



SUMMARY OF CLINICAL GUIDELINE	
Disease or Condition	Pulmonary Embolism
Guideline Title:	Pulmonary Embolism
Guideline Source:	<p>Evaluation of Patients with Suspected Acute Pulmonary Embolism: Best Practice Advice from the Clinical Guidelines Committee of the American College of Physicians <i>Ann Intern Med.</i> doi 10.7326/M14-1772</p> <p>Antithrombotic Therapy for VTE Disease CHEST 2016; 149(2):315-352</p> <p>2019 ESC Guidelines for Acute Pulmonary Embolism Eur Heart Volume 41, issue 4, 21 January 2020, pages 543-603</p>
Guideline Original Date	January 2020
Guideline Most Recent Revision Date & Any Notable Updates	January 2020
CHC Review Dates(s)	<p>Guidelines and Components in Summary were reviewed and approved on by the Pulmonary Embolism Workgroup. Recommendations for adoption referred to the Board of Managers for approval on March 19, 2020.</p> <p>Guideline Approval/Update/Revision Meetings:</p> <ul style="list-style-type: none"> • Approved • Will be reviewed with updates or at least every two years.
Guideline Summary	<p>Pulmonary embolism (PE) is due to thrombotic occlusion of the main or branching pulmonary arteries and is a common condition that leads to significant morbidity and mortality.</p> <p>No individual risk factor, clinical sign, or patient's symptom can definitively diagnose or exclude PE. Clinician gestalt must be a part of the diagnostic process.</p> <p>Clinical decision tools have been developed to help guide clinicians during their evaluation of patients with suspected acute PE. These have been developed to help physicians stratify patients into groups for whom different diagnostic strategies are appropriate:</p> <ol style="list-style-type: none"> 1) Those for whom PE is so unlikely that they do not need further testing. 2) Those for whom plasma D-dimer testing can provide additional risk stratification. 3) Those who are at high enough risk that imaging is indicated.



<p>Implementation Components Identify component(s) of the guideline CHC should adopt.</p>	<p>Key Components/Messages:</p> <p>Diagnostic Wells Criteria for acute pulmonary embolism to risk stratify into low, intermediate/moderate, and high risk.</p> <p>WELLS SCORE</p> <ul style="list-style-type: none">• clinical signs and symptoms of DVT = 3• an alternative diagnosis is less likely than PE = 3• heart rate more than 100 = 1.5• immobilization for 3 or more consecutive days or surgery in the previous 4 weeks = 1.5• previous objectively diagnosed PE or DVT = 1.5• hemoptysis = 1• malignancy (on treatment, treatment in last 6 months or palliative) =1 <p>Three tier scoring:</p> <ul style="list-style-type: none">• 0-1: low risk (Use pulmonary embolism rule-out criteria (PERC) can be considered as well as D-dimer)• 2-6: moderate risk (moderate risk: consider D-dimer or CT pulmonary angiography)• >6: high risk (high risk: D-dimer not recommended) <p>a) <u>If low risk, use PERC rule (see next page) and if ALL the criteria are NOT met</u> then the patient should be stratified by using a plasma D-dimer test. A normal plasma D-dimer level (ideally, age adjusted [age x10ng/mL] but otherwise less than 500 ng/mL) provide sufficient negative predictive value for PE; do not order imaging studies. An elevated plasma D-dimer level should lead to imaging studies.</p> <p>b) If <u>intermediate risk</u>, D-dimer and CT pulmonary angiography (CPTA), if indicated.</p> <p>c) If <u>high risk</u>, D-dimer is not recommended, perform CPTA. D –dimer assay should not be obtained in patients with a high pretest probability of PE because a negative value will not obviate the need for imaging.</p>
---	--



PERC Rule: developed in response to growing use of D-dimer testing among patients with the wide range of signs and symptoms potentially suggestive of PE. It was specifically developed to help guide clinicians in identifying low risk patients in whom the risks of any testing including a plasma D-dimer level outweigh the risk for PE. It is meant to be applied to patients in whom a clinician has a genuine concern about PE and whose initial risk stratification (Wells Criteria) identifies them as being at very low risk.

PERC RULE (use for low risk)

- age <50
- pulse <100 bpm
- oxygen saturation >95% on room air
- absence of unilateral leg swelling
- absence of [hemoptysis](#)
- no recent trauma or surgery
- no prior history of venous thromboembolism
- no exogenous estrogen use

If the patient is deemed low risk and meet all of the PERC items then there is no need for further PE workup.

If the patient is deemed low risk, but is positive for any of the above PERC items, a [d-dimer](#) should be considered.

If a d-dimer is positive, further investigation such as CTPA or V/Q scan may be indicated.

Imaging Studies

Imaging should be done for patients with high pretest probability of PE using clinical prediction tools (Wells Criteria/PERC rule), or physician judgement. CT Pulmonary Angiography (CTPA) is the preferred method of diagnosis. Ventilation-perfusion (V/Q) scanning should be used when the CPTA is unavailable or contraindicated. V/Q scanning may be less useful in patients with COPD, pneumonia, or pulmonary edema.

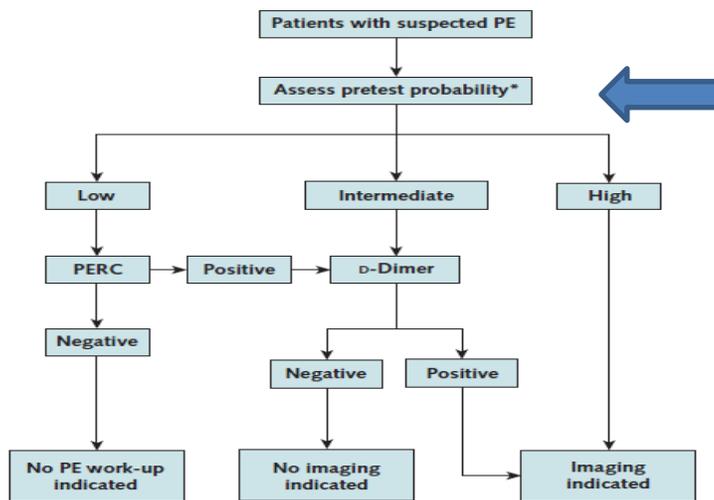
For patients in whom CPTA and V/Q scanning cannot be done, lower extremity venous ultrasonography can be used. This can also be used in patients with symptoms of both DVT and PE.



BEST PRACTICE ADVICE for evaluation of patients with suspected acute pulmonary embolism:

- 1) Clinicians should use validated clinical prediction rules to estimate pretest probability in patients in whom acute PE is being considered.
- 2) Clinicians should not obtain D-dimer measurements or imaging studies in patients with a low pretest probability of PE and who meet all PERC.
- 3) Clinicians should obtain a high sensitivity D-dimer measurement as the initial diagnostic test in patients who have an intermediate pretest probability of PE or in patients with low-test probability of PE who do not meet all PERC. Clinicians should not use imaging studies as the initial test in patients who have a low pretest probability of PE.
- 4) Clinicians should use age adjusted D-dimer thresholds (age x10ng/ml rather than a generic 500 ng/mL) in patients older than 50 years to determine whether imaging is warranted.
- 5) Clinicians should not obtain any imaging studies in patients with the D-dimer level below the age-adjusted cut off.
- 6) Clinicians should obtain imaging with CTPA in patients with high pretest probability of PE. Clinicians should reserve V/Q scans for patients who have a contraindication to CTPA or if CTPA is not available. Clinicians should not obtain a D-dimer measurement in patients with a high-test probability of PE.

Figure 1. Pathway for the evaluation of patients with suspected PE.



PE = pulmonary embolism; PERC = Pulmonary Embolism Rule-Out Criteria.

* Using either a clinical decision tool or gestalt.

Reference: Evaluation of Patients with Suspected Acute Pulmonary Embolism: Best Practice Advice From the Clinical Guidelines Committee of the American College of Physicians *Ann Intern Med.* doi 10.7326/M14-1772



	<p>TREATMENT</p> <ol style="list-style-type: none">1) Rescue intravenous (IV) thrombolysis is now a Class 1 recommendation, and interventional thrombus removing therapy (catheter based or surgical) is now a Class IIa recommendation in hemodynamically deteriorating PE.2) Direct oral anticoagulants (DOACs) are now recommended as first choice anticoagulants over warfarin even in those who are warfarin eligible.3) A reduced dose of apixaban or rivaroxaban for extended anticoagulation should be considered after the first the 6 months of treatment.4) Anticoagulants should all be stopped after 3 months in patients with a proximal DVT or Pulmonary Embolism (PE) <u>provoked by a nonsurgical transient risk factor</u>.*5) Anticoagulation should be given for 3 months in patients with a <u>first unprovoked VTE</u> and after 3 months of treatment the patient should be <u>evaluated for the risk benefit ratio of extended therapy</u>.*6) In patients with a <u>second unprovoked VTE</u> and who have a low, moderate, or high bleeding risk it is suggested that they receive extended anticoagulation therapy with no scheduled stop date. The continued use of anticoagulant should be reassessed at periodical intervals (eg, annually).7) For patients with an <u>unprovoked proximal DVT or PE</u> who are stopping anticoagulant therapy, the guidelines suggest the use of aspirin over no aspirin to prevent recurrent VTE, if there are no contraindications to aspirin therapy.8) Routine follow-up with an integrated inpatient/outpatient care delivery model 3-6 months after, as well as referring symptomatic patients with mismatched perfusion defects(on V/Q scan)> 3 months post PE, to an expert chronic thromboembolic pulmonary hypertension center is a Class I recommendation. <p>*Imaging studies to confirm resolution may be of value in the determination of length of treatment.</p>
<p>Other Clinical Considerations</p>	<p>SPECIAL CONSIDERATIONS</p> <ol style="list-style-type: none">1) <u>CANCER RELATED</u>: Edoxaban or rivaroxaban should be considered as an alternative to low-molecular weight heparin in patients with cancer, with caution in gastrointestinal cancers due to the increased bleeding risks of DOACs.2) <u>SURGICAL PATIENTS</u>: In patients with a proximal DVT of the leg or PE provoked by surgery, anticoagulation for 3 months is recommended over treatment of a shorter or longer course.3) <u>PREGNANT PATIENTS</u>: A dedicated diagnostic algorithm is proposed for suspected PE in pregnancy. Using D-dimer and other clinical prediction rules to rule out PE during pregnancy is now a Class IIa recommendation. DOACs are not recommended in pregnancy.



	<p>4) RECURRENT VTE: In patients who have recurrent VTE on warfarin therapy (in the therapeutic range or on dabigatran, rivaroxaban, apixaban or edoxaban and are believed to be compliant), it is suggested to switch to treatment with low-molecular weight heparin at least temporarily. In patients who have recurrent VTE on long-term low-molecular weight heparin (and are believed to be compliant), it is suggested to increase the dose of low molecular weight heparin by about one quarter to one third.</p> <p>5) IVC FILTER RECOMMENDATIONS:</p> <ul style="list-style-type: none"> a) Adult patients with any acute proximal DVT (or acute PE) with contraindications to anticoagulation or active bleeding complication should receive an IVC filter. b) Anticoagulation should be resumed in patients with an IVC filter once contraindications to anticoagulation or active bleeding complications have resolved. c) Patients who receive retrievable IVC filter should be evaluated periodically for filter retrieval within the specific filters retrieval window. d) For patients with recurrent PE despite therapeutic anticoagulation, it is reasonable to place an IVC filter.
CHC Pulmonary Embolism Guideline Workgroup	<p>2020 Participants:</p> <ol style="list-style-type: none"> 1. Sarah Usmani, MD 2. Thomas Quinn, MD 3. Terrence Moisan, MD

**These guidelines are provided only as “guides” or assistance for physicians making clinical decisions regarding the care of their patients and may not apply to all patients and all clinical situations. Thus, they are not intended to override clinicians' judgment. As such, they cannot substitute the individual judgment brought to each clinical situation by the patient's physician. As with all clinical reference resources, they reflect the best understanding of the science of medicine at the time of publication, but they should be used with the clear understanding that continued research may result in new knowledge and recommendations*