

PULMONARY EMBOLISM ANTICOAGULATION (PERT), ADULT, INPATIENT & EMERGENCY DEPARTMENT, PATHWAY

Updated: September 14, 2022

Clinical Pathway Summary

CLINICAL PATHWAY NAME: Pulmonary Embolism Anticoagulation Pathway

PATIENT POPULATION AND DIAGNOSIS: Adult patients presenting with pulmonary embolism.

APPLICABLE TO: Butterworth, Blodgett, and Regionals

BRIEF DESCRIPTION: Guidance on management of pulmonary embolism (PE) and venous thrombosis. This guideline includes algorithms and recommendations for management of [pulmonary embolism in normotensive patients](#) and [pulmonary embolism in hypotensive patients](#). It also contains direction on anticoagulant selection.

OPTIMIZED EPIC ENHANCEMENTS: Venous Thrombolytic Embolism Prophylaxis Order Set- 403, VTE/PE Discharge Order Set-1330, VTE/PE Treatment Order Set-401

IMPLEMENTATION DATE: September 2022

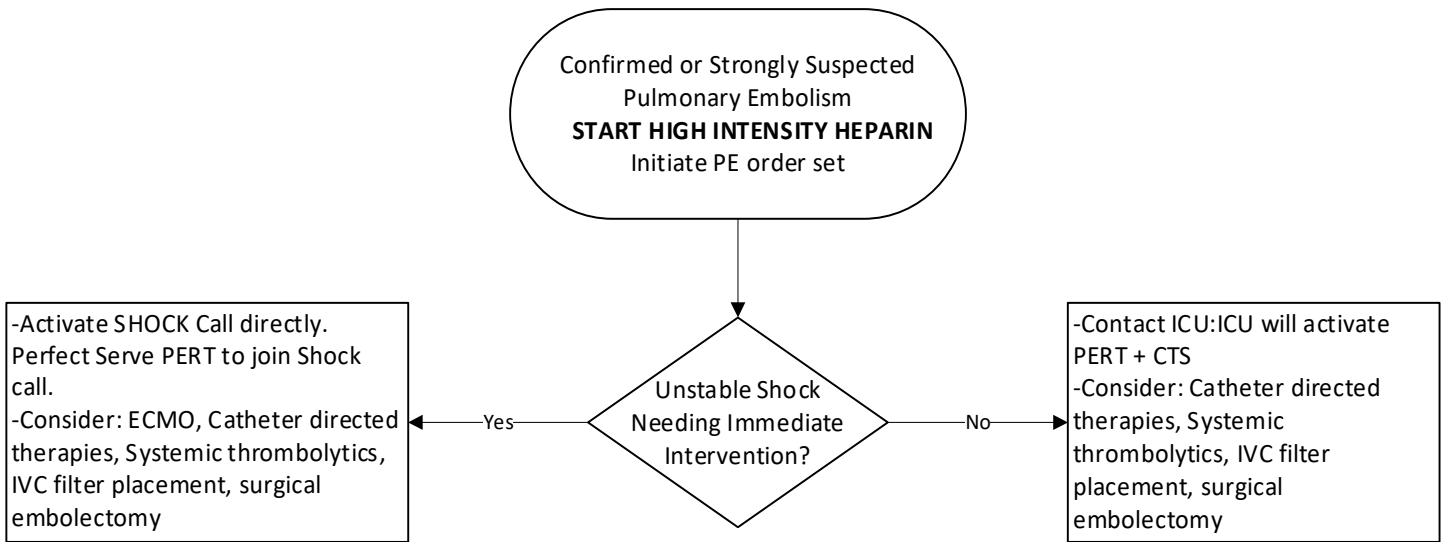
LAST REVISED: September 2022

Clinical pathways clinical approach

TREATMENT AND MANAGEMENT:

Clinical algorithm:

Massive Pulmonary Embolism- Hypotensive Patients (SBP <90 or MAP <65mm Hg)



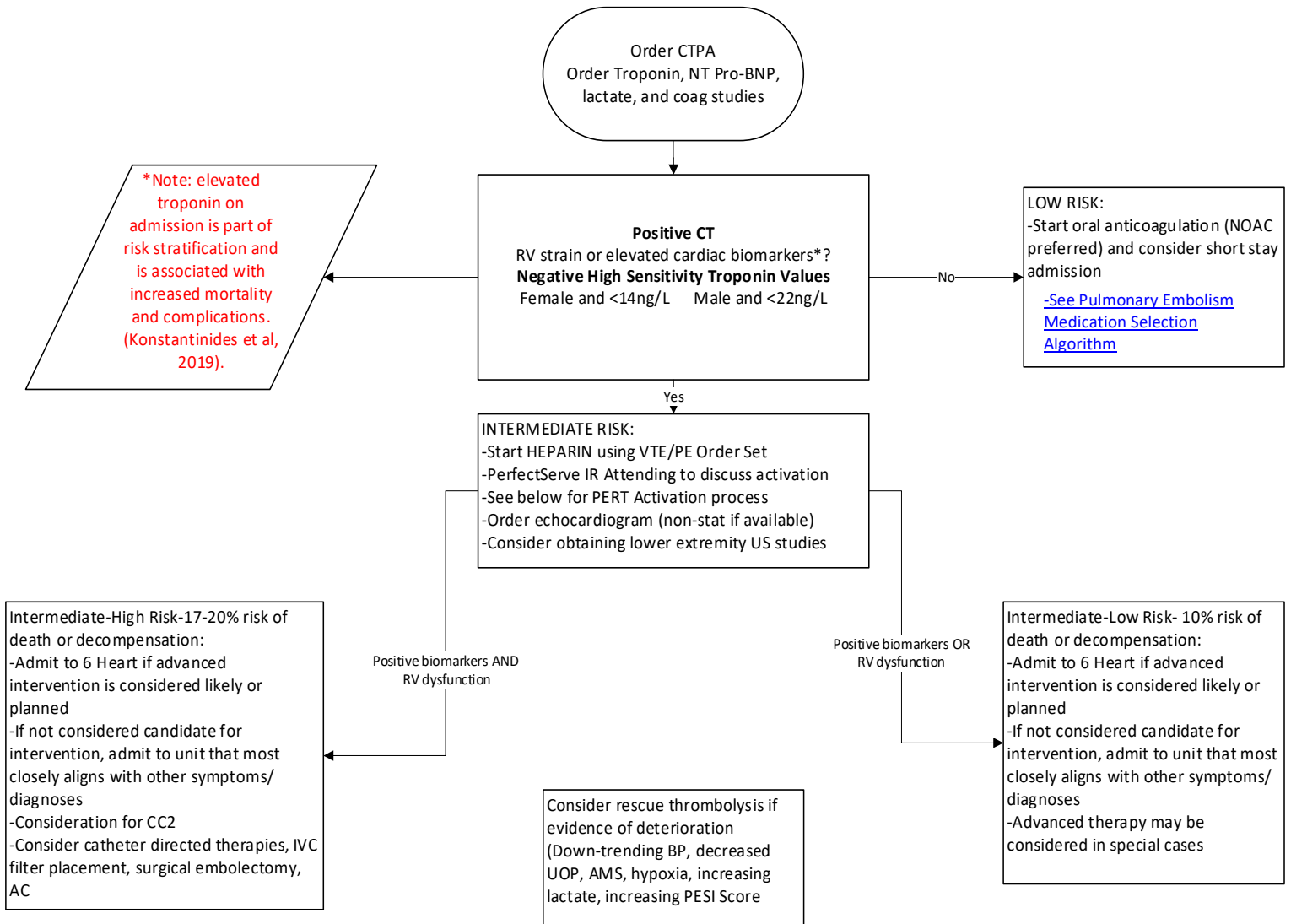
PERT Activation

- Step 1: Perfect Serve ICU or IR to discuss whether PERT activation is appropriate (Regional ED to utilize Transfer Center and IR Contact)
- Step 2: Activate "**PERT Alert**" over Perfect Serve by utilizing group "**PERT Alert**" and follow the prompts
- Step 3: 10 minutes after PerfectServe "**PERT Alert**" activated, Dial ***PERT call Number:** (866-705-2554 enter Code: 304708) to access conference line

**The Primary team is responsible for PERT activation unless otherwise specified and requested to be present on call.*

**Transfer center can activate when part of outside facility transfer.*

Pulmonary Embolism- Normotensive Patients (SBP >90, MAP>65mm Hg)



PERT Activation

- Step 1: PerfectServe ICU or IR to discuss whether PERT activation is appropriate (Regional ED to utilize Transfer Center and IR Contact)
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Absolute Contraindications to systemic thrombolysis:⁹

- History of hemorrhagic stroke or stroke of unknown origin
- Central nervous system neoplasm
- Ischemic stroke in previous 6 months
- History of major trauma, surgery, or head injury in the previous 3 weeks
- Active bleeding
- Bleeding diathesis

Relative Contraindications to systemic thrombolysis:⁹

- Transient ischemic attack in previous 6 months
- Pregnancy or first post-partum week
- Oral anticoagulation
- Non-compressible puncture sites
- Traumatic resuscitation
- Refractory hypertension (SBP >180mm Hg, DBP >100mm Hg)
- Infective endocarditis
- Advanced liver Disease
- Active peptic ulcer

Considerations for Advanced Interventions (catheter directed mechanical thrombectomy, thrombolysis, and/or surgical embolectomy):

- High risk (massive) PE with increased risk of bleeding
- Intermediate risk patients with evidence of clinical deterioration which includes:
 - Down-trending blood pressure
 - Findings of Right Heart Strain (RV/LV Ratio of >0.9, elevated biomarkers, etc.)
 - Change in mental status
 - Decrease in UOP
 - Increasing lactate level
 - Worsening hypoxia
 - Increasing PESI Score
 - Progressive Symptoms despite medical management
- Hypotension with either a contraindication or failed response to thrombolytics
- Intermediate risk or High risk (massive) PE with clot-in-transit (RA-RV thrombus) +/- PFO
- Large anatomically extensive clot burden with Intermediate risk PE

Considerations for IVC Filter:Indications for Permanent Filters:

DVT +/- PE and:

- Contraindication for anticoagulation
- Failure of anticoagulation
- Complication of anticoagulation
- Poor compliance with anticoagulation or poor candidate for long-term anticoagulation

Filter is considered permanent if patient will never be a good candidate for long-term anticoagulation, has terminal illness or severe comorbidities, elderly (no specific cut off age)

Indications for Temporary Filters:

DVT +/- PE and:

- Temporary contraindication to anticoagulation
- Large volume PE and residual DVT
- Severe cardiopulmonary disease with DVT
- Free floating ilio-caval thrombus
- Large volume PE and right ventricular strain/failure (high risk or intermediate risk PE). Although somewhat controversial for routine use, filter placement can be considered in selected high and

intermediate risk PE patients who are treated with pulmonary embolectomy, catheter directed thrombolysis, systemic lysis, or anticoagulation alone.

- Prophylactic placement in some high-risk patients, e.g. trauma, bariatric

Considerations for Extracorporeal Membrane Oxygenation (ECMO)

- May be indicated in case of High risk (massive) PE requiring RV support
- SHOCK Call Initiated

Prognostic Scoring Systems

BOVA Score ¹

Bova Score and Staging System for Risk of PE-Related Complications Within 30 Days of Acute Symptomatic PE Diagnosis¹

| Predictor Variable | Points | |
|--|--------|---|
| Systolic BP 90-100 mm Hg | 2 | Stage I (0-2 points): 5.7% Complications |
| Cardiac Troponin Elevation | 2 | |
| RV Dysfunction (echocardiogram or CT scan) | 2 | Stage II (3-4 points): 14.3% Complications |
| Heart Rate ≥110/min | 1 | |
| | | Stage III (>4 points): 21.6% Complications |

PE prognosis Score ²

sPESI factors: Age >80, Chronic cardiopulmonary disease, HR >110, SBP <100, O2 sats <90%, Hx of Cancer

| Score | 30-day complicated course |
|-----------------------------|---------------------------|
| sPESI ≥1 | 10% |
| sPESI ≥1 + BNP | 14% |
| sPESI ≥1 + BNP + troponin | 20% |
| sPESI ≥1 + BNP + trop + DVT | 26% |

PE Prediction tool ⁴

- One point for: Syncope, Severe RV dysfunction on Echocardiogram, Troponin >0.7ug/L, RV/LV ratio >1.425 on CT.
- Negative 1 point for a normal EKG

| Score | Clinical deterioration or need for escalation therapy |
|-------|---|
| 0 | 1.9% |
| 1 | 9.2% |
| 2 | 21.2% |
| 3 | 36% |
| 4 | 57% |

Use of High-sensitivity Troponin ⁴

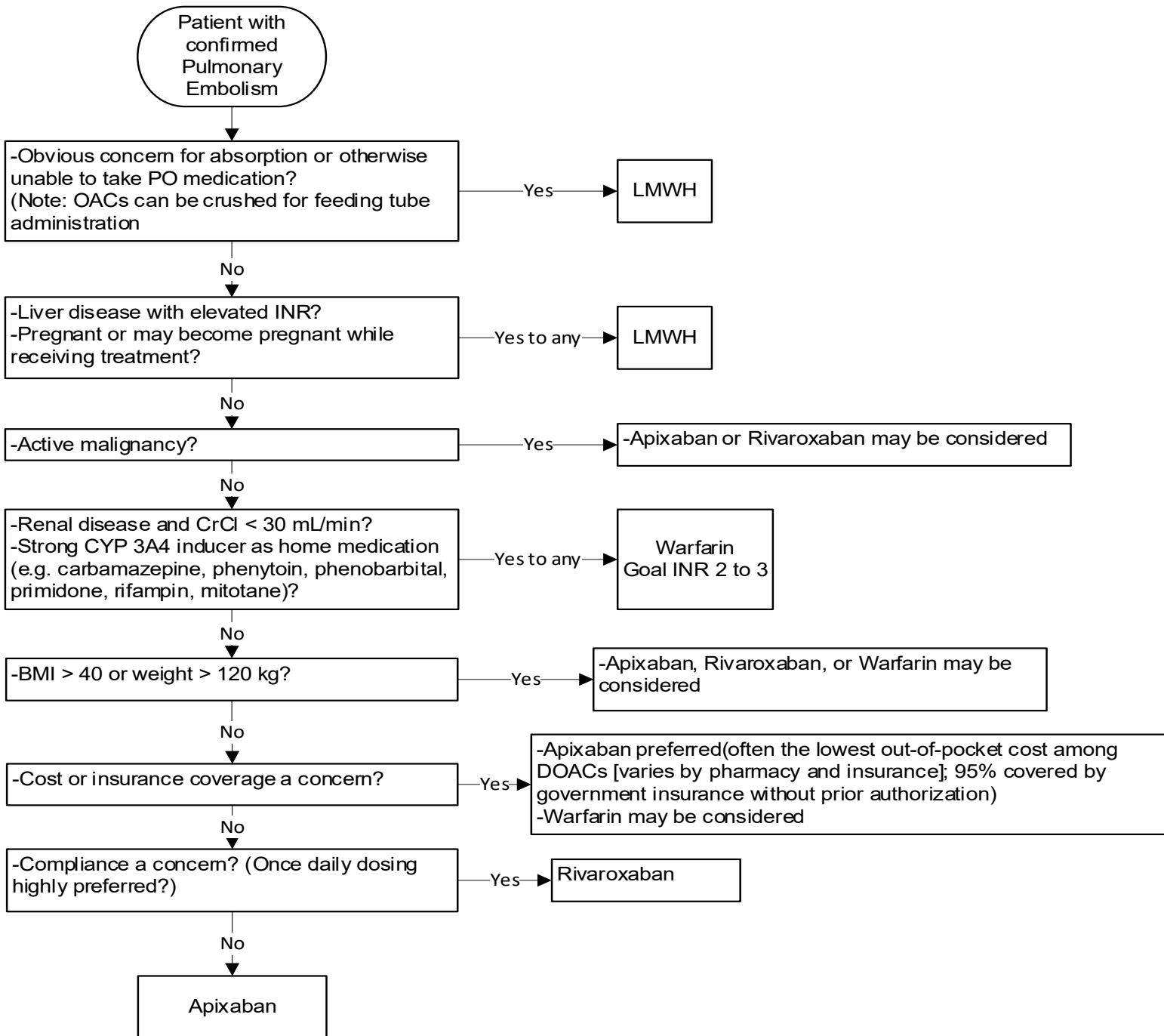
High sensitivity troponin of <14ng/mL – Only 2% of patients had an adverse 30-day outcome and strongly predicts uncomplicated course.

Classification of Pulmonary embolism severity and the risk of early (in-hospital or 30 day) death ¹¹

| Early mortality risk | | Indicators of risk | | | |
|----------------------|-------------------|---------------------------------------|---|--|---|
| | | Haemodynamic instability ^a | Clinical parameters of PE severity and/or comorbidity: PESI class III–V or sPESI ≥1 | RV dysfunction on TTE or CTPA ^b | Elevated cardiac troponin levels ^c |
| High | | + | (+) ^d | + | (+) |
| Intermediate | Intermediate-high | – | + ^e | + | + |
| | Intermediate-low | – | + ^e | One (or none) positive | |
| Low | | – | – | – | Assessment optional; if assessed, negative |

Pulmonary Embolism Medication Selection Algorithm

STEP 1: Choose the Appropriate Medication for Ongoing Treatment



***DOACs are preferred over warfarin!** (Equal efficacy, decreased bleeding, increased convenience & compliance for patients). **Warfarin** is 2nd line drug of choice if other patient-specific factors preclude DOAC use (Allergy, patient refuses DOACs, etc.)

STEP 2: Determine Duration of Therapy

1. Determine Risk of PE Recurrence

| | Definition | Risk of Recurrence |
|-------------------|---|---------------------|
| Provoked | Recent surgery | 3% at 5 years |
| | Non-surgical transient: estrogen therapy, pregnancy, leg injury, flight of > 8h | 15% at 5 years |
| Unprovoked | No transient risk factors identified and no active cancer | 30% at 5 years |
| Cancer-Associated | | 15% <i>per year</i> |

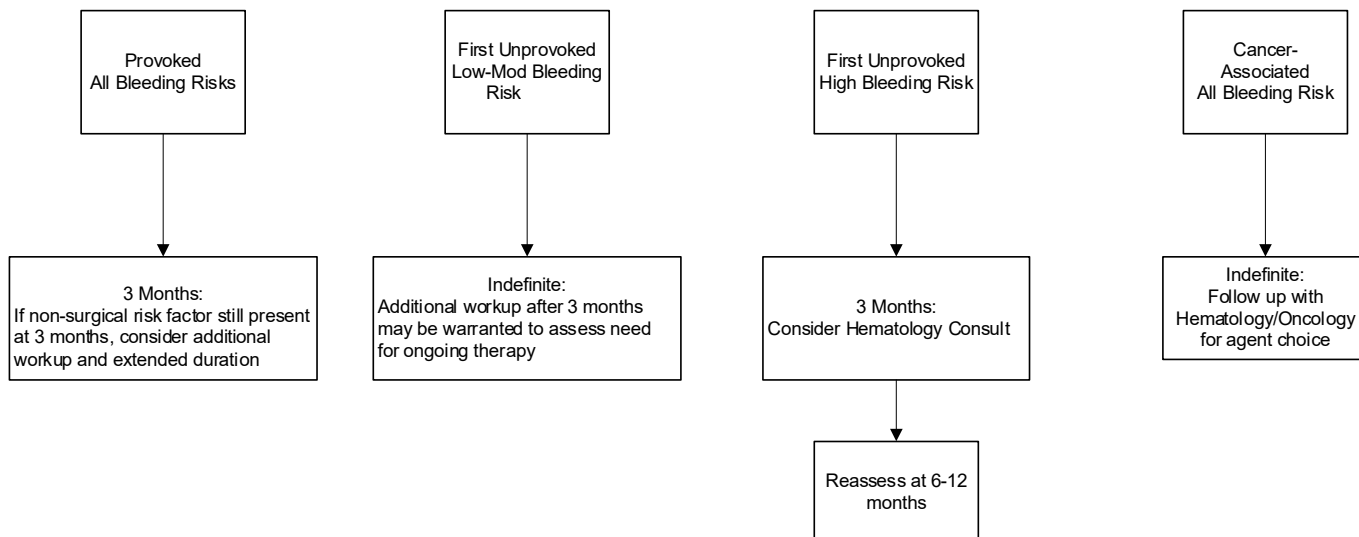
2. Determine Bleeding Risk

| | | |
|---|--|--|
| Age > 65 | Uncontrolled hypertension (SBP > 160) | Alcohol use > 8 drinks/week |
| Renal disease (dialysis, transplant, SCr > 2.2 mg/dL) | Liver disease (cirrhosis, bili > 2x normal w/ AST/ALT > 3x normal) | Labile INR (Time in therapeutic range < 60%) |
| Stroke history | Prior major bleeding | Meds that increase bleeding risk (antiplatelets, NSAIDs, etc.) |

- Low Risk: 0 risk factors (0.9% risk of major bleeding)
- Intermediate Risk: 1-3 risk factor (3.4 – 5.8% chance of major bleeding)
- High Risk: 4 or more risk factors (>9% chance of major bleeding)

Additional Bleeding Risk Considerations: Thrombocytopenia < 40,000, diabetes, frequent falls, anemia, cancer

3. Determine Duration



STEP 3: Determine Appropriate Dosing and Assess Cost Opportunities

| Medication | Dosing |
|------------------------------|--|
| LMWH - Enoxaparin (Lovenox®) | <p>1mg/kg q 12h</p> <p>CrCl < 30 ml/min: 1mg/kg q24h</p> <p>ESRD/Dialysis: Warfarin preferable (LMWH dosing with anti-Xa monitoring possible but highly non-preferred)</p> |
| Warfarin | <p>All patients require bridging with IV UFH or SQ enoxaparin for at least 5 days. Stable, low-risk patients may discharge home with SQ enoxaparin + warfarin; follow-up in office or warfarin clinic within 72 hours</p> <p>Default INR goal 2-3</p> <p><u>Normal liver function, no coagulopathy or major drug interactions:</u> Begin 5-10mg once daily for 2 days; titrate dose based on daily INR analysis.</p> <p><u>Liver impairment or major drug interactions:</u> Begin 2-5mg once daily; titrate dose based on daily INR analysis</p> |
| Apixaban (Eliquis®)* | <p>10mg PO BID x 7 days, then 5mg BID</p> <p>(After 6 months, can reduce to 2.5mg BID if indefinite therapy is planned)</p> |
| Rivaroxaban (Xarelto®)* | <p>15mg PO BID x 21 days, then 20mg daily.</p> <p>Take with food.</p> |

Pathway Information

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CONTRIBUTOR (S): Matthew Gurka

EXPERT IMPROVEMENT TEAM (EIT): PERT EIT

CLINICAL PRACTICE COUNCIL (CPC): Specialty Health and Cardiovascular Health

CPC APPROVAL DATE: Specialty Health CPC September 19, 2022.

OTHER TEAM(S) IMPACTED: Emergency Department, hospitalists

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