Internal Medicine Clerkship
Case Discussions

Deep Venous Thrombosis / Pulmonary Embolism
Student Guide

Objectives:
1. Define and describe risk factors for developing DVT.
2. Define and describe genetic considerations predisposing to venous thrombosis.
3. Define and describe the symptoms and signs of DVT and PE.
4. Discuss the diagnostic evaluation of DVT and PE.
5. Generate a prioritized differential diagnosis of DVT/PE based on specific physical findings using pre-test probability tools.
6. Describe the indications for and utility of various diagnostic tests and describe their interpretation including but not limited to spiral CT, V/Q scan, lower extremity dopplers, and d-dimer.
7. Define and describe the differential diagnosis of DVT including the many causes of unilateral leg pain and swelling.
8. Define and describe and describe the differential diagnosis of PE including the many causes of chest pain and dyspnea.
9. Define, describe, and develop an appropriate management plan for DVT/PE.
10. Define and describe the risks, benefits, and indications for inferior vena cava filters.
11. Define and describe the long-term sequelae of DVT and PE.
12. Define and describe methods of DVT/PE prophylaxis, their indications, and their efficacy. Identify the appropriate duration of anticoagulation therapy in a patient with DVT and PE based on the clinical picture.

Clinical Case:

A 25 year old white female reports to the emergency room because of sharp left-sided chest pain and shortness of breath for the past day. The patient was in excellent health until yesterday. She was awakened from sleep by the sharp left-sided chest pain. The pain worsened with motion and deep breathing. The pain has been increasing in severity and now she has severe left shoulder pain. She reveals having a similar, transient episode of chest pain about one year ago while she was vacationing in Michigan. Presently, she complains of shortness of breath and is very apprehensive about dying. She denies any cough, fever, or sputum production, but has had one episode of hemoptysis earlier today and, upon further questioning, notes some tenderness of the left calf. She is married and had one normal delivery three years ago. She is taking birth control pills. She has never been hospitalized except for delivery of her first child. The patient does recall having a left ankle fracture 6 years ago with a cast in place for 6 weeks. A review of systems is negative. She denies any history of venous problems. She works as a computer programmer. She has smoked one pack of cigarettes a day for the past eight years. She considers herself a social drinker.
Questions:

1. What is the problem list and differential diagnosis for this patient on presentation to the emergency room?

- **Sharp chest pain with radiation to left shoulder, pleuritic**

<table>
<thead>
<tr>
<th>Cardiac</th>
<th>Pulm</th>
<th>GI</th>
<th>MSK</th>
<th>Psych</th>
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- **Shortness of breath**

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- **Hemoptysis**

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<th>Psych</th>
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- **Swelling, tender calf**

2. Which of these diagnoses carry the greatest risk?

3. What are the patient's risk factors for DVT/PE?

**Physical Exam:**
Blood pressure 102/80; pulse 128; respiratory rate 32; oral temperature 37.0 C.
GEN: She appears to be in moderate respiratory distress. She is well developed and nourished.
HEENT: There is no tracheal deviation.
CV: Examination of the heart revealed an accentuated pulmonic component of the second sound. Tachycardic, regular, no murmurs
PULM: Her breathing is rapid and shallow. There is dullness to percussion and decreased breath sounds in the left base. There were no rhonchi or crackles or sounds of increased voice transmission.
ABD: soft, nontender, nondistended
EXT: no edema, cyanosis or clubbing. There is no calf tenderness or swelling. The shoulders revealed normal range of motion; no warmth or tenderness was noted. The other joints are normal.
Questions:

4. Which of the diagnoses is supported by the physical exam?

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<th>Pertinent Positives</th>
<th>Pertinent Negatives</th>
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<td>PE</td>
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<td>Pneumonia</td>
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<td>PTX</td>
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<td>DVT</td>
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5. Interpret the findings on lung and cardiac exam

Laboratory Data:
The emergency room physician orders the following tests:

CBC:  
\[\begin{array}{l|l|l} \text{\%} & \text{WBC} & \text{Hct} \\ \hline \text{RBC} & 415 & 140 \\ \text{Hb} & 105 & 10 \\ \text{Hct} & 11.5 & 85 \\ \text{Hct} & 43 & 3.8 \\ \text{Hct} & 30 & 0.7 \\
\end{array}\]

(83 polys, 1 band, 14 lymphs).

Blood Gases:

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<tr>
<th>(\text{FIO}_2)</th>
<th>pH</th>
<th>(\text{PCO}_2)</th>
<th>(\text{PO}_2)</th>
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<td>0.21</td>
<td>7.48</td>
<td>30</td>
<td>80</td>
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Questions:

6. Interpret the arterial blood gases. 7.48/30/80/24

7. Calculate the alveolar-arterial oxygen gradient.

8. Do the EKG findings support your diagnosis?

9. What is your pre-test probability that she has a PE?

10. The following are tests that can be ordered for evaluation of patients with suspected acute PE. Describe a scenario when each test would be appropriate and which test should be ordered on our patient?
   a. Chest X-ray
   b. D-dimer
   c. CT-PE protocol
   d. LE Doppler
   e. VQ scan
   f. Echocardiogram

11. How are VQ scans reported when considering pulmonary embolism?
Chest xray is completed:

Questions:

12. Interpret the CXR findings.

13. Is there anything on the CXR to explain the left shoulder pain?

14. Imaging is positive for left sided PE. Should she be admitted? What is her simplified PESI score?

15. The following are options for treatment of acute PE/DVT. Explain when each treatment option would be appropriate and which would you choose for our patient?
   a. Heparin drip:
   b. Low molecular weight heparin:
   c. Warfarin
   d. Rivaroxaban (Xarelto):
   e. Dabigatran (Pradaxa):
   f. Aspirin:

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<tr>
<th>Factor</th>
<th>Preferred Anticoagulant</th>
<th>Reason to avoid other anticoagulants</th>
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<td>Cancer</td>
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<td>Once daily oral therapy preferred</td>
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<tr>
<td>Condition</td>
<td>Risk of recurrence after 1 year</td>
<td>Risk of recurrence after 5 years</td>
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<td>VTE provoked by surgery:</td>
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<td>VTE provoked by nonsurgical reversible factor (estrogen, pregnancy, leg injury, flight &gt;8hrs):</td>
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<tr>
<td>Unprovoked VTE</td>
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<tr>
<td>Provoked VTE with persistent risk factor (antiphospholipid syndrome or other inherited thrombophilias)</td>
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<td>VTE in setting of cancer</td>
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16. How long should outpatient therapy be maintained? Fill in the “recommended duration of anticoagulation” for each of the VTEs mentioned below:
Unprovoked isolated distal DVT

17. What treatment would you suggest in the following scenarios?
   A. Systemic Thrombolysis
   B. Catheter-directed thrombolysis
   C. Anticoagulation with Lovenox or DOAC (Apixiban)

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<tr>
<th>BP 140/85, HR 100, RR 30, O2 sat 92% on room air, mild respiratory distress. Saddle embolus found on CTA chest.</th>
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<tbody>
<tr>
<td>BP 70/45, HR 140, RR 32, O2 sat 90% on NRB. PE noted in subsegmental branch of pulmonary artery on right</td>
</tr>
<tr>
<td>BP 70/45, HR 140, RR 32, O2 90% on NRB. PE noted in subsegmental branch of pulmonary artery on right. Hx of multiple GI bleeds requiring ICU stay, most recently 2 weeks ago.</td>
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<tr>
<td>BP 120/80, HR 90, RR 25, O2 93% on RA. Multiple PEs noted bilaterally on CT. Troponin +, BNP elevated, right heart strain on echo.</td>
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<tr>
<td>BP 128/70, HR 95, RR 22, O2 92% on RA on admission. Large PE in R main pulmonary artery. Patient started on lovenox and admitted. On hospital day #2, patient is more hypoxic with BP now 100/70, HR 110, RR 30 and O2 sat 92% on NRB.</td>
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18. Should she also have an IVC filter placed prior to discharge?

References:
https://www-clinicalkey-com.archer.luhs.org/#!/content/playContent/1-s2.0-S0012369215003359

Agnelli G, Becattini C. Acute Pulmonary Embolism. NEJM. 2010; 363: 266-274.


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Updated 7/8/2020   EG
http://www.bloodjournal.org/content/123/12/1794.long?ssoreader=true