Massive and Submassive Pulmonary Embolism Algorithm

Hemodynamic or respiratory instability/concern for possible clinical decompensation
- Admit/transfer to ICU
- Continue anticoagulation
- Obtain STAT ECHO, BMP, CBC, troponin, BNP, lactate, INR, PTT, fibrinogen, type and screen, bilateral LE Doppler US
- Avoid arterial or non-compressible venous punctures
- Call 612-863-1000 to activate PE Response Team (Intensivist, Interventional Radiologist, Cardiologist, Pediatrics for ages 15-18)

**Massive PE**
- SBP < 90 or > 40 mm Hg drop from baseline
- PE-related need for vasopressors
- Shock
- Consider CV Surgery Consult
- Consider ECMO in shock with severe RV or bi-ventricular dysfunction + signs of tissue hypoxia or hypotension requiring high dose catecholamines

**Submassive PE**
- High Risk Features
  - Moderate to severe RV dysfunction (ECHO, CT)
  - Worsening hemodynamic status
  - Troponin and BNP elevation
  - S4ESI ≥1*
- Rule out alternative cause of the above findings

**Without High Risk Features**
- Systemic anticoagulation alone

**Assess the need for IVC filter**
- Established indications:
  - Unable to anticoagulate
  - Recurrent PE despite adequate anticoagulation
- Consider in:
  - Patients with lower extremity or iliocaval DVT and hemodynamic instability or limited hemodynamic reserve**

**Catheter-Directed Intervention**
- Persistent hypotension/shock
- Start heparin infusion. Use tPA for PE Order Set #30840
- Consider systemic tPA**
- Consider Catheter-Directed Intervention**

**Simplified Pulmonary Embolism Severity Index (SPESI)** predicts overall 30-day mortality
- Age >80
- History of cancer
- Chronic pulmonary disease
- HR ≥ 110
- SBP <100
- Arterial O₂ saturation < 90%

**ECMO Catheter-Directed Intervention Surgical Embolectomy**

**Intervention on a case by case basis.**
TPA Checklist *Patient-specific risk/benefit assessment is required in each case.*

**Major contraindications**
- Active bleeding
- Current or previous intracranial hemorrhage
- Structural intracranial disease
- Ischemic stroke within 3 months
- Head or facial trauma, brain or spine surgery within 12 months (shorter intervals may be applicable)
- Suspected aortic dissection

**Relative Contraindications/Precautions**
- Severe, poorly controlled hypertension or current BP ≥ 180/110 mm Hg
- Major non-intracranial bleeding in the last 2 months
- Surgery, trauma, or invasive procedure in the last 2 – 4 weeks
- Traumatic or prolonged (>10 min) cardiopulmonary resuscitation
- Lumbar puncture in the past 3 days
- Vascular puncture at a non-compressible site
- Pericarditis or pericardial effusion
- Platelet count < 100,000 mm3 or anticoagulation resulting in INR > 1.7
- Active peptic ulcer
- Diabetic retinopathy
- Caution in patients currently receiving warfarin, heparin, or antiplatelet drugs
- Caution in pregnancy or h/o parturition in the past 30 days.
- Caution in age > 75 years, Low body weight (< 60 kg)

**Outpatient follow up**
PE patients with pulmonary hypertension (RVSP > 40) and/or moderate/severe RV dysfunction should have a repeat ECHO and a cardiology follow up at the MHI Pulmonary Hypertension Clinic 6- 8 weeks after discharge. Call PH Clinic (612-863-9996/Emily) to make follow-up appointments.

MHI Thrombophilia/Anticoagulation Clinic. Call 612-863-6800 for appointments.

**IV TPA Administration and Anticoagulation Highlights**

**Reduced Dose tPA** (associated with reduced bleeding risk):
- For high risk submassive PE
- Patient weighing >50 kg: 10 mg bolus followed by 40 mg infusion over 2 hours
- Patient weighing ≤50 kg: A total dose of 0.5 mg/kg (10 mg bolus followed by the remaining amount, over 2 hours)

**Full Dose tPA:** 100 mg infusion over 2 hours

**Heparin Infusion:** *Stop heparin prior to IV tPA administration*

1. Check aPTT 1 hour after the IV TPA infusion completion, then q 1 hour as needed if first aPTT is still too high
2. Resume IV Heparin infusion per VTE Protocol without a bolus when aPTT is < 80

**Catheter-Directed Interventions (CDI) for PE**

**Massive PE**
- Clot fragmentation or aspiration plus tPA 20-40 mg
- Depending on hemodynamic response, continued local low dose lytic infusion directly into clot (see submassive PE below)

**Submassive PE**
- Local infusion through a catheter
  - Total tPA dose is ~24 mg over 12 or 24 hrs locally
  - Bilateral rate 1 mg/hr x 12 hrs, unilateral rate 0.5 mg/hr x 24 hrs
  - Sub-therapeutic heparin @ 500 units/hr during lysis
  - tPA adjustment if fibrinogen < 200
  - tPA is either stopped or cryoprecipitate is given if fibrinogen<100
  - Hgb, Plt, INR, fibrinogen in 4 hrs, then q 6 hrs
- Therapeutic heparin is continued until in IR suite and restarted when exiting IR suite after completion of procedure (sub- therapeutic heparin regimen during thrombolytic infusion)

**When thrombolysis absolutely contraindicated**
- CDI is reserved for Massive or high risk AND clinically deteriorating Submassive PE
- Mechanical clot fragmentation or catheter -aspiration (both typically less effective without tPA)