Outline
Risk Assessment
- Do we understand risk stratification?
- Are we limiting radiation/contrast with the PERC rule and D-Dimers?

CASE #1
- 61 y.o. M w/ worsening pleuritic CP and SOB
  - Recent URI symptoms
  - Heavy smoker, No other PMHx
  - NAD, HR=98, RR = 24, Afebrile 93% on RA
  - Diffuse wheezes, No edema

- ED is busy and patient looks comfortable
  - What orders should you write?

CASE #1
- 61 y.o. M w/ worsening pleuritic CP and SOB
  - ECG, CXR?
  - CBC, Chem 7?
  - Troponin?
  - D-dimer?
  - BNP?
  - Albuterol/Ipatropium x 3?
Pitfalls in Risk Assessment of PE

- When to start the workup?
- Overestimation of risk
- Failure to perform PERC AFTER risk assessment
- Failure to perform d-dimer AFTER PERC
- Belief that you need to delay your ordering of d-dimer

Can we Improve Our Accuracy?

- Only about 8% of pts who undergo CT Pulmonary Angiography are diagnosed with PE
- We can eliminate up to 1/3 of CT scans with a rational evaluation!

Clinical Assessment

- How Do I Risk Stratify?
  - Low
  - Moderate
  - High
- Who is NO Risk vs LOW Risk?

Most Recent Data
Symptoms / Signs/ Risk Factors

- 7940 ED pts
- Evaluated 25 Risk Factors/Signs/Sx’s
- Strongest predictors of PE (OR=2-3):
  - Hx of VTE
  - Unilateral Leg Swelling
  - O2 Sat < 95%
  - Estrogen Use
  - Surgery (GA) w/in 4 weeks

When to start the work up?

- 97% with PE had at least ONE of the following
  - Dyspnea
  - Tachypnea
  - Pleuritic pain

Kline, J Thromb Hemo, 08
Venkatesh, Arch Int Med, 12

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Venkatesh, Arch Int Med, 12

Stein, Chest, 91
Don’t evaluate patients that don’t need it

- Dyspnea, Tachypnea, or Pleuritic CP – the Triggers!
- Reality check: If you wouldn’t get a CT scan under any circumstance, DON’T send a d-dimer!

Overestimation of Risk

- **Pretest Probability**
  - Low (2-15%) 3%
  - Moderate (15-40%) 10%
  - High (>40%) 31%

Failure to perform PERC

PERC (like d-dimer) can eliminate the need for imaging

- Apply AFTER risk stratification (Gestalt or Decision Rule)
- Apply to Patients with <10% probability (= Low or Moderate Risk)
  - This comprises 93% of all presentations!
- If negative, STOP!

Kline, JA et al. JTH 08

The PERC rule

- **NPPV = 99% (PERC Neg + Low Suspicion)**

  **Criteria**
  1. no prior VTE
  2. no hemoptysis
  3. no estrogen use
  4. no hospitalization for trauma/surgery w/in 4 wks
  5. Age < 50 years
  6. SaO2 > 95%
  7. Pulse < 100 bpm
  8. no unilateral leg swelling

CASE #1

- **61 y.o. M w/ worsening pleuritic CP and SOB**
  - Recent URI symptoms
  - Meds = statin, Heavy smoker, No other PMHs
  - NAD, HR=98, RR = 24, Afebrile 93% on RA
  - Diffuse wheezes, No edema

  **PERC positive**
  1. no prior VTE
  2. no hemoptysis
  3. no estrogen use
  4. no trauma/surgery w/in 4 wks
  5. Age < 50
  6. SaO2 > 95%
  7. Pulse < 100
  8. no unilateral leg swelling
**Failure to Use D-Dimers**

- My belief is that this is result of overestimation of risk
  - Use ONLY if PERC cannot exclude testing
  - Apply to Patients with <10% probability (= Low or Moderate Risk)
  - This comprises 93% of all presentations!
  - If negative, STOP!

**Rapid D-Dimer Tests**

<table>
<thead>
<tr>
<th>TEST</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latex Agglutination∀ Quantitative</td>
<td>95%</td>
<td>50%</td>
</tr>
<tr>
<td>ELISA ∀ Microplate</td>
<td>95%</td>
<td>50%</td>
</tr>
<tr>
<td>ELFA</td>
<td>97%</td>
<td>43%</td>
</tr>
<tr>
<td>Whole Blood (SimpliRed)</td>
<td>87%</td>
<td>69%</td>
</tr>
</tbody>
</table>

**Delay to order a D-dimer**

- 61 y.o. M with worsening pleuritic CP and SOB
- Should we wait for the CXR result before sending the d-dimer?
  - If there is a pneumonia, we won’t need it.
- Should we wait to see a response to therapy?
  - After 3 nebs feels almost back to normal
  - O2 sat now 97% on RA

**Can you stop the workup?**

- 61 y.o. M w/ worsening pleuritic CP and SOB resolved with nebulizers
  - Given response to nebs and smoking history, I would call this COPD exacerbation
  - Unless there was something else of concern, I would not pursue a workup for PE at this point
  - If D-dimer already ordered and additional clinical or diagnostic data obviates the need, carefully chart why your PRETEST probability has changed

**But I heard COPD is a significant PE risk factor?**

- 5 articles, 550 pts w/ COPD exacerbation, 20% had PE!
  - Lesser et al. - 108 pts from 1986 using V/Q
  - Tille-Leblond - 197 pts referred to “Lung unit” - 49 had PE (21 w cancer, 6 w/ neg CTPA)
  - Rutschmann – 123 pts in ED with mod to very severe COPD – only 4 (3%) had PE

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**Conclusions**

- This doesn’t apply to discharged COPD patients
- May apply to the admitted COPD patient who is a non-responder, but this is very weak data
**Didn’t want the d-dimer — now it’s mildly elevated**

*Academic Emergency Medicine, 2009*

- Multi-center prospective study of 4357 ED pts who received d-dimer testing
- Increasing cutoff from 500 to 1000 ng/ml for low prob pts decreased sensitivity from 94% to 88%
- NPV remained 99%

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**Didn’t want the d-dimer — now it’s mildly elevated**

*Annals Emergency Medicine, 2010*

**PE Exclusion**

- Recommends D-dimer cutoff < 800 ng/mL to exclude PE for patients with Low Pretest Prob

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**CASE #2**

- 38 y.o. F with morbid obesity complains of palpitations. No Chest discomfort. SOB only with exertion
- Anxious, 120/80, 139, 24, 37.1, 96%
- Exam unremarkable
- Diagnosed with SVT and started on dilt drip
- Rate slowed to 120’s. Admitted to step-down unit.

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**Pitfalls in Risk Assessment of PE**

- When to start the workup?
- Overestimation of risk
- Failure to perform PERC AFTER risk assessment
- Failure to perform d-dimer AFTER PERC
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Summary

- Consider PE in the patient with:
  - Pleuritic CP
  - Dyspnea
  - Tachypnea

- Assign a risk
  - Gestalt
  - Clinical algorithm

Summary

- Use the PERC rule
  - Excludes disease if Negative result in pt < 10% pretest prob

- Send a sensitive d-dimer
  - Negative excludes dz in pt with < 10-15% pretest prob
  - Probably too non-specific for inpatients