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Asthma Pathophysiology

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Pathophysiology

- Asthma is thought to be multi-factorial and can be influenced by not only pathological triggers, but also, environmental triggers.
- The chronic inflammatory environment in asthma is characterized by chemokines interacting with G-protein-coupled receptors on target leucocytes.1 However, four atypical chemokine receptors have been described which lack the structural components to induce downstream signalling2 and are thought to regulate inflammatory responses by acting as chemokine decoys or scavengers (Chapman et. Al, 2017, p. 1214)
- Asthma is a chronic inflammatory disease, which is characterized by airway hyper-responsiveness leading to intermittent, repeated bouts of wheezing, chest tightness, breathlessness and coughing (Sullivan et., al, 2016, p. 4)
- Asthma has a complex heterogeneity with many clinical phenotypes whose varying expression depends on interplay between numerous environmental factors along with many different susceptibility genes (Sullivan et al, 2016, p. 4)
- The airway epithelium is pivotal in the inflammatory response of the host and is a major source of proinflammatory mediators [33]. TH2 cells subsequently play a prominent role in allergic disorder pathogenesis leading to B cells isotype switching, generating IgE antibodies which are specific to the particular insulting allergen [8]. TH2 cells further enlist and enhance survival of eosinophils and mast cells, induce goblet cell hyperplasia and further drive bronchial hyper reactivity (Sullivan et al, 2016, p. 4)
- Causes can be influenced by both genetic and environmental causes
- The airway obstruction which characterizes the clinical presentation of asthma runs in cycles of symptom free periods followed by varying periods of exacerbation to which there is usually a trigger or stimuli. These exacerbations result in a worsening in symptoms and lung function and although is generally reversible and followed by a return to normal lung function, in some patients repeated exacerbations may lead to a new, compromised baseline. (Sullivan et al, 2016, p. 4)

Signs and Symptoms of Asthma Exacerbation

Asthma exacerbations can lead to the following complications

- Dyspnea
- Shortness of Breath
- Airway tightening and inflammation
- Cough
- Chest tightness
- Wheezing
- Anxiousness
- Airflow obstruction
- Any combination of these symptoms

- Evaluation of peak flow may be useful during asthma exacerbation, but only if patient's individualized peak flow baseline is current and known during the time of treatment (Fanta 2017, p 1).

- If Asthma exacerbations continue on without treatment, the risk for respiratory failure increases.

Things to look at when respiratory failure is imminent

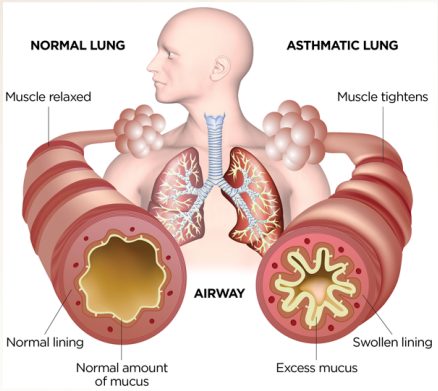
- Increased Respirations (Tachypnea)
- Increased work of breathing and accessory muscle breathing
- Increased Heart Rate (Tachycardia)

When interventions fail or not implemented in time, mechanical ventilation can be used.

- Use of mechanical ventilation is indicated when other therapies fail to improve the patient's symptoms and the patient has had a decrease in respiratory effort, change in mental status, or exhibits hypercapnia and respiratory acidosis (Fanta 2017, p 6).

Introduction

- Asthma is one of the most common diseases throughout the world.
- It was estimated that more than 339 million people suffer from asthma. Asthma is the most common noncommunicable disease among children. Most deaths occur in older adults (WHO, 2019)
- Asthma continues to increase in prevalence and is one of the most common lung disorders seen and treated in the healthcare setting (Fehrenbach, Wagner, and Wegmann 2017, p 551).
- The pathophysiology of Asthma is studied throughout the world in attempts to provide a better lifestyle to those affected.
- A heterogeneous disease, usually characterized by chronic airway inflammation. It is defined by the history of respiratory symptoms such as wheeze, shortness of breath, chest tightness, and cough that vary over time and in intensity, together with variable expiratory airflow limitation (Hikichi et al., 2018)
- This topic was chosen because the DNP practitioner need to be able to identify specific types of asthma problems and treat them timely and effectively.



Why Asthma Pathophysiology?

- Understanding the pathophysiology of Asthma is important as it can allow the practitioners and patients avoid certain triggers and help manage symptoms when an asthma exacerbation occurs
- Understanding the pathologic process allows practitioners to develop the right treatment and therapeutic interventions
- Asthma is thought to have two phenotypes; gradual onset and sudden onset. Depending on the phenotype, the response to interventions may be different. For example, in gradual onset there is mucus plugging in the airway, and a slower response to treatment. Sudden onset typically does not have mucus plugging, and responds more rapidly to treatment (Restrepo, et al, p 522).

Nursing Care Implications

- Nurses have to be able to assess and identify issues when asthma complications arise. Have the ability to identify abnormal lung sounds as well as abnormal breathing and abnormal mentation due to breathing problems
- Use a multidisciplinary approach to facilitate proper treatment and testing to identify the underlying issues

Possible Interventions include

- Apply oxygen to patient to achieve a SPO2 >92%
- Upright positioning to allow for proper gas exchange and elimination
- Effective communication to patient to ensure proper breathing technique
- Use of nebulizer, inhaler and spacer device.
- Oxygen titrated to maintain SpO2 of >92%.
- Selective beta 2 agonists Antimuscarinics
- Corticosteroids
- Nurses have to be very knowledgeable on potential interventions as well as side effects to each medication and what complications could arise

Education to patients is vital in helping avoid potential complications.

- Avoid risk factors (environmental, foods, and smoke)
- AVOID TRIGGERS THAT ARE KNOWN
- Action plan when things arise
- Use of inhaler (rescue and maintenance)
- Visit a pulmonologist to determine the best course of action for asthma problems
- Smoking cessation

Conclusions

- Asthma is a chronic condition in which many people are effected. The best treatment and management can be by avoiding triggers, changing lifestyles, maintaining medications, and having an asthma action plan.
- Morbidity for patients with mold to moderate asthma is relatively low.
- Understanding the pathophysiology of asthma will help the DNP practitioner properly treat and maintain an asthmatics issues and problems
- However, approximately 10 to 30% of patients may still require positive pressure ventilation for severe acute asthma and mortality could be as high as 22% (Restrepo, et al, p532).
- This understanding will allow for early intervention in asthma issues that will lead to positive outcomes for the patients

References

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