Case Report

A Patient with Suspected Pulmonary Embolism

Urgent message: High degree of suspicion combined with thorough history and proper use of available tests can help the clinician identify patients in need of emergent referral.

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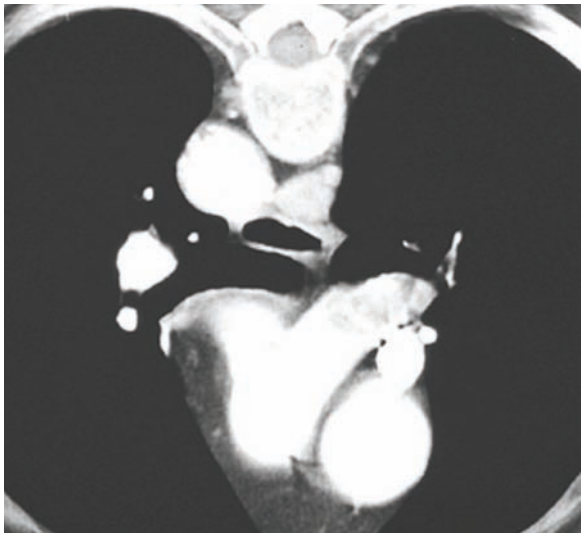
Introduction

A 47-year-old woman with a diagnosis of ovarian cancer developed an acute onset of mild shortness of breath two days after being discharged for a work-up of symptomatic ascites. Her medical history was significant for obesity and recent travel. She presented to the emergency department and was found to have a large left pleural effusion and was subsequently admitted to the hospital.



A thoracentesis performed in the ED removed 2 L of fluid. During her hospital stay, her respiratory status improved and she was discharged home.

Two days later, she presented to an urgent care with the complaint of dyspnea. A chest x-ray was performed to rule out a pneumothorax from the thoracentesis or a reaccumulation of the effusion. The chest ray was negative for both. She was given albuterol in a small-volume nebulizer, improved post-treatment, and was sent home. At discharge, she was afebrile, with a room air pulse oximetry of 92%, pulse of 110 beats per minute, and respiratory rate of 24.

The following day, she became dyspneic and cyanotic and complained of chest pain with hemoptysis. After a 911 call, she was taken to the emergency department where she arrested moments after arrival. Her resuscitation was unsuccessful. An autopsy revealed a large saddle embolus and acute cor pulmonale.

Her family sued the urgent care center, the physician, the hospital, and the emergency department attending for wrongful death secondary to failure to diagnose pulmonary embolism. This article reviews the etiology, diagnosis, and treatment for pulmonary embolism (PE) in an urgent care setting.

Pulmonary Embolism: An Overview

Pulmonary embolism is a remarkably common—and often underappreciated—leading cause of death in all age groups. In the U.S., roughly 60,000 people die per year from pulmonary embolism[1]; many of these cases are diagnosed at autopsy.

Pulmonary embolism and deep venous thrombosis

Table 1. Common Risk Factors for Pulmonary Embolism

- Prolonged venous stasis common in patients who are bedridden or who have traveled in an automobile or plane for hours

- Advanced age
- AIDS
- Autoimmune disorders (SLE)
- Burns
- Cancer and resultant chemotherapy
- Congestive heart failure
- IV drug abuse
- Family history of blood clotting disorder
- Fractures
- Immobilization
- Myocardial infarctions
- Obesity
- Oral contraceptives
- Postoperative and postpartum
- Protein S and C deficiency
- Trauma

(DVT) are conditions that stem from venous thromboembolism (VTE).

Three factors that promote intravascular coagulation include: immobilization, vessel wall damage, and hypercoaguability through either inherited defects or acquired factors that make patients more prone to clotting. Proximal DVT of the leg specifically describes blood clots located in the popliteal, femoral, or iliac veins, which is where the majority of blood clots associated with PE originate.[2] Approximately 60% to 80% of patients with DVT also suffer from a PE, but more than half of the patients are asymptomatic.

Pulmonary embolism is a potentially fatal condition which occurs when a blood clot detaches from the wall of a vessel and travels from one part of the body, typically the veins in the lower extremities, to the pulmonary artery or one of its arterioles, where it blocks blood flow to the lungs peripherally causing a pulmonary infarction.[2]

Most patients with PE and DVT go clinically unrecognized. Thirty percent of patients who survive an initial PE die of a future embolic event. Massive PEs can also cause acute cor pulmonale. When diagnosed correctly, it is more easily treated and complications are greatly reduced. However, the diagnosis is often delayed or the condition initially misdiagnosed due to its non-specific symptoms.[1]

Unfortunately, appropriate diagnostic tests and therapy are withheld even when the potential for PE has been clearly elucidated on the chart. It is particularly important for urgent care providers to keep a high index of suspicion about PE inasmuch as discharging a misdiagnosed patient with PE could result in untoward and devastating consequences.

For the provider to accurately diagnosis PE in urgent care, it is particularly important to:

- obtain a thorough history
- perform a focused physical exam
- recognize the symptoms of PE
- initiate diagnostic tests
- refer the patient to the emergency room when appropriate.

Patient History

Unfortunately, many urgent care facilities have limited access to the most accurate tests for PE. Hence, providers must take full advantage of the tools available.

One of the most important for the urgent care provider is the patient's history; approximately 75% of patients with VTE have at least one established risk factor.[2-4] (See **Table 1**). For a history to be of any value to a provider, it needs to have been taken in a detailed fashion that would accurately illustrate the subtle inconsistencies that separate PE from other potential diagnoses. If a patient's symptoms or history provide even a suspicion for PE, further testing needs be done to rule out PE.

Physical Examination

The physical examination of patients with suspected PE should be performed in a meticulous and exhaustive manner because of PE's variable signs and symptoms. Chest wall tenderness, with a history excluding trauma, is unsettling because it is one of the very few physical findings in patients with PE.

Providers also need to be on the lookout for unexplained anxiety, cyanosis, or general instability that can be caused by hypoxemia. Patients with PE often have a room air pulse oximetry of < 92%.[3] If a patient is experiencing shortness of breath, increased respiratory rate, or chest pain (fairly common symptoms of PE) they should be noted during the physical examination.

Nonetheless, it is possible for a patient experiencing PE to have none of these symptoms. The history and physical examination of a patient with suspected PE needs to be well documented.

Symptoms

The symptoms of PE can vary widely from patient to patient (**Table 2**).[3] This variety, along with the nonspecific nature of symptoms, contributes to the frequent misdiagnosis seen in the urgent care setting.

Table 2. Common Symptoms for PE*

Symptom	*Presentation (%)*
Tachypnea	70-96
Dyspnea	73-84
Chest pain exclusively on one side	66-90
Sharp localized chest pain (often pleuritic)	66-74
Rales	51-58
Lower extremity edema	24-28
Hemoptysis	13-30
Syncope	5-13

*This list is far from exhaustive. It is also important to note that the absence of one or all of these symptoms does not completely rule out PE.

Common differential diagnoses include asthma, bronchitis, pleurisy or pleuritis, intercostal muscle strain, Tietze's syndrome, hyperventilation, anxiety, and pneumonia.

These differential diagnoses are among many others with symptoms similar to PE and may, in fact, co-exist with PE.[3]

Diagnosis

Currently, the best diagnostic test for PE is a CT angiogram of the chest. However, because this is typically unavailable in urgent care facilities, the next-best tests to help diagnose PE are a chest x-ray, an electrocardiogram (EKG), and a D-dimer test.

Both the chest x-ray and the EKG are useful in eliminating alternative diagnoses.[5] The physician should get definitive testing if basic work-up does not reveal a clear alternative diagnosis or if risk factors make the pre-test probability too high to ignore. Providers may also consult tools such as the Wells Prediction Rule in order to better assess the probability of PE in a patient based on the available clinical data.

Apart from eliminating an alternative diagnosis, chest x-rays have limited diagnostic value because they are typically normal in patients with PE.[6] In very few cases, a chest x-ray can show signs of PE in the form of a Hampton's hump, a "peripheral wedge-shaped, pleural-based density with apex pointing to the hilum,"[3] Westermark sign, an area of decreased pulmonary vascular markings,[1] or Palla's sign, noted by an enlarged, right, descending pulmonary artery.[3] Rarely are these signs obvious enough to make an accurate diagnosis of PE.

EKG results are abnormal in most patients with PE, but the abnormality is non-specific,[5] and <10% of patients show the classic right heart strain due to a PE.[1]

D-dimer is the final product of fibrin degradation, released in plasma. High levels of fibrin degradation products present in the blood are demonstrated by a positive serum D-dimer. A normal D-dimer can effectively rule out PE in more than 90% of cases.[3]

Conversely, an abnormal or elevated D-dimer can be attributed to a variety of conditions,[1] such as: [1,3]

- inflammatory diseases
- pneumonia
- myocardial infarction
- sepsis
- pregnancy
- trauma
- infection
- cancer.

D-dimer tests almost always show elevated levels among inpatients, so are of little value in that population.[4] They are of greater value in outpatients because they can almost always rule out PE, are non-invasive, and offer results in a short turnaround time.[3]

Conclusion

In order to accurately diagnose a patient with PE, the provider must obtain a thorough history from the patient, perform a focused physical examination, be familiar with the signs, symptoms and risks of PE, and perform the diagnostic tests available at that urgent care facility.

The combination of a high degree of suspicion coupled with the aforementioned will enable a provider to identify those patients who are at risk. If a patient is experiencing a PE, he should be referred expeditiously to an emergency department, where confirmatory testing and treatment can begin. ■

REFERENCES

1. Garcia G, Ageno W, Libby E. Update on the diagnosis and management of pulmonary embolism. *Br J Haematol*. 2005;131:301-312.
2. Ramzi D, Leeper K. DVT and pulmonary embolism: Part I. Diagnosis. *Am Fam Physician*. 2004;69:2829-2836.
3. Cloutier L. Diagnosis of pulmonary embolism. *Clin J Oncol Nurs*. 2007;11:343-348.
4. Goldhaber S. Pulmonary embolism. *Lancet*. 2004; 363:1295-1305.
5. Kruip MJ, Söhne M, Nijkeuter M, et al. A simple diagnostic strategy in hospitalized patients with clinically suspected pulmonary embolism. *J Intern Med*. 2006; 260:459-466.
6. Cardin T, Marinelli A. Pulmonary embolism. *Crit Care Nurs Q*. 2004;27:310-322.