Acute Dyspnea

David Jimenez, MD, PhD
## Disclosures for Dr. Jimenez

<table>
<thead>
<tr>
<th>Category</th>
<th>Disclosures</th>
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<tr>
<td><strong>Research Support</strong></td>
<td>Daiichi Sankyo, Sanofi</td>
</tr>
<tr>
<td><strong>Employee</strong></td>
<td>No relevant conflicts of interest to declare</td>
</tr>
<tr>
<td><strong>Consultant and/or Honoraria</strong></td>
<td>Bayer, Boehringer Ingelheim, BMS, Daiichi Sankyo, Leo Pharma, Pfizer, ROVI, Sanofi</td>
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<tr>
<td><strong>Stockholder</strong></td>
<td>No relevant conflicts of interest to declare</td>
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<tr>
<td><strong>Speakers Bureau</strong></td>
<td>Bayer, BMS, Sanofi</td>
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Case presentation

- 52 year-old man; morbidly obese (BMI: 40 kg/m$^2$)
- Presented at ED: increasing dyspnoea over 6 weeks, now almost at rest; substernal chest discomfort
- OSA on CPAP treatment (compliant)
- COPD: ratio of forced expiratory volume in 1 second (FEV$_1$) to forced vital capacity (FVC), 0.59; FEV$_1$, 64% of the predicted value. No previous admissions because of AECOPD
- No hypertension. No history of CAD
- History of unprovoked intermediate-risk PE four months ago; on warfarin therapy
Clinical findings at presentation:

- BP: 110/70 mmHg; HR: 116/min; resp. rate: 28/min; SO₂: 88% on room air, increasing to 96% with supplemental oxygen (2 liters)
- Heart examination: no murmurs
- Lung examination: breath sounds diminished
- Jugular venous distention difficult to assess (due to obesity)
- Chronic venous insufficiency of lower extremities present
Case presentation (cont’d)

Laboratory

- Normal blood count
- Creatinine: 0.9 mg/dl
- GPT: 56 U/L; GOT: 123 U/L
- hsTnT: 0 pg/mL; BNP: 180 pg/mL
- INR: 2.7

Blood gas analysis

- pH: 7.45; PaCO₂: 32 mm Hg; PaO₂: 55 mm Hg; lactate normal
Case presentation (cont’d)
Case presentation (cont’d)
Qu. 1 Which is the most likely diagnosis?

1. COPD exacerbation
2. Congestive heart failure
3. Recurrent PE
4. Pulmonary hypertension
5. Panic attack
Respiratory physician

Does this patient have a COPD exacerbation?
Disease severity and exacerbations

Figure 1. Association of Disease Severity with the Frequency and Severity of Exacerbations during the First Year of Follow-up in Patients with Chronic Obstructive Pulmonary Disease.

Patients with two or more exacerbations during the year were considered to have frequent exacerbations. An exacerbation requiring hospitalization was classified as severe. Disease severity was classified according to the stages of disease defined by the Global Initiative for Chronic Obstructive Lung Disease (GOLD). P<0.001 for both comparisons.
History of exacerbations

Hurst JR, N Engl J Med 2010
Does this patient have COPD exacerbation?

- No cough or sputum purulence
- Mild COPD
- No history of exacerbations
- Discrepancy between COPD stage and pulmonary arterial enlargement on chest X-ray
Cardiologist

Does this patient have recurrent PE?
Prevalence of PE in COPD exacerbations

Figure 2. The prevalence of PE across different sites. The filled circles represent the mean, and the line bars represent SE; p value for overall = 0.014; p value for emergency department (ER) is not calculable because there was only one study; p value for studies that evaluated inpatients and outpatients = 0.133; p value for studies that evaluated only hospitalized patients = 0.034.
Risk of venous thromboembolism recurrence

Metaanalysis including 15 trials, 27,237 patients

Limone BL, Thromb Res 2013
Risk factors for VTE recurrence

Early recurrence

- Poor quality of anticoagulation (failure to achieve therapeutic aPTT and INR)
- Cancer

aPTT, activated partial thromboplastin time; BMI, body mass index; INR, international normalized ratio
Diagnosis of recurrent PE: REPEAD study

516 patients with suspected recurrent PE

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<tr>
<th>Pathway</th>
<th>N</th>
<th>3-month VTE risk % (95% CI)</th>
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<tr>
<td>PE unlikely, normal DD</td>
<td>88</td>
<td>0</td>
</tr>
<tr>
<td>PE unlikely, abnormal DD or PE likely, negative CTPA</td>
<td>249</td>
<td>2.8 (1.2-5.5)</td>
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Case: CT pulmonary angiography
Heart Team

Does this patient have pulmonary hypertension?
Heart Team

Does this patient have pulmonary hypertension?

• COPD and pulmonary hypertension (3.1)
• OSA and pulmonary hypertension (3.4)
• Chronic thromboembolic pulmonary hypertension (4.1)
Heart Team

Does this patient have COPD pulmonary hypertension?

- Few epidemiological data (most in very severe COPD)
- Prevalence in patients listed for lung transplantation: 31%

Cuttica MJ, Respir Med 2010
Heart Team

Does this patient have COPD pulmonary hypertension?

- Pulmonary hypertension increases mortality in advanced COPD

Cuttica MJ, Respir Med 2010
Heart Team

Does this patient have COPD pulmonary hypertension?

- Discrepancy between COPD stage and pulmonary arterial enlargement on chest X-ray
Does this patient have OSA pulmonary hypertension?
Heart Team

Does this patient have chronic thromboembolic pulmonary hypertension?
Natural history of CTEPH

- Genetic/intrinsic variables
- Prothrombotic tendencies
- Recurrent thromboembolic events

Acute PE → CTEPH

Resolution without hemodynamic compromise

96%-98%
Natural history of CTEPH

Acute PE → Genetic/intrinsic variables → Prothrombotic tendencies → Recurrent thromboembolic events → Small vessel changes → CTEPH
Qu. 2 Regarding CTEPH, which of the following is true?

1. The prevalence of CTEPH after PE is 15% after 2 years
2. Multiple episodes of PE increase the risk of CTEPH
3. A normal V/Q scan does not exclude the disease
4. The treatment of choice for CTEPH is balloon angioplasty
5. The treatment of choice for CTEPH is epoprostenol
Diagnostic pathway for suspected CTEPH

Clinical suspicion

Echo: TR >2.8 m/s and >3 months of therapeutic anticoagulation

V/Q scan

- Negative
  - CTEPH ruled out
- Indeterminate
  - CTEPH uncertain
- At least 1–2 segmental or larger-sized defects
  - CTEPH likely

Right heart catheterization and pulmonary angiography (by conventional DSA, multidetector CT, MRA)

Konstantinides S, Eur Heart J 2015
Case: echocardiography
Case: V/Q scan

Q scan

V scan

www.escardio.org
Case: Pulmonary angiogram
Hemodynamic data on right heart catheterization

• RAP: 26 mmHg
• PAP: 90/35 mmHg (mean, 57 mmHg)
• PAWP: 16 mmHg
• Cardiac output: 2.5 L/min
• PVR: 1294 dyn·sec/cm$^5$
• Pulmonary artery saturation: 43%
Heart Team

Final diagnosis

Chronic thromboembolic pulmonary hypertension
Chronic obstructive pulmonary disease (mild)
Obstructive sleep apnea
Diagnosis of CTEPH  
Life-long Anticoagulation

Operability Assessment by multidisciplinary CTEPH Team

Technically Operable  
- Acceptable surgical risk/benefit ratio  
  - Pulmonary Endarterectomy
  - Persistent symptomatic pulmonary hypertension

Technically Non-Operable  
- Unacceptable surgical risk/benefit ratio  
  - Targeted medical therapy
  - Consider BPA in an expert center
  - Persistent symptomatic pulmonary hypertension

- Consider lung transplantation

BPA, balloon pulmonary angioplasty.

Galie N, Eur Heart J 2016
Take home messages

Acute dyspnea is a complex symptom

Different clinical situations (often combined) may cause acute dyspnea

A multidisciplinary approach to patients with acute dyspnea might improve patient outcomes
Thank you!