HMC EM EVIDENCE-BASED CLINICAL ALGORITHM:
PULMONARY EMBOLISM WORKUP (LOW-PROBABILITY CASES)

Version date: 15 September 2015
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Evidence basis:
- Singh B. Diagnostic accuracy of Pulmonary Embolism Rule-Out Criteria (PERC). *Ann Emerg Med* 2012; 59: 517-520.
- Green SM. Right-sizing testing for pulmonary embolism: Recognizing the risks of detecting any clot. *Ann Emerg Med* 2012; 59: 524-526.
- Righini M. Age-adjusted D-dimer cutoff levels to rule out pulmonary embolism: ADJUST PE Study. *JAMA* 2014; 1117-1124.

This EBCA:
- has been endorsed by HMC EM and other consultants for education and assistance with clinical practice in HMC's EDs.
- is intended to complement any related multispecialty Clinical Practice Guideline prepared as per HMC policy.
- is not presented as the binding "standard of care" but is rather a reference tool to inform clinical judgment.

Algorithm aim & applicability:
This algorithm applies to adult non-obstetric patients (>17) in whom, after initial evaluation, there is low risk (<15% by gestalt *or* Wells) of pulmonary embolism (PE) and question of need to pursue PE work-up/evaluation)

Application of PERC: Are *all* of the following true)?
- Age <50 years
- HR <100
- SpO2 >94%
- Absent unilateral leg swelling
- No hemoptysis
- No surgery or trauma within 4 weeks
- No history of previous DVT or PE
- No oral hormone use

No

Yes

Wells' criteria use in defining low-risk (<15% chance) for PE

Patients can have *neither* of the following characteristics
- Clinical signs/symptoms of DVT
- PE is the #1 diagnosis (including "tie" for #1)

Patients can have *zero or one* of the following characteristics:
- HR >100
- Immobilization at least 3 days or surgery <4 weeks ago
- Previous objectively diagnosed DVT or PE
- Hemoptysis
- Malignancy with Tx (or palliative care) within 6 months

Institute workup for PE diagnosis. PE investigation may include combination of the following (see *boxes* below):
- D-dimer
- ED ultrasound performed by EM
- Radiology-performed ultrasound
- CT scan
- V/Q scan

ED PE workup not required. It is likely that the overall harm of a PE work-up outweighs the benefit to the patient.
- Document: *"My clinical judgment for this patient is that the risks of PE workup outweigh the likely benefits."*
- Only for those cases in which there is lingering concern, patients should be recommended for 24-hour recheck. If this option is chosen, document: *"I have asked the patient to be rechecked in 24 hours (or earlier if worse)."*

Notes on D-dimer interpretation

Age
- D-dimer cutoff is 500 mcg/L in patients up to 50 years old
- For patients >50 the cutoff is *10×age* (*e.g.* 550 if 55 years old)

Conditions increasing or decreasing D-dimer (partial listing)
- D-dimer can be elevated by infection, cancer, pregnancy (*PE work-up in pregnant patients is outside this EBCA's scope*), or recent surgery/trauma.
- D-dimer can be falsely negative in patients taking warfarin or in patients with small clots, >5 days of symptoms, calf-only thrombosis, or isolated small pulmonary infarction.

Notes on PE imaging

Ultrasound (US)
- Emergency Radiology resources do not allow performance of large numbers of lower extremity (LE) US studies.
- Patients can often safely be given a dose of anticoagulation (*e.g.* LMWH) and then sent for outpatient-clinic US.
- PE can come from multiple sites (not just proximal LEs).
- EM US *may* be incorporated into decision-making *only* for those whose training/certification specifically includes DVT evaluation.

CT scan
- "Double rule-out" chest CT (*i.e.* to assess for PE and aortic dssxn) requires an additional dose of ionizing radiation (to get venous & arterial phases of contrast). Discuss with Radiology if considering.

V/Q: Rarely indicated in the ED (discuss with Radiology if considering)