1	7–8	> 50	Daily	1. HASHTI 2. Platelet Transfusion 3. Case Reports of Methylprednisolone and desmopressin	**Discontinue 5–7 days before procedure**
	Ticlopidine (Ticlid)	2	12	> 80	b.i.d.	1. HASHTI 2. Platelet Transfusion	**Discontinue 10-14 days before procedure**
	Prasugrel (Effient)	0.5	2–15	> 79	Daily	1. HASHTI 2. Platelet Transfusion	**Discontinue 5–7 days before procedure**
	Ticagrelor (Brillinta)	1.5	7–8.5	> 36	Daily or BID	1. HASHTI 2. Platelet Transfusion	**Discontinue 5 days before procedure**
	PAR-1 inhibitor: vorapaxar (Zontivity)						**Discontinue 5-13 days before procedure**
	Dipyrimadole (Persantine)	1.25	7–10	50–75	q.i.d.	1. HASHTI 2. Platelet Transfusion 3. Aminophylline for Dipyrimadole overdose	**Discontinue 2-3 days before procedure**
	(Aggrenox (Extrended release dipyrimadole+aspirin)	2	13.6	50–75	b.i.d.	1. HASHTI 2. Platelet Transfusion	**Discontinue 7 days before procedure**

HASHTI
1. Hold further doses of anticoagulant
2. Consider Antidote
3. Supportive treatment: volume resuscitation, inotropes as needed
4. Local or surgical Hemostatic measures: topical agents (aminocaproic acid, tranexamic acid)
5. Transfusion (red cells, platelets, FFP as indicated)
6. Investigate for bleeding source

Management of Anticoagulants and Antiplatelet Agents in GI Bleed

Anticoagulant Drug Management with GIB



Barkun et al. *Am J Gastroenterol* 2022

Triage: Life-Threatening Hemorrhage

Major clinically overt or apparent bleeding with:

- **Hypovolemic shock or severe hypotension requiring pressors or surgery**
- ***or* associated with a decrease in Hg of >5 g/dL***
- ***or* requiring transfusion of ≥ 5 units* of packed red blood cells**
- ***or* at-risk of causing death**

*** RULE OF FIVES ***

@NeenaSAbrahamMD

Abraham & Barkun et al, *Am J Gastroent* 2022

Warfarin Resumption

What did ACG-CAG CPG guideline panel think?

- Limited high-certainty evidence (acute & elective setting)
- We could not reach a recommendation for or against resuming warfarin the same day as the procedure vs. 1-7 days after the procedure

What do I do?

- **The heart always wins!**
- **Balance risk of thromboembolism & further bleeding**
- **Resume w/in 4-7 days from drug discontinuation; same day if diagnostic**
- **1% embolic risk**

Abraham & Barkun et al, *Am J Gastroent* 2022

No *routine* use of DOAC reversal agents

- **Avoid andexanet alfa**
  - Single published study with serious risk of bias & no control group; little GIB data
  - Higher risk of thromboembolism & cost of drug ($49,500)
  - Could be considered w/ life-threatening GIB in hospitalized patients if rivaroxaban or apixaban taken w/in last 24 hours
- **Rarely need idarucizumab**
  - Few patients taking dabigatran; could be considered w/ life-threatening GIB in hospitalized patients
- **Possibly a role for PCC?**
  - Two cohort studies* with comparator arms (no PCC); both with limitations
  - Systematic reviews of mainly low-quality, single arm cohort studies ^
  - ***"Better bad choice" in the setting of life-threatening hemorrhage?***

*Schulman *Thromb Res* 2017; *Smythe *J Thromb Thrombolysis* 2015; ^da Luz *Transfusion* 2017

DOAC Resumption after GIB

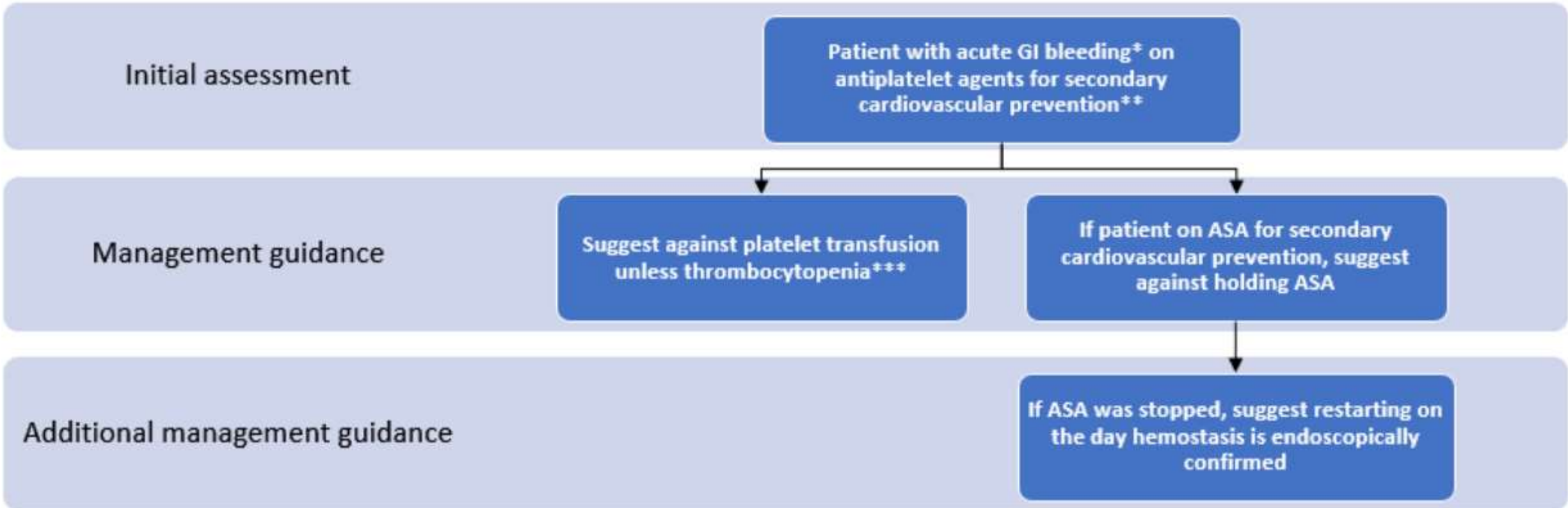
- **Not addressed in ACG-CAG CPG**
  - Limited/No high-certainty data in the GIB setting

What do I recommend?

- **Resume DOAC day after the procedure in MOST**
  - Providing endoscopic hemostasis had been achieved ^
  - **Would not hold DOAC post-procedure > 48-72 hours**
    - Timing of resumption dictated by the risk of post-procedural bleeding & multidisciplinary discussion

^ Barkun et al. 2022 (*DDW 2022*); Abraham, Barkun et al. *Am J Gastro* 2022

Antiplatelet Drug Management with GIB



Thrombocytopenia < 100,000 per microliter

Why were these recommendations made?

Routine Platelet Transfusion

- Mortality increase with GIB (OR = 5.6, 95% CI: 1.5-27.1)
  - Mortality increase with CABG (OR= 4.8, 95% CI: 1.7-13.7)
  - Mortality increase with ICH (OR = 2.1, 95% CI: 1.2-3.6)

Interrupt Cardiac ASA Used for Secondary Prevention

- Reduced mortality with ASA continuation
- ASA discontinued at presentation? Resume w/in 24 hrs of successful endoscopic hemostasis
- *ASA for primary prevention- little CV benefit & high GIB risk*

Acute GIB Take Home Points

Triage based on life-threatening GIB vs. not

- ❑Life Threatening = Hospitalized, Pressors, Rule of 5

VKA (warfarin) Supratherapeutic Bleed

- ❑No routine FFP
- ❑No routine Vit K
- ❑Choose PCC over FFP if life-threatening bleed

DOAC GIB

- ❑No routine use of reversal agents
- ❑ Life-threatening GIB? Consider reversal agent if DOAC w/in 24 hours (DOAC-specific or PCC)

Antiplatelet GIB

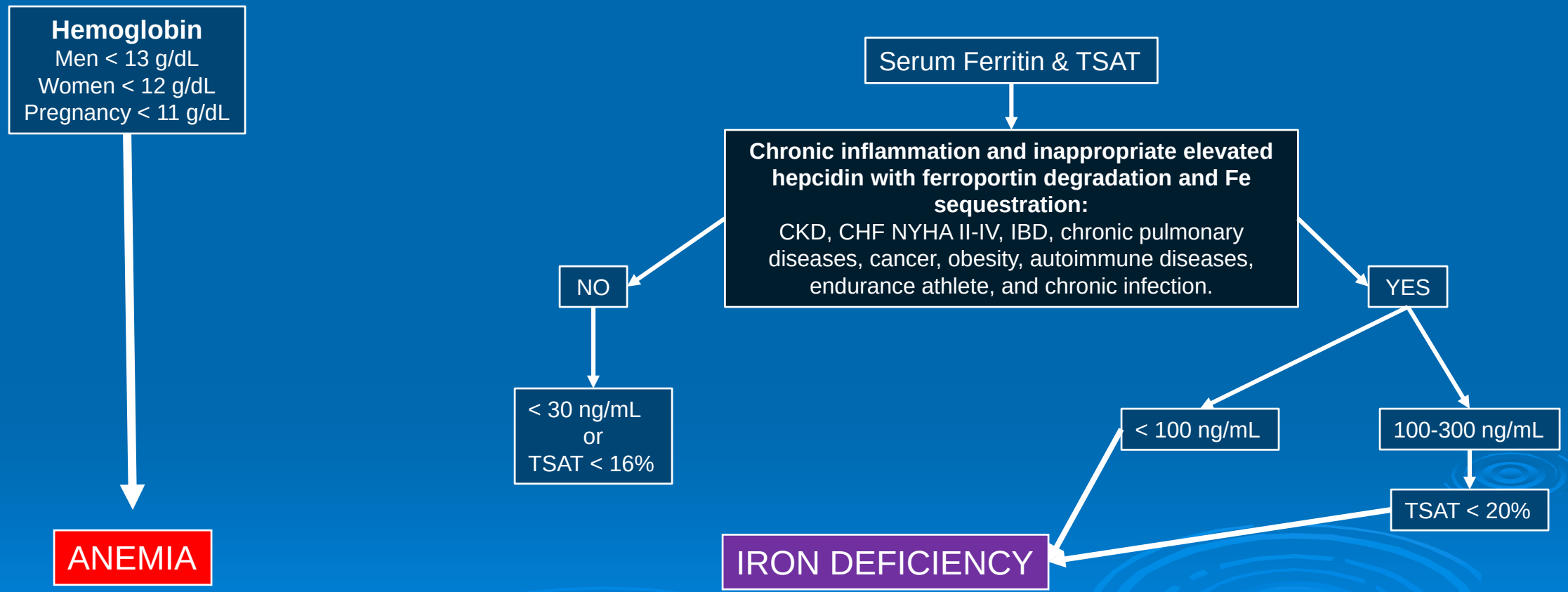
- ❑No routine platelet transfusion (consider if platelets <100,000 per microliter)
- ❑Continue ASA prescribed for secondary prevention

JH Criteria for LVAD to have Endoscopy under Moderate Sedation in Endoscopy Suite

- Patient can be sedated with Moderate-Sedation.
- LVAD Implanted more than 30 days earlier.
- Pulse Pressure > 15 mm Hg (BPs – BPd).
- Reliable Blood Pressure, with BP-Cuff or Doppler.
- No Obstructive Sleep Apnea.
- No COPD on Home Oxygen.
- Perfusionist Available for the Endoscopy (Ext. 8384).

Is this Iron Deficiency?

Cappellini MD et al. Journal of Internal Medicine, 2020, 287; 153–170



Treat Fe deficiency and Investigate Cause (Celiac Dz, H. Pylori, Colonoscopy, EGD)

Coagulation in Cirrhosis
A Precarious Re-Balance

The State of Coagulation in Cirrhosis

O'Leary JG et al. Gastroenterology 2019 Jul;157(1):34-43

Re-balanced Systems (precarious state)

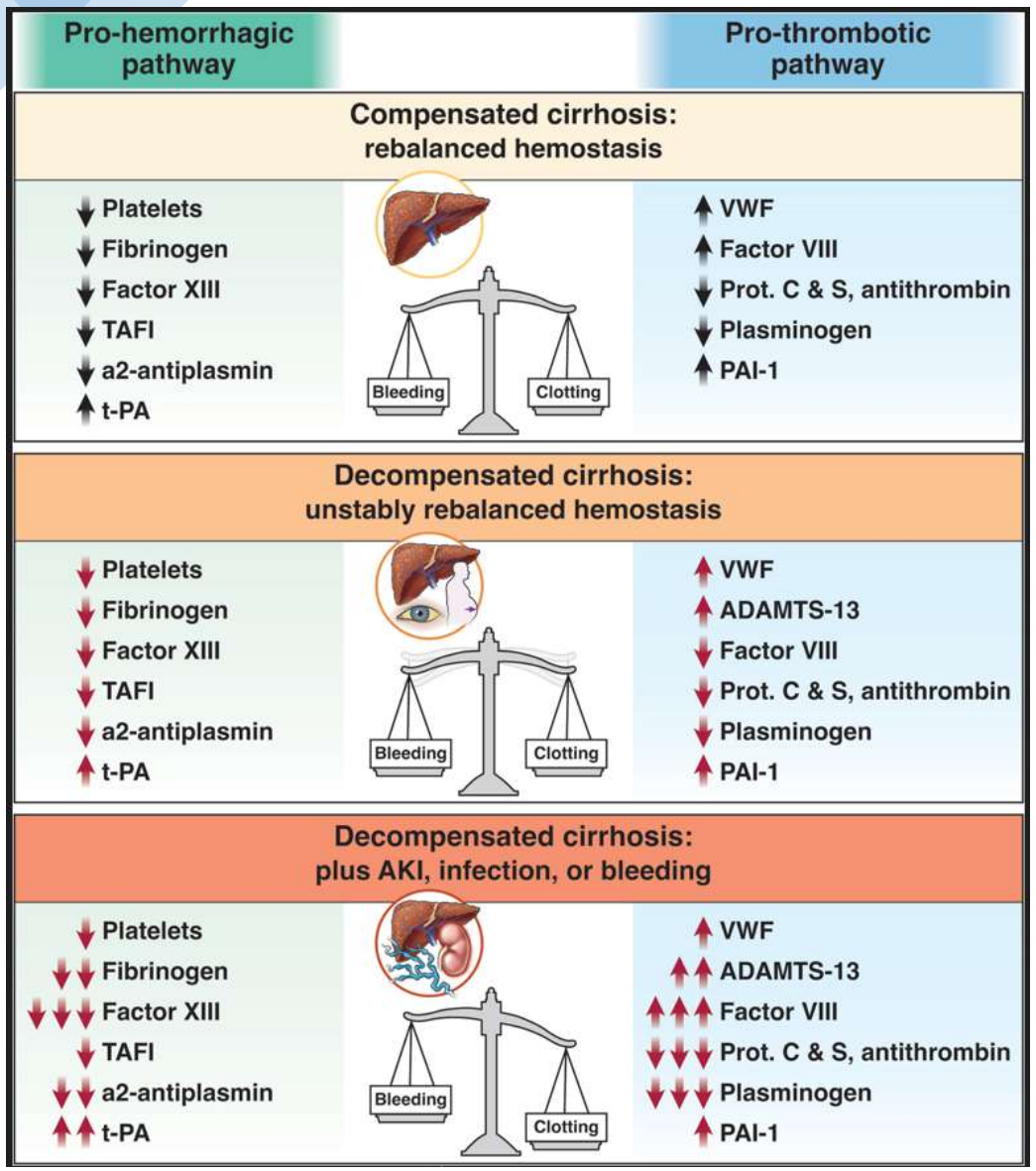
- Platelet deficit and dysfunction is counterbalanced by increased endothelial derived vWF
- Decreased liver-derived pro-coagulant factors V, VII, X are counterbalanced with low Protein C

Increased Bleeding Risk:

- Portal Pressure driven (not related to coagulation/fibrinolysis).
  - Worsen by excessive transfusion.
- Mucosal or Puncture site bleeding: due to
  - Premature clot dissolution due to "Accelerated Intravascular Coagulation and Fibrinolysis" (AICF)
    - In DIC Factor VIII is low; in AICF Factor VIII is high.
  - Thrombocytopenia due to sequestration (1/3), decreased survival, and low thrombopoietin (TPO)

Increased Thrombosis Risk:

- Due to elevated Endothelial-derived Factor VIII + low Protein C + venous stasis +/- endothelial injury.
  - Risk of Portal vein and Mesenteric vein thrombosis
  - Risk of Peripheral limb DVT



Hemostatic balance in patients with compensated cirrhosis, decompensated cirrhosis, or decompensated cirrhosis with complications (acute kidney injury [AKI], infection, bleeding).

-In compensated cirrhosis, the parallel changes in both pro- and antihemostatic pathways result in a rebalanced hemostatic state.

-With advancing disease severity, the ratio of pro- vs anticoagulant

drivers increases progressively, resulting in higher hemostatic imbalance, tipping toward hypercoagulability, and a more fragile rebalanced state.

-This is further worsened by clinical events like AKI, bleeding, or infection.

ADAMTS-13, A disintegrin and metalloprotease with thrombospondin-1 domain, member 13;
AKI, acute kidney insufficiency;
PAI-1, plasminogen activator inhibitor-1;
t-PA, tissue plasminogen activator;
TAFI, thrombin activatable fibrinolysis inhibitor.

Procedure Related Bleeding Risk

Intagliata NM et al. Thromb Haemost 2018;118:1491–1506.

- Correction of Coagulation is NOT recommended before Low nor Intermediate Risk Procedures
- Individualization is often necessary

Higher risk procedures	Intermediate risk procedures	Lower risk procedures
Brain or spinal surgery	Lumbar puncture	Paracentesis
All major surgery (cardiac, intra-abdominal and orthopedic)	Percutaneous or transjugular liver biopsy	Thoracentesis
Intra-cranial pressure catheter insertion	Transjugular intrahepatic portosystemic shunt	Dental extraction
Endoscopy (large polypectomy with endoscopic mucosal or sub-mucosal resection, NOTES)	Endoscopy (e.g. percutaneous gastrostomy placement, cystgastrostomy, biliary sphincterotomy)	Endoscopy (e.g. diagnostic, variceal band ligation, uncomplicated polypectomy)
	Percutaneous biopsy of extra-hepatic organ or lesions	Cardiac catheterization
	Trans-arterial or percutaneous HCC therapies	Central line placement

Hemostasis Tests in Cirrhosis

O'Leary JG et al. Gastroenterology 2019 Jul;157(1):34-43
Intagliata NM et al. Thromb Haemost 2018;118:1491–1506

INR (International Normalization Ratio):

- Testing NOT recommended
- Measures pro-coagulant factors I, II, V, VII and X.
- Does not measure the effect of the deficit of Protein C.
- Depends in which thromboplastin is used to run the test (different INR in different hospitals).
- Does not predict risk of bleeding.
- Attempts to correct it with FFP increases portal pressure.

Platelet Count:

- Testing recommended before "High Risk" procedures
- Traditionally 50,000 to **56,000** needed to promote thrombin generation
- Increased circulating activated platelets and elevated endothelial-derived vWF increases their effectiveness.

Fibrinogen Level:

- Testing recommended before "High Risk" procedures
- Better at predicting bleeding risk than INR.
- Most (98%) is generated in the liver.
- Its half life (normal 4 days) is shortened in cirrhosis.
- Level needed is > 120 mg/dL

UofL TEG-6s Guided Management of Abnormal Coagulation in Liver Disease

Cirrhosis or Acute Liver Failure with Bleeding, or Before Moderate or Severe Bleeding-Risk Procedure

Measure Fibrinogen level, Platelet count, TEG-6s and look for "bleeding in puncture sites". Consider Factor VIII level.

K-Fibrin Time & Angle (K 0.8-2.1 min reference range) (Angle 63-78 degrees reference range)

- If R and MA are normal and K-time and Angle are abnormal: consider cryoprecipitate
- K > 2.1 min: consider 1-2 pre-pooled Units Cryoprecipitate.
- Angle < 63 degrees: consider 1-2 pre-pooled Units' cryoprecipitate.
- *Recheck TEG if cryoprecipitate has been given and patient is not improving, consider platelets*

Bleeding in Puncture Site:

a) Correct Fibrinogen to >/= 150 and Platelets to > 50K.

b) If bleeding persist, give Tranexamic Acid 1 gm IV q 6h until bleeding controlled.

Factor VIII measurement: Low level supports DIC; High level supports Localized Cirrhotic Fibrinolysis.

R–Latency Coagulation Time (4.6-9.1 min reference range)

- < 4.6 min hypercoagulable
- 9.2-12 min: give 1u FFP
- 13-15 min: give 2u FFP
- >15 min: give 3u FFP

Low Fibrinogen < 150 mg/dL:

Give cryoprecipitate to reach >/= 150 mg/dL.

Each pooled cryoprecipitate unit (5 units) will increase Fibrinogen by 25-50 mg/dL in a 70 kg person.

MA–Prior to Invasive Procedure

- If platelet count is <20,000 and MA <52: consider TPO agents if time to plan the procedure, or 2 U Single Donor Platelets (SDP).
- If platelet count is between 20,000 and 60,000 and MA is <52 and a procedure is planned, use TPO agonist to avoid platelet transfusions if time to plan the procedure, or 1 U Single Donor Platelets.

MA–Platelet Function (52-69 reference range bleeding)

- 48-51 mm: Consider 0.3 mcg/kg DDAVP, in the presence of uremia, or 1 Unit Single Donor Platelets if not uremic.
- ≤ 47 mm: Consider 1 Unit Single Donor Platelets.

Modified from: Gish RG et al. Gastroenterology & Hepatology Volume 17, Issue 1, Supplement 1 January 2021

Complications of Blood Product Transfusion

Rahimi RS et al, HEPATOLOGY, Vol. 63, No. 2, 2016; 368-370

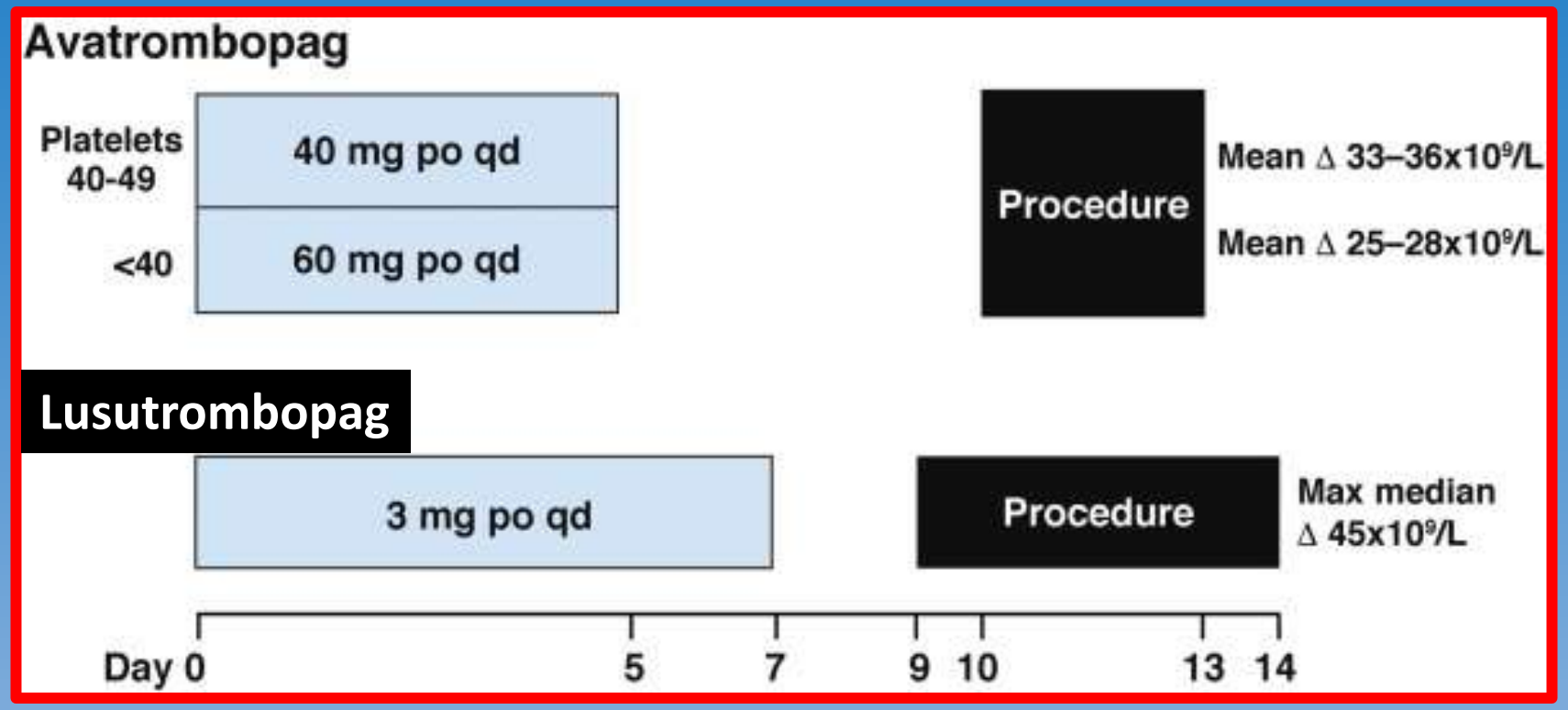
Timing	Complication
Short Term	Cost per Unit: Platelets = $ 500; FFP = $ 1600-2400 Transfusion reactions Cross-match errors Prolonged ventilator time Exacerbation of portal hypertension Transfusion-related acute lung injury (TRALI) Increased mortality Infection transmission Potential hypercoagulable complications, eg, portal vein thrombosis
Intermediate Term	Increased intensive care unit stay Increased hospital length of stay Systemic inflammatory response syndrome (SIRS) Transfusion-related acute lung injury (TRALI) Increased mortality
Long Term	HLA antibody formation Disease transmission Increased mortality

Correction of Coagulation Parameters in Cirrhosis Before High Bleeding Risk Procedures

- In high-risk procedures, correction of **Platelet count < 50,000** is reasonable
  - Low platelets are due to sequestration and low TPO.
  - Platelet dysfunction is offset by increased endothelial derived vWF.
  - One-unit single donor platelets increases plat count by 5-10,000
  - In elective procedures can be corrected with oral Avatrombopag 40-60 mg/day x 5 days, or Lusutrombopag 3 mg a day x 7 days
- In high-risk procedures, correction of **Fibrinogen < 120 mg/dL** is reasonable.
  - One unit of cryoprecipitate (10-20 mL each) per 10 kg of weight, increase fibrinogen by 50 mg/dL
- In bleeding after procedure consider **Antifibrinolytic agents**:
  - Suspect in delayed or diffuse mucosal or puncture site bleeding
  - Requires caution if pathological clot such as portal vein thrombosis is present
  - Aminocaproic acid 3 grams oral QID, or Intravenous 5 grams in 250 mL NS over 1 hour + 1 gm in 50 mL NS per hour until bleeding stops
  - Tranexamic acid 1 gm IV every 6 hours, until bleeding stops.

- O'Leary JG et al. Coagulation in Cirrhosis. Gastroenterology 2019

Oral Agent to Treat Thrombocytopenia



65 to 69% pf patients reach Platelet count >/= 50,000

TPO-Agonists Use in Cirrhosis

	Avatrombopag	**Lusutrombopag**
Platelets < 40,000	60 mg PO x 5 days (day 1 = first dose)	3 mg PO x 7 days (day 1 = first dose)
Platelets 40,000 - 49,000	40 mg PO x 5 days (day 1 = first dose)	3 mg PO x 7 days (day 1 = first dose)
Platelets >/= 50,000	Not Recommended	Not Recommended
Procedure Day	Day 10 - 13	Day 9 - 15

SIR Periprocedural Thrombotic and Bleeding Risk Management Guidelines

Patel, IJ et al. J Vasc Interv Radiol 2019; 30:1168–1184

ALL PATIENTS – High Bleeding Risk Procedures

- **Screening Coagulation Laboratory Test High bleeding risk**
  - PT/INR:
    - routinely recommended
  - Platelet count/hemoglobin:
    - routinely recommended
- Thresholds in General
  - INR: correct to within range of 1.5–1.8
  - Platelets: transfuse if < 50,000
- Threshold in Liver Disease
  - INR: Correct if > 2.5
  - Platelets: Transfuse if < 30,000
  - Fibrinogen: Cryoprecipitate if < 100 mg/dL

- 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 (eg, lung parenchyma, abdominal, pelvic, retroperitoneal)
- Deep nonorgan biopsies (eg, 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 (eg, 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

ALL PATIENTS – Low Bleeding Risk Procedures

- **Screening Coagulation Laboratory Test Low bleeding risk**
- PT/INR:
  - not routinely recommended
- Platelet count/hemoglobin:
  - not routinely recommended
- Thresholds General
  - INR: correct to within range of 2.0–3.0
  - Platelets: transfuse if < 20,000
- Threshold in Liver Disease:
  - INR: N/A
  - Platelets: Transfuse if < 20,000
  - Fibrinogen: Cryoprecipitate if < 100 mg/dL

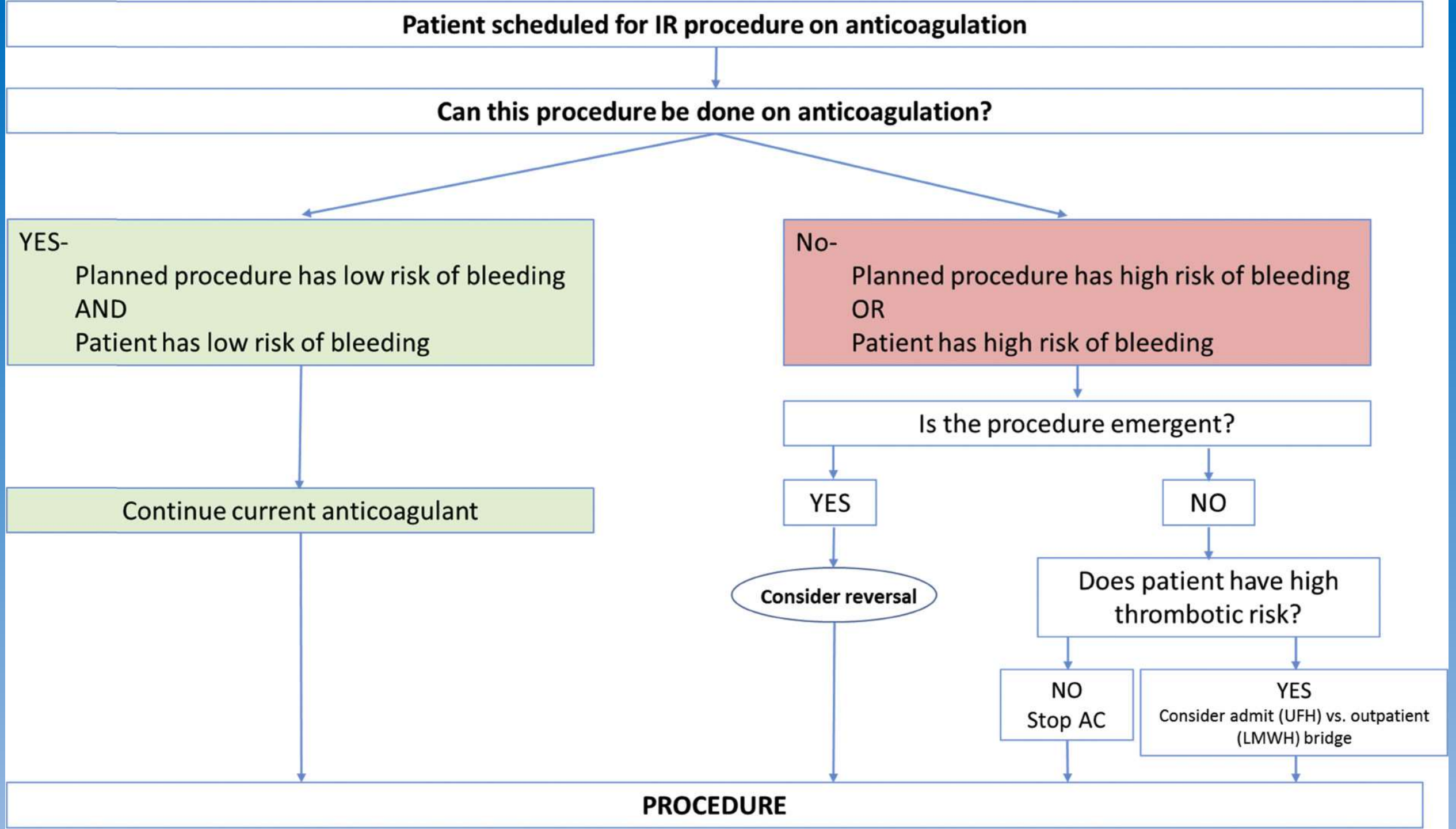
- Catheter exchanges (gastrostomy, biliary, nephrostomy, abscess, including gastrostomy/ gastrojejunostomy conversions)
- Diagnostic arteriography and arterial interventions: peripheral, sheath < 6 F, embolotherapy‡
- Diagnostic venography and select venous interventions: pelvis and extremities
- Dialysis access interventions
- Facet joint injections and medial branch nerve blocks (thoracic and lumbar spine)§
- IVC filter placement and removal k
- Lumbar puncture¶
- Non-tunneled chest tube placement for pleural effusion
- Non-tunneled venous access and removal (including PICC placement)
- Paracentesis
- Peripheral nerve blocks, joint, and musculoskeletal injections§
- Sacroiliac joint injection and sacral lateral branch blocks§
- Superficial abscess drainage or biopsy (palpable lesion, lymph node, soft tissue, breast,
- thyroid, superficial bone, eg, extremities and bone marrow aspiration)
- Thoracentesis
- Transjugular liver biopsy (plat > 30,000)

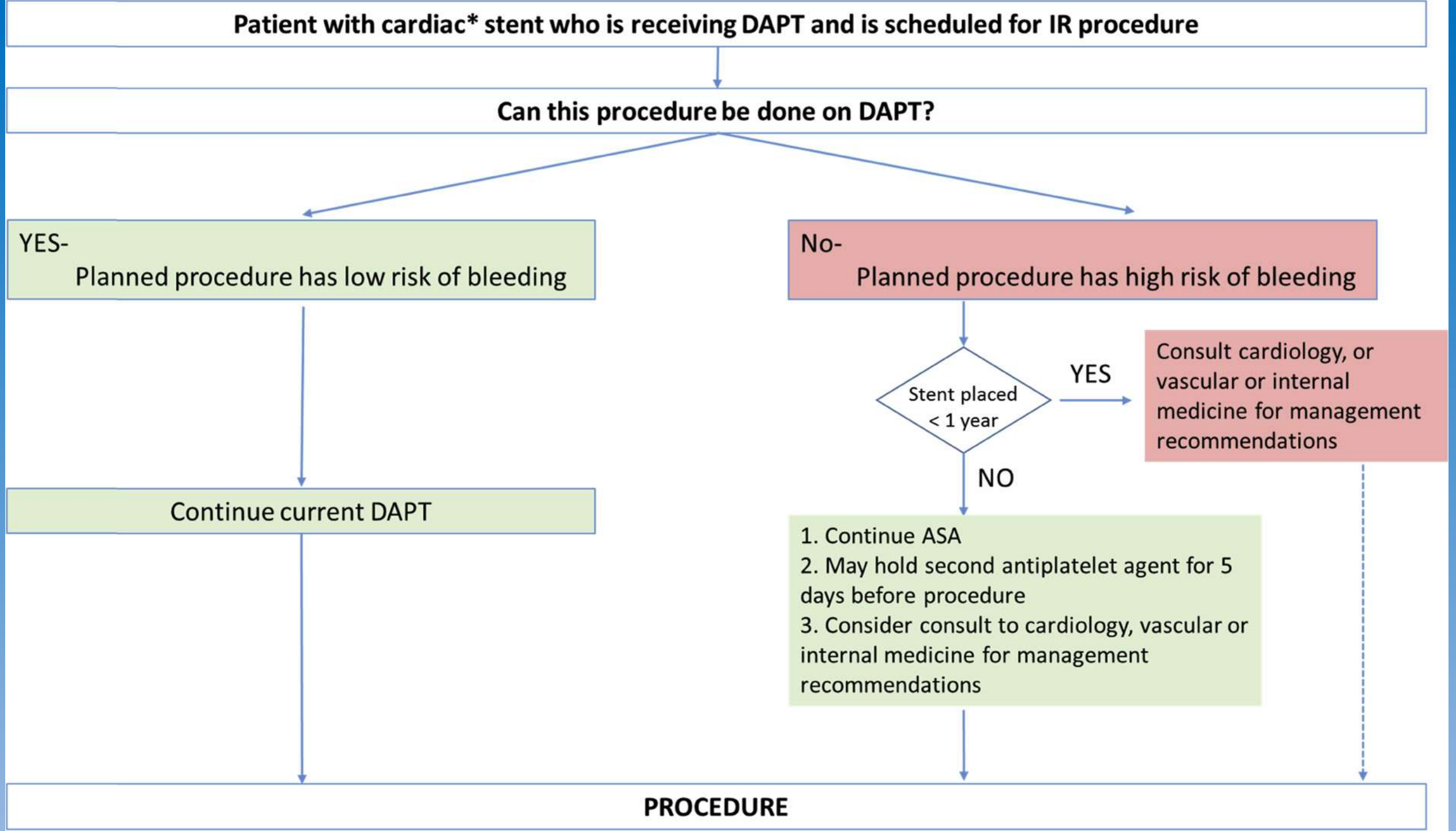
Suggested Laboratory Thresholds for Performance of a Procedure in Patients with Chronic Liver Disease

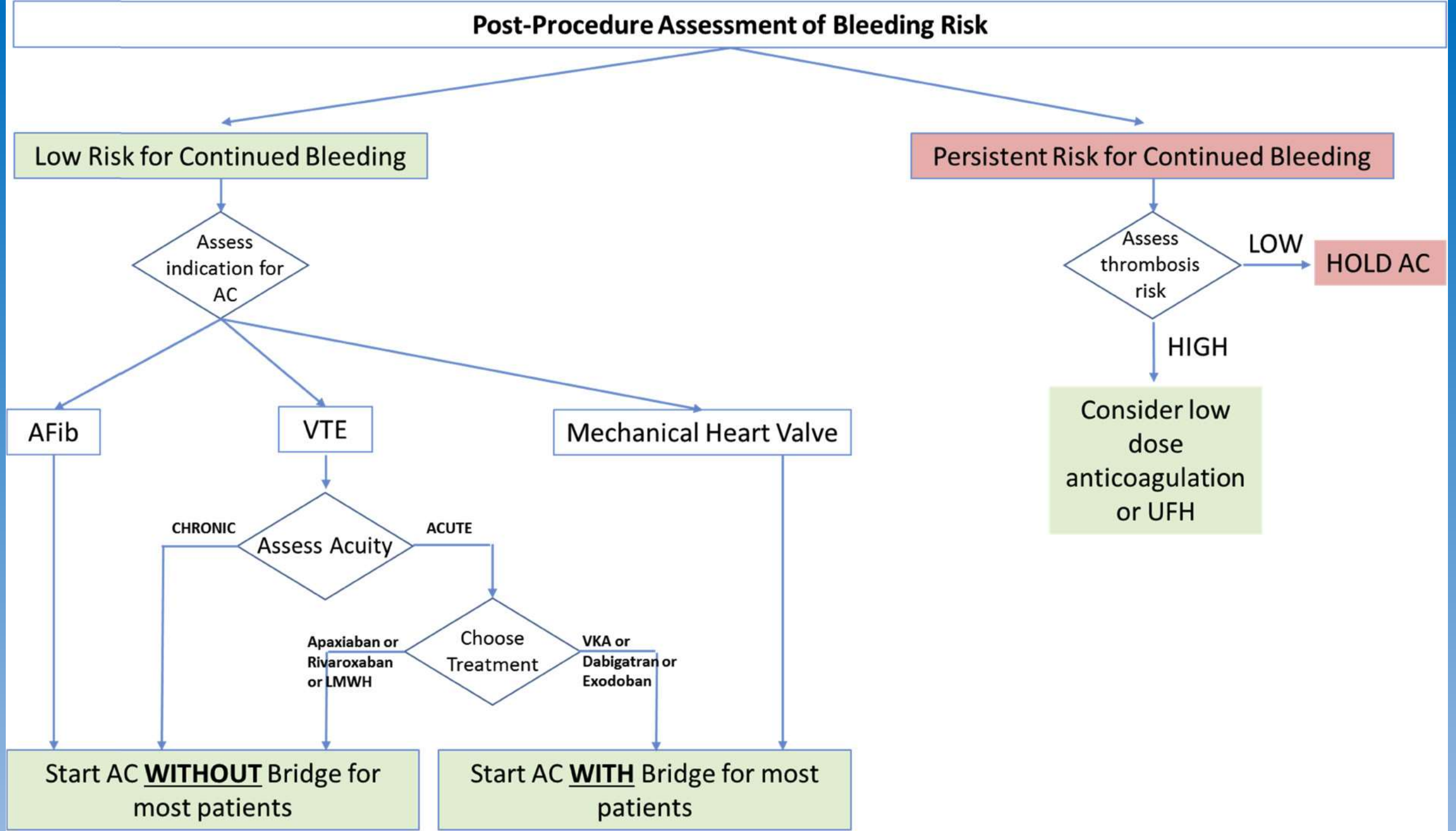
Procedure Risk	INR	Platelets *	Fibrinogen (mg/dL) **
Low	N/A	> 20,000	> 100
High	< 2.5	> 30,000	> 100

* One unit of apheresis or 4-6 pooled from whole blood donors) increases the platelet count by 25–50 x 10^9/L in normal-sized patient without splenomegaly

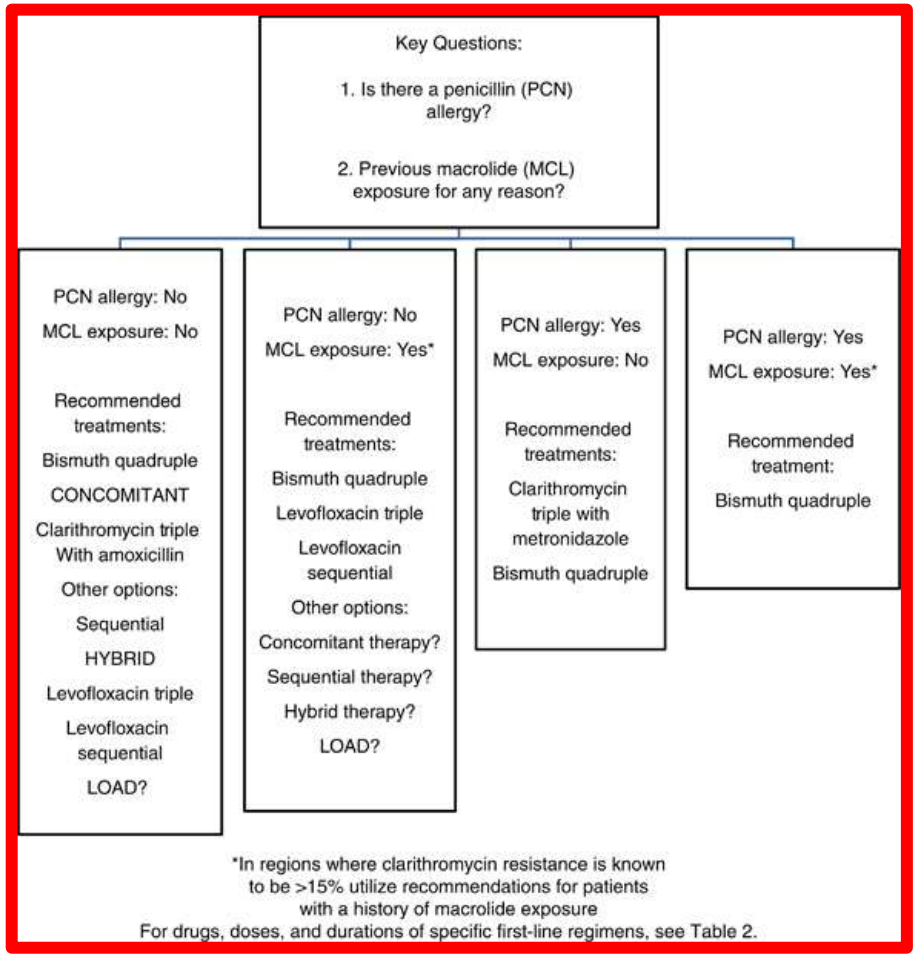
** Administer 1 dose cryoprecipitate (bodyweight < 80 kg) or 2 doses (body weight > 80 kg)


Patient scheduled for IR procedure on anticoagulation
Can this procedure be done on anticoagulation?
YES-
Planned procedure has low risk of bleeding
AND
Patient has low risk of bleeding
No-
Planned procedure has high risk of bleeding
OR
Patient has high risk of bleeding
Continue current anticoagulant
Is the procedure emergent?
YES
NO
Consider reversal
Does patient have high thrombotic risk?
NO
Stop AC
YES
Consider admit (UFH) vs. outpatient (LMWH) bridge
PROCEDURE


Patient with cardiac* stent who is receiving DAPT and is scheduled for IR procedure
Can this procedure be done on DAPT?
YES-
Planned procedure has low risk of bleeding
No-
Planned procedure has high risk of bleeding
Stent placed < 1 year
YES
Consult cardiology, or vascular or internal medicine for management recommendations
NO
Continue current DAPT
1. Continue ASA
2. May hold second antiplatelet agent for 5 days before procedure
3. Consider consult to cardiology, vascular or internal medicine for management recommendations
PROCEDURE


Post-Procedure Assessment of Bleeding Risk
Low Risk for Continued Bleeding
Persistent Risk for Continued Bleeding
Assess indication for AC
Assess thrombosis risk
LOW
HOLD AC
HIGH
Consider low dose anticoagulation or UFH
AFib
VTE
Mechanical Heart Valve
CHRONIC
Assess Acuity
ACUTE
Apaxiaban or Rivaroxaban or LMWH
Choose Treatment
VKA or Dabigatran or Exodoban
Start AC WITHOUT Bridge for most patients
Start AC WITH Bridge for most patients

H. Pylori Antibiotic Regimens Based in Allergy and Exposure



Antibiotic	Resistance rate (%)
Metronidazole	20
Clarithromycin	16
Levofloxacin	31
Tetracycline	<2
Amoxicillin	<2
Rifabutin	<2

Most patients with a history of penicillin allergy do not have true penicillin hypersensitivity.
After failure of first-line therapy, such patients should be considered for referral for allergy testing since the vast majority can ultimately be safely given amoxicillin-containing salvage regimens

Patients with past exposure to Metronidazole should use the 500 mg dose (partial resistance).

Regimen	Drugs (doses)	Dosing frequency	Duration (days)	FDA approval
Clarithromycin triple	*PPI (standard or double dose)*	*BID*	*14*	*Yes[a]*
	Clarithromycin (500 mg)			
	Amoxicillin (1 grm) or Metronidazole (500 mg TID)			
Bismuth quadruple	PPI (standard dose)	BID	10–14 (14 if salvage therapy)	No[b]
	Bismuth subcitrate (120–300 mg) or subsalicylate (300 mg)	QID		
	Tetracycline (500 mg)	QID		
	Metronidazole (250–500 mg)	QID (250)		
		TID to QID (500)		
Concomitant	*PPI (standard dose)*	*BID*	*10–14 (same as salvage therapy)*	*No*
	Clarithromycin (500 mg)			
	Amoxicillin (1 grm)			
	Nitroimidazole (500 mg)[c]			
Sequential	PPI (standard dose)+Amoxicillin (1 grm)	BID	5–7	No
	PPI, Clarithromycin (500 mg)+Nitroimidazole (500 mg)[c]	BID	5–7	
Hybrid	*PPI (standard dose)+Amox (1 grm)*	*BID*	*7*	*No*
	PPI, Amoxicillin, Clarithromycin (500 mg), Nitroimidazole (500 mg)[c]	*BID*	*7*	
Levofloxacin triple	PPI (standard dose)	BID	10–14 (14 if salvage therapy)	No
	Levofloxacin (500 mg)	QD		
	Amoxicillin (1 grm)	BID		
Levofloxacin sequential	*PPI (standard or double dose)+Amox (1 grm)*	*BID*	*5–7*	*No*
	PPI, Amox, Levofloxacin (500 mg QD), Nitroimidazole (500 mg)[c]	*BID*	*5–7*	
LOAD	Levofloxacin (250 mg)	QD	7–10	No
	PPI (double dose)	QD		
	Nitazoxanide (500 mg)	BID		
	Doxycycline (100 mg)	QD		

AIMS 65 Score

ER Prediction of Mortality, LOS, & Cost

Saltzman JR et al. Gastrointest Endosc 2011;74:1215-24

FACTOR	1 point for each	Alternative Description
Albumin	< 3 g/dL	
INR	> 1.5	
Mental status	Glasgow score < 14	disorientation, lethargy, stupor, or coma
Systolic Pressure	</= 90 mm Hg	
Age	> ***65***	

All factors are the ones present at time of arrival to ER

Mortality/LOS: 2 pts = 3%/5.5 d; 3 pts = 8-10%/6.5 d; 4 pts = 15%/7.5 d; 5 pts = 24%/9 d

13.5% of patients have score =/> 3, with mortality of 10% or higher

Heater Probe in Upper Endoscopy

(Inject “pillow” before Small Bowel burn)

Lesion	Probe	Pressure	Energy	Pulses/ Site
PUD/ Dieulafoy	10 Fr	Very Firm	30 J	4
M-W Tear	7-10 Fr	Moderate	20 J	3
Angiodysplasia	7-10 Fr	Light	15 J	2

BICAP (Gold Probe) in Upper Endoscopy

(Inject “pillow” before Small Bowel burn)

Lesion	Probe	Pressure	Energy	Time/ Site
PUD/ Dieulafoy	10 Fr	Very Firm	20 W	10-14 sec
M-W Tear	7-10 Fr	Moderate	20 W	4 sec
Angiodysplasia	7-10 Fr	Light	15 W	2 sec

Re-Bleeding Risk Factors for Severe Acute LGIB

Strate LL; Am J Gastroenterol 2005;100:1821-1827

Risk Factors	Coefficient	Odds Ratio	95% CI
Heart rate >/= 100/min	1.2	3.7	1.8–7.6
Systolic blood pressure </= 115 mmHg	***0.6***	***3.5***	***1.5–7.7***
Syncope	1.5	2.8	1.1–7.5
Non-tender abdominal examination	***0.9***	***2.4***	***1.2–4.9***
Rectal bleeding within 1st 4 h of evaluation	1.0	2.3	1.3–4.2
Aspirin use (>/= 81 mg in last 7 days)	***0.5***	***2.1***	***1.1–3.8***
>2 comorbid illnesses	0.6	1.9	1.1–3.4

0 RF = 6% re-bleeding rate; LOS 1.7-2.8 d
1-3 RF = 43% re-bleeding; LOS 2.5-3.1 d
> 3 RF = 79% re-bleeding; LOS 3.0-3.5 d

Heater Probe in Colonoscopy

(Inject “Pillow” before burn; tattoo after)

Lesion	Probe	Pressure	Energy	Pulses/ Site
Ulcer	10 Fr	Moderate	15 J	2
Stalk	10 Fr	Moderate	15-20 J	2
Diverticuli	10 Fr	Moderate	15 J	2
Cancer	10 Fr	Moderate	20 J	2
Angiodysplasia	7-10 Fr	Light	10 J	1

BICAP (Gold Probe) in Colonoscopy

(Inject “Pillow” before burn; tattoo after)

Lesion	Probe	Pressure	Energy	Time/ Site
Ulcer	10 Fr	Moderate	20 W	2 sec
Stalk	10 Fr	Moderate	20 W	2 sec
Diverticuli	10 Fr	Moderate	20 W	2 sec
Cancer	10 Fr	Moderate	20 W	2 sec
Angiodysplasia	7-10 Fr	Light	15 W	1 sec

Effect of Family History on Onset & Frequency of Screening Colonoscopy

Category	Start age (the lesser)	Interval
One 2nd degree, or any number 3rd degree with CRC	50	10 years
1st degree with CRC =/> age 60	40	10 years
1st degree with adenoma =/> age 60	40	10 years
Two 2nd degree with CRC	40	10 years
1st degree with adenoma or CRC < age 60	40, or [10 y before “index”]	5 years
=/> two 1st degree with CRC	40, or [10 y before “index”]	5 years

Effect of IBD on Onset & Frequency of Screening Colonoscopy

Category	Start time	Interval
Pancolitis	> 8 years of disease	2 years; q 1 y after 20 y of IBD
Left sided colitis	> 15 years of disease	2 years; q 1 y after 20 y of IBD
Colitis associated with Primary Sclerosing Cholangitis	At time of diagnosis	1 year
IBD colitis with 1st degree relative with CRC (consider also for: histologic inflammation, foreshortened colon, stricture, or multiple inflammatory pseudopolyps)	Pancolitis x 8 y Left sided colitis x 15 y	1 year

Effect of Inherited Disorders on Onset & Frequency of Screening Colonoscopy

Category	Start age (the lesser)	Interval
Serrated Polyposis Syndrome	First degree relative: 10 y younger than index case	1 y (to remove all polyps > 5 mm)
Peutz-Jeghers Syndrome	With symptoms or late teens (whichever is first)	2-3 years
Juvenile Polyposis Syndrome	With symptoms or late teens (whichever is first)	2-3 years
HNPCC (gene carrier or risk) **(Muir-Torre & Turcot w glioblastoma)**	20, or [10 y before "index"] whichever is first	2 years; q 1 y after 40
MYH associated Adenomatous Polyposis (MAP) [> 15 adenomas]	25	2-3 year
FAP/Gardner/Turcot with medulloblastoma/Attenuated APC	10	Yearly colonoscopy

First Follow-Up in Average-Risk Adults With Normal Colonoscopy or Adenomas

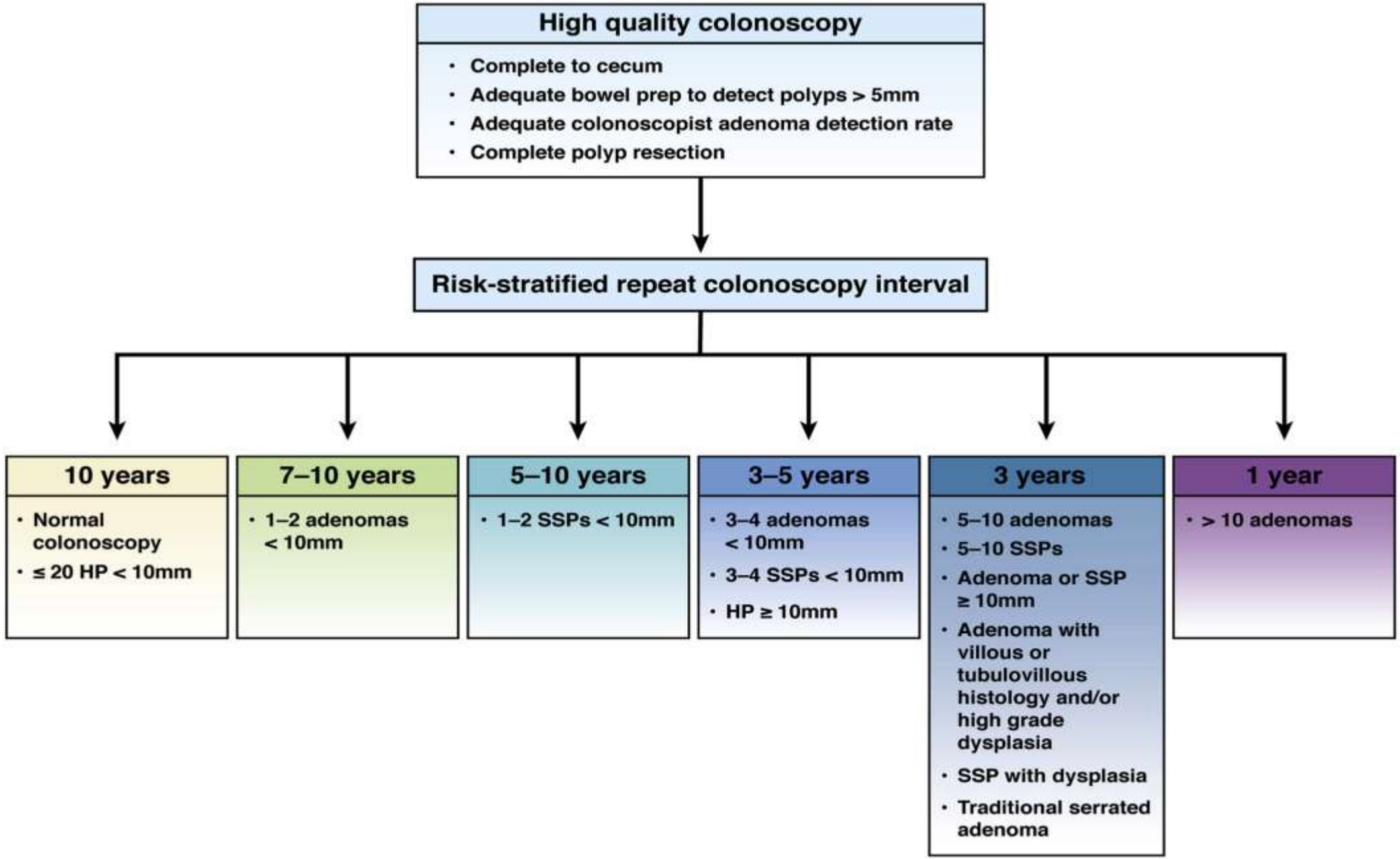
Baseline (First) colonoscopy finding	Recommended interval for surveillance colonoscopy (years)	Strength of recommendation	Quality of evidence
Normal	10	Strong	High
1–2 tubular adenomas <10 mm	7-10	Strong	Moderate
3–4 tubular adenomas <10 mm	3-5	Weak	Very Low
5–10 tubular adenomas <10 mm	3	Strong	Moderate
Adenoma 10 mm	3	Strong	High
Adenoma with tubulovillous or villous histology	3	Strong	Moderate
Adenoma with high-grade dysplasia	3	Strong	Moderate
>10 adenomas on single examination*	1	Weak	Very Low
Piecemeal resection of adenoma 20 mm	6 months	Strong	Moderate

*Patients with >10 adenomas or lifetime >10 cumulative adenomas may need to be considered for genetic testing based on absolute/cumulative adenoma number, patient age, and other factors such as family history of CRC

Recommendations for Post-Colonoscopy First Follow-Up in Average-Risk Adults With Serrated Polyps

Baseline (First) colonoscopy finding	Recommended interval for surveillance colonoscopy (years)	Strength of recommendation	Quality of evidence
</= 20 HPs in rectum or sigmoid colon <10 mm	10	Strong	Moderate
</= 20 HPs proximal to sigmoid colon <10 mm	10	Weak	Very Low
1–2 SSPs <10 mm	5-10	Weak	Very Low
3–4 SSPs <10 mm	3-5	Weak	Very Low
5–10 SSPs <10 mm	3	Weak	Very Low
SSP 10 mm	3	Weak	Very Low
SSP with dysplasia	3	Weak	Very Low
HP 10 mm	3-5	Weak	Very Low
TSA	3	Weak	Very Low
Piecemeal resection of SSP 20 mm	6 months	Strong	Moderate

Patients with cumulative >20 hyperplastic polyps distributed throughout the colon, with at least 5 being proximal to the rectum, as well as those with 5 serrated polyps proximal to the rectum > 5 mm, with at least two 10 mm meet criteria for serrated polyposis syndrome and may require specialized management


High quality colonoscopy
• Complete to cecum
• Adequate bowel prep to detect polyps > 5mm
• Adequate colonoscopist adenoma detection rate
• Complete polyp resection
Risk-stratified repeat colonoscopy interval
10 years
• Normal colonoscopy
• ≤ 20 HP < 10mm
7–10 years
• 1–2 adenomas < 10mm
5–10 years
• 1–2 SSPs < 10mm
3–5 years
• 3–4 adenomas < 10mm
• 3–4 SSPs < 10mm
• HP ≥ 10mm
3 years
• 5–10 adenomas
• 5–10 SSPs
• Adenoma or SSP ≥ 10mm
• Adenoma with villous or tubulovillous histology and/or high grade dysplasia
• SSP with dysplasia
• Traditional serrated adenoma
1 year
• > 10 adenomas

Recommendations for Second Surveillance Stratified by Adenoma Findings at Baseline and First Surveillance

Baseline Finding	First Interval (y)	First Surveillance Finding	Next Interval (y)
1-2 Tubular Adenoma (TA) < 10 mm	7-10	Normal	10
		1-2 TA < 10 mm	7-10
		3-4 TA < 10 mm	3-5
		Adenoma 10 mm in size; or adenoma with tubulovillous/villous histology; or adenoma with high grade dysplasia; or 5–10 adenomas <10 mm	3
3-4 Tubular Adenoma (TA)< 10 mm	3-5	Normal	10
		1-2 TA < 10 mm	7-10
		3-4 TA < 10 mm	3-5
		Adenoma 10 mm in size; or adenoma with tubulovillous/villous histology; or adenoma with high grade dysplasia; or 5–10 adenomas <10 mm	3
Adenoma 10 mm in size; or adenoma with tubulovillous/villous histology; or adenoma with high-grade dysplasia; or 5–10 adenomas <10 mm	3	Normal	5
		1-2 TA < 10 mm	5
		3-4 TA < 10 mm	3-5
		Adenoma 10 mm in size; or adenoma with tubulovillous/villous histology; or adenoma with high grade dysplasia; or 5–10 adenomas <10 mm	3

Additional Surveillance Considerations

- **Discontinuation of surveillance** should be considered in patients with serious comorbidities with less than 10 years of life expectancy.
- Surveillance guidelines are intended for asymptomatic people; new symptoms may need diagnostic work-up.
- Evolving technologies like chromoendoscopy, magnification endoscopy, narrow band imaging, and CT colonography are not established for postpolypectomy surveillance at this time.

Post-Colorectal Cancer Surveillance

	Interval from Previous Exam
Clearing Colonoscopy	Before, During, or 3 months After Resection
Post-Clearing Colonoscopy	1 year later
1st Metachronous Surveillance	3 years later
Subsequent Metachronous Surveillance	5 years later, and every 5 years thereafter

Rectal Cancer

Local Recurrence Surveillance After Low-Anterior Resection

(In addition to Colonoscopies)

	Interval	Duration
Rectal EUS or Rigid/Flexible Proctoscopy	Every 3 months	3 years