Pulmonary embolism

1. The most appropriate next step in management is to obtain a CT angiogram of the chest. Physicians caring for patients with apparent COPD exacerbations should also consider other common causes of acute dyspnea, including heart failure, pulmonary embolism (PE), and pneumonia. Hypoxemia is generally mild in patients with COPD exacerbation and readily improves with supplemental oxygen. This patient, however, continues to have marginal oxygenation despite a significant amount of supplemental oxygen, which should prompt consideration of other causes of respiratory distress. PE is relatively common in patients with COPD who are hospitalized for increased dyspnea; some (but not all) published studies found more severe hypoxemia among patients with COPD and PE compared with those with an exacerbation alone. This patient has no findings that support the diagnosis of heart failure, pneumonia, or other apparent cause of her clinical findings. Therefore, CT angiography should be performed to evaluate for PE prior to attributing her symptoms to an exacerbation of her COPD.

Aminophylline is a theophylline derivative that causes bronchodilation. It was previously used extensively in the treatment of acute bronchospasm, but it is currently a second-line agent that is in frequently used for the treatment of COPD exacerbations. Addition of this medication to the combination of inhaled bronchodilators and systemic corticosteroids carries a significant risk of gastrointestinal and cardiovascular side effects.

An echocardiogram might be appropriate in a patient with a history of heart failure, but the absence of pleural effusions, pulmonary infiltrates, inspiratory crackles, or suggestive electrocardiographic findings in this patient makes it unlikely that a cardiac cause is responsible for her severe hypoxemia.

Antibiotics are indicated in the treatment of COPD exacerbations for critically ill patients and patients with a combination of increased dyspnea, increased sputum production, and increased sputum purulence. However, this patient is experiencing increased dyspnea alone and does not have an infiltrate on her chest radiograph to suggest pneumonia; further evaluation for the cause of her severe hypoxemia should take precedence.

2. The most appropriate next step in management is unfractionated heparin. This patient has documented acute pulmonary emboli. Although she had a period of hypotension on presentation, she is now normotensive but tachycardic following fluid administration. There is right ventricular dilatation, borderline pulmonary hypertension, and an elevated B-type natriuretic peptide level, suggesting she is at risk for hemodynamic complications. Thus, anticoagulation with unfractionated heparin is indicated at this time. Unfractionated heparin is typically administered in a fixed-dose, weight-adjusted manner via continuous intravenous infusion. Activated partial thromboplastin time (aPTT) should be monitored and the dose should be adjusted appropriately.

The primary indication for thrombolysis with agents such as alteplase in pulmonary embolism is persistent hypotension and hemodynamic instability. Because this patient stabilized with fluid resuscitation, there is no current indication for thrombolysis. Thrombolytic agents could, however, be used if the patient’s status deteriorates. Available data suggest that this strategy (anticoagulation with escalation to thrombolytic therapy if further deterioration occurs) can be used with very acceptable outcomes.

Although low-molecular-weight heparin (LMWH) would provide therapeutic
anticoagulation and is convenient, particularly for treatment of thrombotic disease in ambulatory patients, dosing is more difficult in patients with significant kidney impairment, and the anticoagulant effect of LMWH is more difficult to assess than unfractionated heparin. Additionally, because these agents are long acting and not readily reversible, their use would be problematic if the patient became hypotensive and a decision was made to treat with thrombolytic agents or clot extraction. Thrombus extraction, either surgically or by catheter, is not appropriate in this patient. Like thrombolytic therapy, extraction is best reserved for emboli causing hemodynamic instability. Extraction should be used in situations where thrombolytic agents would be used but are contraindicated. Moreover, the segmental and multifocal distribution of this patient’s clots is not ideal for such an approach.