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Pediatric Asthma

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Introduction

"Asthma is the most common chronic disease in children. Asthma often begins in childhood, and it remains a worldwide serious public health problem reaching epidemic proportions" (Deng et al., 2019, p. 1).

- According to the Global Asthma Report 2018, an estimated 340 million persons are experiencing asthma, and nearly 1000 persons die of asthma-related conditions per day, and most of these deaths are preventable, highlighting the importance of early prevention measures in promoting pulmonary health, especially among children. (Deng et al., 2019, p. 1)
- "Asthma is one of the most common causes of respiratory distress. It affects more than 6.2 million children in the United States younger than 18 years of age and accounted for 20 million ED visits in 2014" (Agbim et al., 2018, p. 49).
- "Respiratory failure is the most common cause of cardiopulmonary arrest in the pediatric population; therefore, it is important emergency providers to recognize respiratory distress quickly in children of all ages and intervene aggressively to prevent respiratory failure" (Agbim et al., 2018, p. 41).
- "Asthma is a serious disease causing wheezing, difficulty breathing, and coughing. Over a lifetime, it can cause permanent lung damage. About 16% of black children and 7% of white children have asthma" (CDC, 2018).
- "More than half of children with asthma had one or more attacks in 2016. Every year, 1 in 6 children with asthma visits the Emergency Department with about 1 in 20 children with asthma hospitalized with asthma" (CDC, 2018).

Signs and Symptoms

"Children experience chest tightness, dyspnea, wheezing, coughing, and anxiety during acute asthmatic episodes, inhibiting their ability to breathe and accomplish daily activities. These episodes can be frightening, life threatening, and detrimental to a child's well-being" (Woodley, 2019, p. 191).

- Patients with asthma exacerbation will present with shortness of breath or chest tightness, an audible wheeze on auscultation, and possibly hypoxia (Agbim et al., 2018, p. 49)
- Mild Distress: Involves tachypnea and shortness of breath. (Agbim et al., 2018, p. 42)
- Moderate Distress: Subcostal retractions and nasal flaring. (Agbim et al., 2018, p. 42)
- Severe Distress: Supraclavicular tugging and head bobbing. (Agbim et al., 2018, p. 42)

"Some cases of severe respiratory distress, the entire sternum may retract, which is referred to paradoxical breathing" (Agbim et al., 2018, p. 42).

- Oxygen saturation can be misleading in patients with asthma because of ventilation and perfusion (V/Q) mismatching. This may be apparent after the initial administration of a bronchodilator. For example, patients with asthma may experience a further decline in their oxygen saturation after receiving albuterol, due to V/Q mismatch or intrapulmonary shunting, even though their overall clinical status is improving. The decline in oxygen saturation should be temporary.
- Persistent decline in oxygenation and further respiratory distress would indicate deteriorating respiratory status. (Agbim et al., 2018, p. 49)
- "Patients with persistent or refractory asthma symptoms require repeated doses of continuous albuterol, additional therapy, and prolonged observation in the Emergency Department or hospital" (Agbim et al., 2018, p. 51).

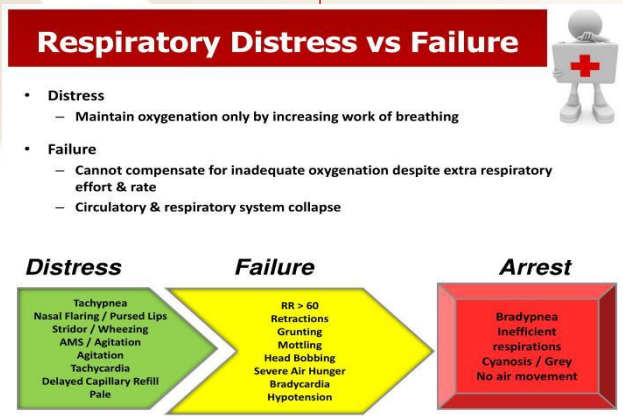

Figure 1

Pathophysiological Processes

Asthma is mediated through either type 1 T-helper (TH-1) cell or a type 2 T-helper (Th-2) cell response, the pathways of which have a fair amount of overlap (Rali et al., 2020, p. 135).

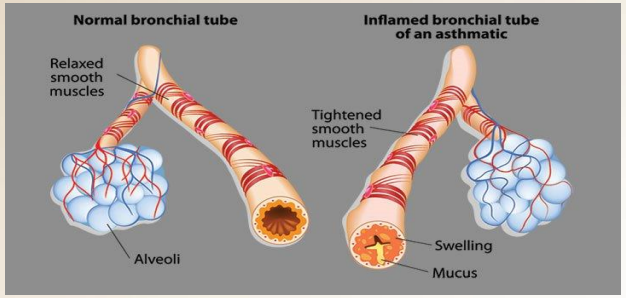

Figure 2

Airway Inflammation:

- Neutrophilic-predominant phenotype, irritants, pollutants, and viruses trigger an innate Th-1 cell-mediated pathway that leads to subsequent neutrophil release. This asthma phenotype responds poorly to standard asthma therapy (Rali et al., 2020, p. 135).
- Eosinophilic-predominant phenotype, environmental allergic antigens induce a Th-2 cell-mediated response in the airways of patients with asthma. This creates a downstream effect on the release of interleukins (IL) including IL-4, IL-5, and IL-13. IL-4 triggers immunoglobulin (Ig) E release, which induces mast cells to release inflammatory cytokines, while IL-5 and IL-13 are responsible for eosinophilic response. These cytokines and eosinophils induce airway hyperresponsiveness, remodeling, and mucus production. Through repeated exposure, chronic inflammation develops and subsequently causes structural changes related to increased smooth muscle mass, goblet cell hyperplasia, and thickening of lamina reticularis. (Rali et al., 2020, p. 135-136)

Airway Obstruction:

- Early asthmatic response is due to acute bronchoconstriction secondary to IgE; this is followed by airway edema occurring 6 to 24 hours after an acute event (called late asthmatic response). The obstruction is worsened by an overproduction of mucus, which may take weeks to resolve. Longstanding inflammation can lead to structural changes and reduced airflow reversibility. (Rali et al., 2020, p. 136)

Bronchial hyperresponsiveness:

- Is induced by various forms of allergens, pollutants, or viral upper respiratory infections. Sympathetic control in the airway is mediated via beta-adrenoceptors expressed on airway smooth muscle, which is responsible for the effect of bronchodilation in response to albuterol. Cholinergic pathways may further contribute to bronchial hyperresponsiveness and form the basis for the efficacy of anticholinergic therapy. (Rali et al., 2020, p. 136)

Nursing Implications

Improving management of pediatric asthma through education:

- The pediatric patient and caregivers can improve asthma management with education and instruction of inhaler technique. "The National Heart, Lung, and Blood Institute guidelines recommend that providers check inhaler technique at every opportunity and correct any deficiencies seen" (Gillette et al., 2016, p. 613).
- Pediatric education is continuously developing along with the pediatric patient to support pediatric patient autonomy of asthma management.
- The most common steps performed incorrectly were inhaling slowly and deeply for 3 to 4 seconds, holding breath for 5 to 10 seconds, and waiting 30 seconds before repeating if a second dose was necessary and not shaking the metered dose inhaler (MDI) prior to use with the spacer. (Gillette et al., 2016, p. 607)

Following the Asthma Action Plan:

- How to identify allergens or irritants to avoid
- How to recognize and handle asthma attacks
- Which medications to take and when to take them
- When to call your doctor or go to the emergency room
- Who to contact in an emergency

(U.S. Department of Health and Human Services, 2020)

- Assessing if the asthma action plan is effective for the patient and that the plan is being utilized correctly.

Influenza Vaccine for the Pediatric Patient:

- People with asthma are at risk of complications from flu. Flu infection in lungs can trigger asthma attacks, worsen asthma symptoms, and may lead to development of pneumonia. Centers for Disease Control and Prevention (CDC) recommends that people 6 months of age and older get a flu vaccine every year to protect against getting the flu and complications from flu. (CDC, 2017)

Identifying Triggers:

- Triggers can be very different from those of someone else with asthma. Know your triggers and learn how to avoid them. Watch out for an attack when you can't avoid the triggers. Some of the most common triggers:
- Tobacco Smoke, Dust Mites, Outdoor Air Pollution, Cockroach Allergan, Pets, Mold, Smoke from Burning Wood or Grass.
- Other Triggers: Influenza, Colds, and Respiratory Syncytial Virus (RSV), Sinus Infections, Strong emotions can lead to hyperventilation that can also cause an asthma attack (CDC, 2020)

Missing any school because of asthma is associated with suboptimal asthma control; assessment of school absenteeism may serve as a health status indicator for the pediatric asthma patient (Hsu et al., 2016, p. 23).

- Asthma is a leading cause of chronic disease-related school absenteeism in the US., associated with more than 10 million missed school days annually. Asthma-related school absenteeism affects most (59%) children with asthma and is linked to lower academic performance, especially among urban minority youth. (Hsu et al., 2016, p. 23)

Promote Healthy Choices

A study completed by Deng et al. (2019), identified that obesity having correlation with asthma in children related to obesity-reduction in lung volume (mechanical effects of obesity) and changes in hormone, dyslipidemia, and inflammatory mediators (p. 11).

- "Sedentary behavior can lead to central adiposity and obesity, and excessive high-fat and low in antioxidant content diet is associated with an increased risk of asthma" (Deng et al., 2019, p. 12).
- "Childhood obesity is recognized as a new pandemic of the new millennium" (Poorolajal et al., 2019, p. 116).
- "Eating breakfast and physical activity were the first and second most powerful protective factors against excess weight gain in children and adolescents" (Poorolajal et al., 2019, p. 116).
- "Watching too much TV and lack of enough sleep was the first and second most powerful risk factors of childhood obesity" (Poorolajal et al., 2019, p. 116).

Conclusion

Effective management of pediatric asthma and education are both vital components to improve the pediatric patient's quality of life. Family centered care is pivotal to prevent asthma exacerbations and possible emergency department visits and admissions.

My goal is to provide a framework for the pediatric asthma patient and his or her caregivers to achieve autonomy with management of asthma, increasing quality of life.

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