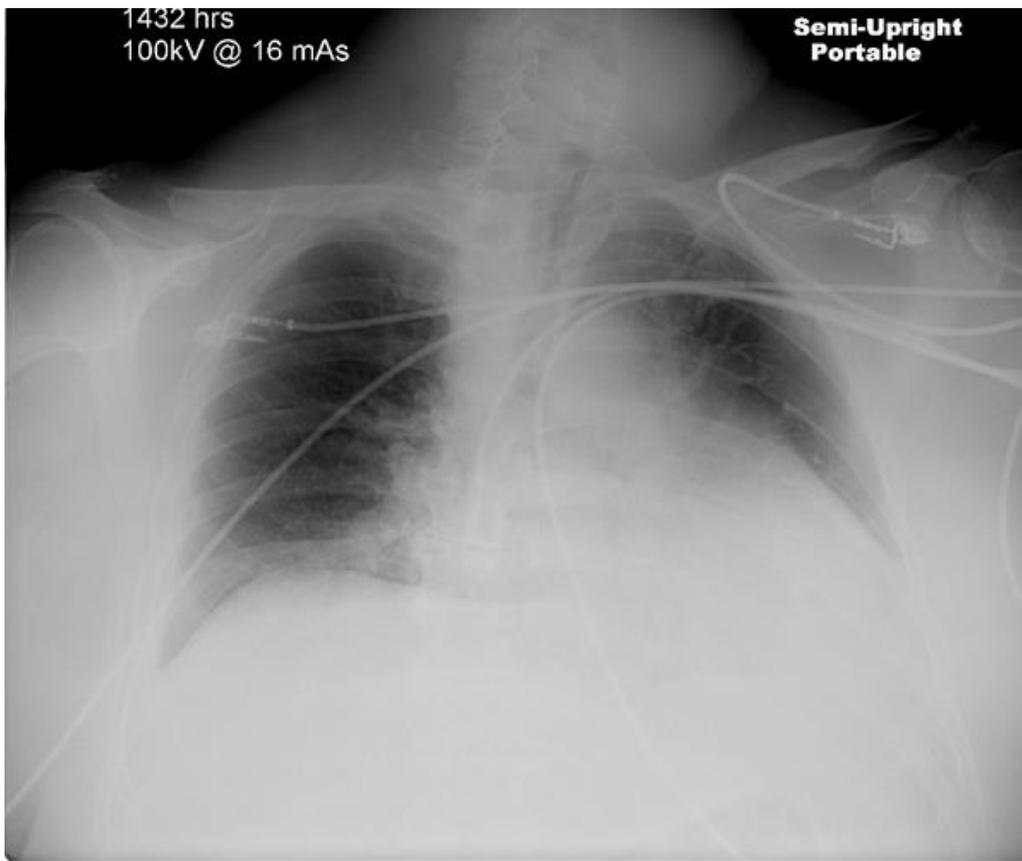


## CLINICAL PRESENTATION AND RADIOLOGY QUIZ QUESTION

A 61 year old man presents with acute shortness of breath. He has recently been in the hospital for three weeks for bowel obstruction from adhesions complicated by a bowel obstruction. He was discharged just over 24 hours prior to presentation. Since surgery he has needed to defecate several times per day. On the morning of admission during defecation he developed acute shortness of breath which has persisted for several hours. His blood pressure is 90/50, his pulse 115, and his respiratory rate is 46. He has a history of prior pulmonary embolism. A stat portable chest radiograph was obtained:



Which of the following imaging studies is the best next step in the evaluation of this patient?

- (a) left side down decubitus plain film examination
- (b) ultrasound of the chest
- (c) computed tomographic angiography (CTA) of the chest
- (d) magnetic resonance imaging angiography (MRA) of the chest

<b>RADIOLOGY QUIZ QUESTION, ANSWER, AND EXPLANATION</b>
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For the patient history and portable chest radiograph, see Page 1. Which of the following imaging studies is the best next step in the evaluation of this patient?

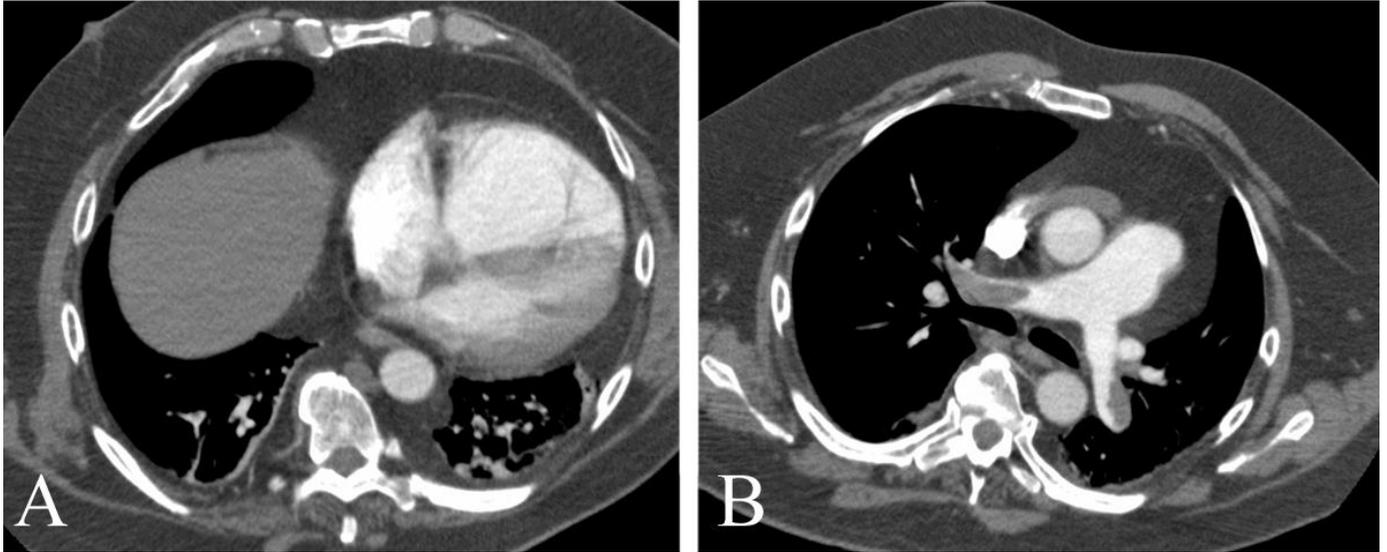
- (a) left side down decubitus plain film examination
- (b) ultrasound of the chest
- (c) computed tomography of the chest
- (d) magnetic resonance imaging of the chest

Answer: (c), computed tomographic angiography of the chest, is the correct response. The patient has a clinical presentation and several historical risk factors for pulmonary embolism, including a personal history of pulmonary embolism, recent hospitalization with immobilization, and acute onset of shortness of breath. His Wells score is at least 7.5, and a score of greater than 4.0 indicates that a pulmonary embolism is likely.

A left-side down decubitus plain film might be helpful in cases where a left pleural effusion or a right pneumothorax was suspected on a supine radiograph, but not in this case, and (a) is incorrect. Ultrasound of the chest is helpful to evaluate the location and extent of a pleural effusion but the ultrasound beam would be blocked by the surrounding lung in this case, and (b) is incorrect. Magnetic resonance imaging angiography of the chest is rarely performed and is not the standard next step in evaluation of an abnormal chest radiograph, and (d) is incorrect.

## IMAGING STUDY AND QUESTIONS

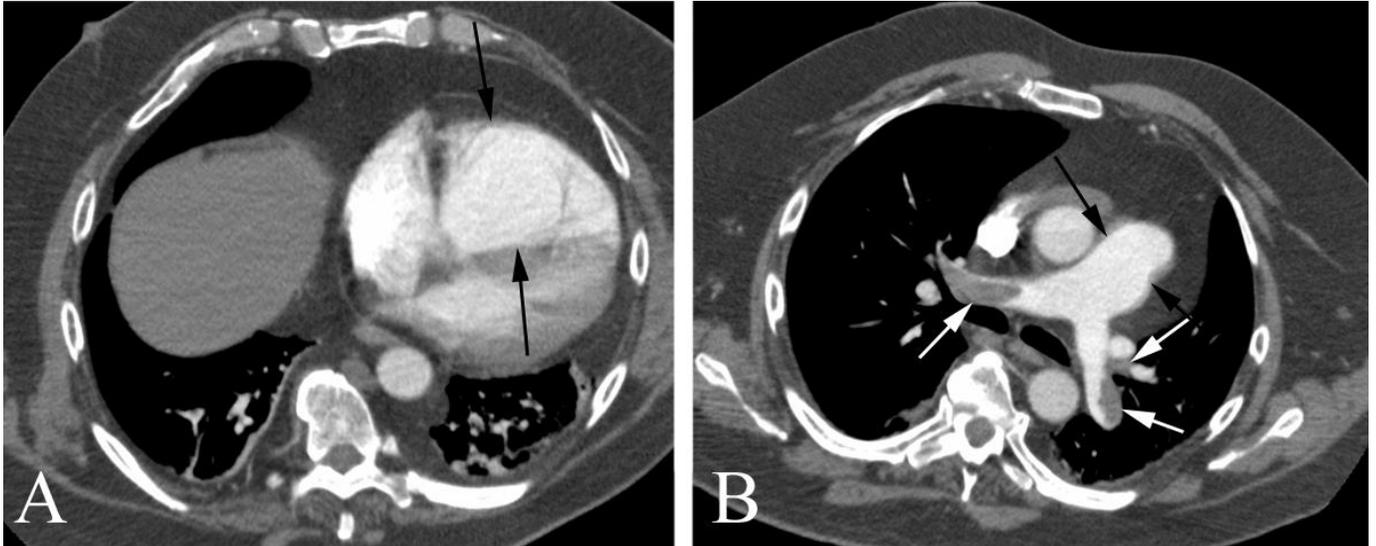
The patient underwent imaging:



Imaging questions:

- 1) What type of study is shown?
- 2) Are there any abnormalities?
- 3) What is the most likely diagnosis?
- 4) What is the next step in management?

## IMAGING STUDY QUESTIONS AND ANSWERS



### Imaging questions:

- 1) What type of study is shown? Computed tomographic angiography (CTA) of the chest.
- 2) Are there any abnormalities? Yes. There are multiple filling defects in the pulmonary arterial tree (white arrows in B). There is also distension of the right ventricle (black arrows in A) and distension of the main pulmonary artery relative to the aorta (black arrows in B). The main pulmonary artery should be the same size as the aorta. Both the right heart and the pulmonary artery were also enlarged compared to a prior comparison study (not shown).
- 3) What is the most likely diagnosis? Pulmonary embolism with associated right heart failure.
- 4) What is the next step in management? Emergent anticoagulation. Consultation with cardiology and/or cardiothoracic surgery for possible emergent embolectomy.

**PATIENT DISPOSITION, DIAGNOSIS, AND FOLLOW-UP**

The patient was treated with anticoagulants. A filter was placed in the patient's inferior vena cava after documenting blood clots in his lower extremity deep venous system with using an ultrasound study. His symptoms gradually improved.

## SUMMARY

**Presenting symptom:** The patient initially presented with severe shortness of breath. He did not have chest pain. He did have clinical features including prolonged recent hospitalization and surgery increasing the likelihood of pulmonary embolism. In addition, he had a personal history of prior pulmonary emboli.

**Imaging work-up:** In patients with high risk for pulmonary embolism, a chest radiograph is usually obtained followed by an urgent computed tomographic angiography (CTA) of the chest. The chest radiograph may show nonspecific findings such as consolidation, atelectasis, or pleural effusion, and is helpful to exclude pneumothorax and pulmonary edema from congestive heart failure.

**Establishing the diagnosis:** Multiple obvious filling defects within the pulmonary arterial tree are diagnostic of pulmonary emboli.

**Take-home message:** Patients with sudden onset of dyspnea with clinical features suggesting pulmonary embolism should undergo chest radiography followed by urgent computed tomography angiography (CTA) of the chest.

### FURTHER READING

Renfrew, DL. Cough, dyspnea, and lung nodules. Chapter 10 of *Symptom Based Radiology*, Symptom Based Radiology Publishing, Sturgeon Bay, WI, 2010, available for no charge at [www.symptombasedradiology.com](http://www.symptombasedradiology.com).

Wells PS et al. Derivation of a simple clinical model to categorize patients' probability of pulmonary embolism: increasing the model's utility with the SimpliRED D-dimer. *Thromb Haemost.* 2000; 83:416-420.

Winer-Muram HT. Pulmonary emboli. Chapter in Gurney JW, Winer-Muram HT, Stern EJ et al, *Diagnostic Imaging: Chest*. Amirsys, Salt Lake City, Utah, 2006.