

Investigation 3.1

3.1A: Breathing Difficulty

3.1B: Pulmonary Embolism

Investigation

3.1A: Breathing Difficulty

“Good morning, Doctor” says Betsy, an 18 year old female, speaking with difficulty. You notice she is sitting up very straight on your **examination table** and appears **agitated**. “I’m having a lot of trouble breathing. I just can’t get enough air and I’m scared.” Betsy is depending on you to figure out why she feels so **distressed**.

As you **listen and observe** Betsy you see that she is working very hard to breathe. You see the muscles in her neck **contracting** as she tries to take in more air. You count the number of times she breathes in 30 seconds and determine she is breathing in and out more than 30 times a minute, whereas a normal rate is about 18 breaths per minute. During this time of careful observation you see a tightly wrapped **elastic** bandage covering Betsy’s left calf, ankle, and half of her foot.

When you ask Betsy how long she has felt this way, she tells you she was fine last night, but woke up this morning feeling this way. She states she has never felt like this before, and has not been sick recently, but **sprained** her left ankle a three days ago playing soccer.

You have enough information to begin your examination. Observation has already demonstrated that Betsy is breathing rapidly. You take out your **stethoscope** and first listen to her lungs because her main complaint is difficulty breathing. You hear normal **breath sounds** in both lungs. Moving the stethoscope to the area of the heart, you hear a very rapid heart rate of 115 beats per minute; a normal rate would fall between 60 and 80 beats per minute. Finally, you perform one more test that will provide helpful information. Your nurse attaches the pulse **oximeter** to Betsy’s right index finger and reveals her **oxygen saturation** is 76%; a normal oxygen saturation registers between 95% and 100%.

Doctors commonly begin their assessment of any patient by classifying the urgency of the patient’s medical problem. If the symptoms came on suddenly we call the condition **acute**. If the symptoms have existed for weeks or months we classify the condition as **chronic**. If the symptoms are growing worse by the minute we have an **emergency** and need to treat that condition quickly. If the patient’s symptoms appear stable, not an emergency, we can take more time for assessment without placing the patient’s health in jeopardy.

Doctors also try to determine all of the known conditions that are capable of causing the symptoms the patient reports and the examination reveals. This list of possibilities is known in medical investigation as the “**Differential Diagnosis**”. If the physician has any doubt about the most likely cause, he or she will start “**ruling out**” life threatening conditions first. For the patient described above at least fifteen different conditions could potentially cause her breathing difficulty.

Here is a Differential Diagnosis for Patient Betsy:

Pneumonia	Chronic Obstructive Pulmonary Disease	Tuberculosis		
Pulmonary Hypertension	Choking	Epiglottitis	Asthma	
Heart Failure	Pulmonary Embolus	Chest Wall Compression		
Anxiety	Hiatal Hernia	Obesity	Altitude Sickness	Allergic Reaction

This means that you, Betsy's new doctor, must mentally check off whether each of these medical conditions could be the cause of Betsy's breathing difficulty. Some are easy to rule out, such as choking and altitude sickness. Others you can rule out because they do not fit the pattern of Betsy's complaint and what you found in your examination. Finally, a few conditions are left on your list for you to evaluate by additional examination or medical tests.

Breathing Difficulty Case 1 Worksheet

Directions: Answer the following questions based on Case 3.1: Breathing Difficulty.

1. What is the patient's Chief Complaint? _____
2. What was the patient's Secondary Complaint? _____
3. How many breaths per minute were detected in the examination? _____/min
4. What is the normal rate of breathing for a patient her age: _____/min
5. Using a watch with a second hand, count the number of breaths you take in a minute and record here: _____ breaths/minute
6. What does an "oximeter" measure? _____
7. What was the result of the oximeter test done on Betsy at the end of the examination? _____%
8. What is the "normal" finding on the oximeter test? _____%
9. What does Betsy's oximeter test result indicate?

10. Do you think Betsy's ankle sprain could have caused Betsy's breathing difficulty?

Circle: Yes No

11. Would you classify Betsy's condition as (circle one) Acute or Chronic

12. Would you classify Betsy's condition as (circle one):

Possible Emergency or Probable Non-Emergency

13. From the chart below select the top three on your Differential Diagnosis List of things you want to rule out on this patient.

Differential Diagnosis	Yes	No
Pneumonia		
Anxiety Reaction		
Pulmonary Embolus		
Asthma		
Pulmonary Hypertension		
Heart Failure		
Chronic Obstructive Pulmonary Disease		
Tuberculosis		

14. Do you think Betsy should be sent to a specialist for more evaluation or would you feel comfortable sending her home to rest for a few days before returning for further evaluation if the breathing difficulty continues?

(Circle one) Send to Specialist or Send Home to rest

15. If you sent Betsy to a specialist, to which one would you send her?

Investigation

3.1B: Pulmonary Embolism

In your role as a busy Family Doctor your patients come to you for many medical problems. Many are within your ability to diagnose and treat confidently using your knowledge and the limited medical equipment in your office. To make the correct diagnosis may require specialized tests, some of which can only be performed in a hospital. Sometimes a problem is complicated enough that you would best serve the patient by sending them to a physician specializing in that area of the body or that particular medical condition. Betsy may well be one of those patients.

One of the conditions that should have worked its way up to near the top of your differential diagnosis is **pulmonary embolism**. Betsy has an acute problem, as she felt fine the day before presenting with difficulty breathing. The tightly wrapped ankle and history of recent injury are clues to the potential origin of her current problem.

So what is a pulmonary embolism and how does it happen? The word **pulmonary** is the medical word referring to the lung. An **embolism** is an obstruction, or blockage, of an artery by an air bubble, fat or a **blood clot**; in Betsy's case a blood clot (the embolus) most likely caused her embolism. A blood clot is a clump of blood cells that have stuck together.

It is possible that the bleeding that occurred internally when Betsy sprained her ankle resulted in some of the blood cells clumping together as the body tried to heal her ankle injury. If the clot broke loose inside the vein taking blood back to the **central circulation** (heart and lungs), it is possible for the embolus to get stuck in a lung and block circulation through part of that lung. That would make it difficult for Betsy to get enough oxygen into her circulation because air is going to portions of the lung that have no blood flow; that would cause Betsy to have a rapid rate of breathing as she tried harder and harder to get more oxygen into her circulation. A blockage in the lung reduces **air exchange** and causes the heart to beat more rapidly as cells throughout the body cry out for more oxygen. Would you consider this a potential emergency situation?

As a Family Doctor you realize this patient needs immediate evaluation, including several tests to confirm the diagnosis. If your hunch proves correct, Betsy will require intensive treatment that a specialist in lung diseases can best provide. You would probably call on a Pulmonologist and have him or her meet Betsy at the hospital, where she would be admitted as a patient.

Treatment of the blood clot might include **thrombolytic** drugs designed to break up the blood clot. That method of treatment is only available for a limited time following the onset of symptoms, so Betsy needs to get to the hospital right away. Following the acute treatment Betsy might be placed on an **anticoagulant** drug, a medicine that

lessens the blood's ability to clot. It would be important that Betsy be careful in her lifestyle so she wouldn't accidentally injure herself in a way that might cause her to bleed to death.

In this case you made a good decision to refer Betsy to the pulmonologist so that she could be admitted to the hospital. The final diagnosis was Pulmonary Embolism. The pulmonologist was able to dissolve the clot using a thrombolytic medicine. Betsy was sent home after a few days and continues on anticoagulant medicine.

What would have happened if Betsy had developed pulmonary **emboli** (the plural of embolus) in both lungs? That circumstance probably would not have had such a happy outcome.

Pulmonary Embolism

Directions: Answer the following questions.

1. What does the term “Pulmonary” refer to? _____

2. What is an “Embolism”? _____

3. What is an “Embolus”? _____

4. Is a pulmonary embolism an acute or chronic problem? Explain your answer.

5. What is the most likely cause of Betsy’s pulmonary embolism?

6. Explain how a pulmonary embolism causes difficulty breathing?

7. What is a “thrombolytic drug”? _____

8. Why is it important to begin thrombolytic drug therapy as soon as possible?

