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### Pulmonary Embolism

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# Pulmonary Embolism

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## Introduction

The pathophysiological topic of acute pulmonary embolism was chosen to increase the knowledge base and provide additional information to assist with moving forward from a registered nurse to an Advance Practicing Nurse. Working as a full-time registered nurse in the emergency department, the working diagnosis of acute pulmonary embolism is something that is ruled out on many patients with complaints of shortness of breath, chest pain, or decrease in pulse oximetry. Since a patient with an acute pulmonary embolism can have both typical and atypical symptoms, the death rate can be very high, if not caught earlier enough. An acute pulmonary embolism has a much higher death rate, then that of a patient with a myocardial infarction. The reason for the higher death rate is that an acute pulmonary embolism may be more difficult to detect, as the patient may not always show specific signs and symptoms for an embolism (Goldhaber, MD, 2012, p. 235). By doing further research on this topic, the nurse will be able to provide better care and make better clinical decisions to all patients who come into the emergency room with typical and atypical symptoms of an acute pulmonary embolism. Acute pulmonary embolism can present itself in many different ways, but it is very important to rule this out, even if their vital signs are normal and they have other predisposing factors (Kline, MD, Corredor, NP, Hogg, MS, Hernandez, MD, & Jones, MD, 2012, p. 11). There are many factors that a clinician must think about when trying to rule out an acute pulmonary embolism from additional exposure to radiation and prolonged testing that may or may not affect the outcome of the patients care. The articles that will be discussed in the project will provide additional education and resources that will help to make good clinical decision in the future. After further research on this diagnosis and completion of the project, the nurse intends to be able to implement better practice in the future when caring for patients with the possible diagnosis of acute pulmonary embolism.

## Pathophysiological Processes

### Signs & Symptoms

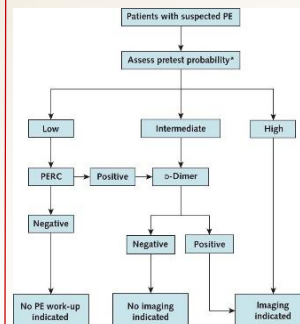
- ❖ Shortness of breath
- ❖ Chest Pain
- ❖ Low Pule Oximetry
- ❖ Tachycardia

### Diagnosis

There are several test that may be performed in order to rule out an acute PE. There is a blood test, called a D-Dimer, that can be done if the patient has a low probability risk for the diagnosis and if the result is negative, this will rule out an acute PE without being exposed to radiation. It is important to understand, that there can be a false-positive on this particular blood test, as the test are highly sensitive. The test that is preferred by most physicians in the emergency room for any person that is suspected for having a PE is a computed tomography (CT) pulmonary angiography (Feng, MPH, Pines, MD, MBA, MSCE, Yusuf, MD, MPH, & Grosse, PHD, 2013, p. 1034). It is very important for clinicians to follow the pulmonary embolism rule-out criteria (PERC) in order to not have overuse of imaging and cause additional harm to patients with radiation exposure while trying to diagnose them, it is important to use good clinical judgment while ruling other things out as well, such as acute coronary syndrome, pneumonia, or myocardial infarction (Raja, MD et al., 2015).

### Significance of Pathophysiology

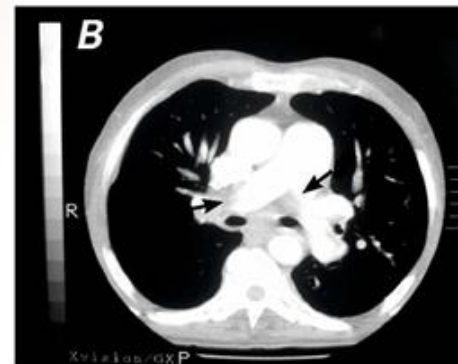
The significance of a pulmonary embolism can have cascade effect once it has occurred. Once the PE occurs, there is pulmonary vascular resistance, which occurs secondary to the blockage that is caused by the PE. The cascade effect from the PE continues, as the vascular resistance then causes pulmonary hypertension; which can then lead a strain on the right ventricle. The strain on the right ventricles then leads to right ventricular hypertrophy and dysfunction. The body then must activate compensatory mechanisms to attempt with activating the sympathetic nervous system to help restore cardiac output (McLenon, 2012).



(Raja, et al., Figure 1) Pathway for the evaluation of patients with suspected PE.

## Underlying Pathophysiology

It is important to understand that a DVT and PE, are the two leading causes for a venous thromboembolism (VTE); which is the third leading cause of cardiovascular disease. Approximately one third of the patients who have VTE will present with a PE; which is more fatal then a deep vein thromboses DVT. One of the contributing factors to consider with a PE, is Virchow's triad; which consist of three components. The three components are hypercoagulability (coagulation disorders, pregnancy and oral contraceptives) venous stasis (sedentary lifestyle, immobilization) and endothelial injury to vessel (trauma) (Meeto, 2010). When the triad is formed, this places a person at a much higher risk for PE as the coagulation cascade places a person at a high risk for a thrombus; which then leads to an embolism. Once a patient has a PE, they also have a higher risk of reoccurrence for another PE (Wilbur & Shian, 2017). Most patients that have recurrent risk for PE are patients that are hospitalized frequently and are immobile for longer periods of time (Sista et al., 2016).



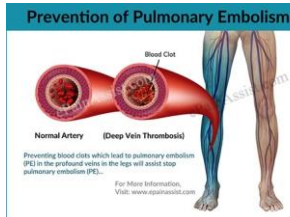
(Buggey, 2007 Image 1) Spiral computed tomographic scan shows thrombus occluding the bilateral pulmonary arteries (arrows).

In general, most PE's will occur from a (DVT) in the lower extremity area that form and can travel to the pulmonary location. The clot would then lodge itself into the pulmonary arteries, where it would then occlude the artery or surrounding vessels.

It is important to understand that a PE is not a disease, rather an underlying condition from a DVT. There are studies that have proven that a PE can be a result of an unknown process and may not originate from extremities. PE's are also found in patients that have a hypercoagulable disorder; which allows the body to make blood clots easily. If a patient has a severe chest injury with an increase in inflammation in the chest, this will also allow for an opportunity of PE to occur (Benns, Reilly, & Kim, 2014). PE's can also occur as a life-threatening cardiovascular process, when the patient has cardiogenic shock, the mortality rate is greater than 50% (Barbero et al., 2017).

## Implications of Nursing Care

The most important factor to understand with a PE, is that it is the most preventable cause of death. When a patient is hospitalized, it is important to implement VTE prophylaxis so the patient does not end up with a PE, due to being immobile while lying in the hospital bed. Prevention is the key factor when caring for a patient who is hospitalized, providing the proper education and VTE prophylaxis will help lower the risk factors and assist with preventing a DVT; which can lead to a PE. If the patient does get a PE while in the hospital, it is important to also know that a PE is also among the most treatable causes of death (Minges, Bikkeli, Curtis, Desai, & Krumholz, 2015). When caring for a patient with an acute pulmonary embolism, it is very important to understand the pathophysiology of the condition. By having a full understanding of the pathophysiological process, this will allow the nurse to assess for changes in the patient; which will can decrease overall complications and decrease and overall mortality rate.



Kerkar, Image 2, 2017

## Conclusions

After review of many articles and completion of the poster project, the Advance Practicing Nurse (APN) will be able to diagnose and treat a patient with typical and atypical symptoms of a PE. The APN will also be able to provide education to patients and family members for signs and symptoms and presentation of PE.

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