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Enhancing Asthma Care Through Collaborative Respiratory Therapy And Nursing Interventions

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Abstract
Asthma is a chronic inflammatory airway disease often presenting more severely in adults compared to children. This paper analyzes adult-onset asthma through a case study showcasing atypical features, such as workplace triggers and silent hypoxemia, alongside comorbidities like allergic rhinitis. It discusses pathophysiological mechanisms and clinical manifestations linked to chronic airway inflammation. Current guidelines recommend inhaled corticosteroids and ICS formoterol regimens, with potential use of biologic therapies for Type 2 inflammation. Respiratory therapists play a crucial role in spirometry and exacerbation management, while advanced practice nurses focus on ongoing assessment and patient education. The analysis highlights discrepancies between textbook descriptions and clinical realities, emphasizing the need for integrated, patient-centered care to prevent long-term airway damage and improve symptom control in adults with asthma.

Keywords: asthma, adult-onset asthma, respiratory therapy, advanced nursing practice, interprofessional care, ICS–formoterol, patient education.

Introduction

Anyone can get asthma, which is a long-term inflammatory disease of the airways. A lot of the time, it starts in the teens or early twenties. Men are more likely than women to have it in their teens and twenties. If someone in your family has asthma, atopy, or another allergy, you are more likely to get allergies. Goldin et al. (2024) assert that workplace allergens, pollutants, and irritants may aggravate or trigger emerging diseases.

Commonly symptoms

People with asthma often have symptoms like wheezing, chest tightness, pain, shortness of breath, and a long-lasting cough. Allergens, cold air, exercise, and respiratory infections are all common triggers. Asthma symptoms usually come and go, with times when the lungs work normally and times when the symptoms are very bad. This indicates that asthma may fluctuate and resolve (Leps et al., 2018).

Physical Examination Findings

After an asthma attack, you may notice wheezing, a long expiratory phase, and the use of extra muscles to breathe. In very bad cases, a lack of oxygen can make the heart and breathing rate go up. Chest hyperinflation can happen when asthma is very bad. Cyanosis, a medical emergency characterized by severe hypoxemia, is infrequent in mild to moderate cases (Salo et al., 2018).

Results from Imaging and Labs
Pulmonary function tests are usually used to check for asthma. One sign of asthma is airflow limitation, which is shown by a lower FEV1/FVC ratio. The fact that this blockage can be fixed with bronchodilator medication is a key sign for diagnosis because it shows how the disease changes over time. People with allergic asthma may have eosinophilia and high levels of serum IgE in their blood. Chest X-rays can also find hyperinflation during acute exacerbations (David et al., 2024).

Pathophysiology
Asthma is also known to be a long-term inflammatory disease that makes the airways smaller and eventually closes them. This condition is marked by inflammation of the bronchi and airways, along with fluctuating airflow limitations. Environmental factors, immune system activity, and genetic predisposition collectively contribute to the disease (Förster-Ruhrmann et al., 2024).

Chronic Airway Inflammation
Goldin et al. (2024) found that eosinophils, mast cells, and Th2 lymphocytes release histamine, interleukins, and leukotrienes when someone has asthma. These things keep the airways inflamed for a long time. Chronic inflammation also makes the airways more sensitive, changes their shape, and makes the lungs work less well.

Airway Hyperresponsiveness
A study by Lee & McDonald (2018) says that airway hyperresponsiveness (AHR) is a sign of asthma. When allergens or other things make the airways too sensitive. After that, acute bronchoconstriction can happen with very little exposure because ongoing inflammation changes the structure of the airway walls, making them more vulnerable. So, when episodes happen more often, Chronic AHR makes the airways change shape, which makes the cycle of inflammation and blockage stronger.

Mucus Hypersecretion
Shen et al. (2018) assert that inflammatory cytokines exacerbate the development of submucosal glands and airway epithelial cells, leading to increased asthma episodes and airway constriction. This makes the mucus thicker and stickier, which blocks the airways and makes it hard for air to get through. Coughing and wheezing are signs that the ventilation and perfusion are not working well together. This gets worse when mucus builds up.

Bronchoconstriction
Sinyor et al. (2023) showed that histamine, leukotrienes, prostaglandins, and acetylcholine are all chemicals that make the airways smaller when someone has asthma. This makes it hard for the person to breathe. After that, these chemicals can make it hard to breathe, wheeze, cough, and feel tight in the chest. If airway inflammation isn't controlled, it can speed up structural remodeling, which makes the problem of poor breathing even worse.

IgE-Mediated Allergic Response and Eosinophilic Infiltration
Sinyor et al. (2023) conducted a study. When you have an asthma attack, histamine, leukotrienes, prostaglandins, and acetylcholine all make the airways smaller and make it harder to breathe. Some of the symptoms that come with this restriction are wheezing, tightness in the chest, coughing, and trouble breathing. So, long-term and uncontrolled airway inflammation can cause rapid changes in the structure of the airways, which can make it harder to breathe.
Luo et al. (2024) demonstrated that atopic asthma arises from two principal immune system processes: an allergic reaction mediated by IgE and eosinophilic infiltration. People with allergies have basophils and mast cells that stick to IgE antibodies. When mast cells come into contact with an allergen, they release histamine, leukotrienes, and prostaglandins. This makes the airways smaller and makes mucus. Sinyor et al (2023) assert that the pathophysiological mechanisms directly responsible for the clinical manifestations of asthma include airway constriction, inflammation, and hyperresponsiveness. When the airways get too narrow, the air flow gets rough, which makes a wheezing sound. This happens when mucus builds up, the bronchi get smaller, and the mucosa gets bigger. When you breathe out, the air

flows fastest through the narrowed bronchioles, which makes it easier to hear the unique high-pitched melodic note.
Murrison et al.'s 2019 study says that dyspnea means that the airway has narrowed, making it harder to breathe. Chest tightness can happen during severe exacerbations when there is hypoxemia and air trapping. The symptoms get worse when you are exposed to allergens at night, have a cough that won't go away, and have mucus build up. Chronic respiratory problems and a lack of oxygen also make the symptoms worse. A combination of inflammation, narrowing of the airways, and changes in how the body breathes causes these asthma symptoms.

Adult-Onset Asthma
Trivedi and Denton (2019) demonstrated that childhood-onset asthma differs from adult-onset asthma in its presentation and pathophysiology. The patient's symptoms are progressing at a rate typical of adult-onset disease, and the patient is 34 years old. Asthma is typically more severe and persistent at onset in adults compared to children, and it is also less commonly associated with atopy. So, atopic asthma is more likely to happen with bad allergies, a good genetic predisposition, and starting in childhood.
Murrison and his team did a study in 2019 that showed that adults with asthma can have a hard time controlling their symptoms because of a number of things, both inside and outside the body. Some things that can cause allergic reactions are being around allergens at work, pollution in the air, smoking, having high levels of IgE, eosinophilia, and being sensitive to allergens. This is why people with asthma often have long-term problems with their airways that don't get better with standard treatments.

Triggers in the workplace and the environment
Environmental and occupational exposures, including classroom dust and cleaning agents, appear to influence patient symptoms. Irritants can make the airways more inflamed and hyperresponsive, which can make asthma attacks happen more often and be worse. Asthma that gets worse at work is different from asthma that is caused by seasonal allergens. This might help explain the pattern. Long-term exposure to low levels of respiratory irritants may gradually impair lung function. Harber et al. (2018) contend that airway inflammation may endure for an extended period.

Silent Hypoxia is Possible
Silent hypoxia is a mild form of hypoxemia that does not result in cyanosis or respiratory distress. Jounieaux et al. (2020) say that you can't tell if someone has respiratory insufficiency just by looking at them. Checking the pulse oximetry and arterial blood gas levels can help find hypoxemia early.

Merging Allergies
"United airway disease" means that inflammation in one of the upper or lower airways can spread to the other because they share immunopathological pathways. Asthma and allergic rhinitis can make the airways swell up. When the nasal mucosa or postnasal drip irritates the bronchial mucosa, asthma attacks are more likely to happen. Proper management of allergic rhinitis can improve asthma symptoms and respiratory control, challenging the independence of the two conditions (Ciprandi et al., 2012).

Comparison of Similarities
The patient's symptoms and diagnostic test findings fulfill the criteria for asthma in numerous aspects:

Most important signs
The patient coughs at night, wheezes, has trouble breathing, and feels tight in the chest. Allergies, allergens, cold air, and dust could all cause these symptoms to show up in this order. Cologne (2022) says that asthma is an inflammatory disease of the airways that can make it hard to breathe for short or long periods of time.

Response to breathodilator
Ponce et al. discovered in a 2025 study that bronchodilator therapy increased FEV_1 by 18%. This shows that asthma is caused by reversible airway constriction. The patient got better after taking albuterol, a

short-acting beta-agonist. This supports the idea that bronchodilators make symptoms and airflow worse.

Allergy

Abd Elkader et al. (2022) contend that eosinophilic airway inflammation precipitates atopic asthma, thereby increasing serum IgE levels and the susceptibility to allergic rhinitis. This study confirms the medical consensus that asthma is closely linked to other allergic conditions that demonstrate similar immunopathological mechanisms.

Differences

Adult-Onset Asthma

De Nijs et al. (2013) contend that the symptoms initiated at age 34 for this patient; however, the majority of asthma research has focused on cases that begin in childhood or early adolescence. Adult asthma symptoms can vary, as evidenced by her atypical atopic profile. Asthma that starts in adults has worse and less predictable symptoms, and it may not be atopic at first.

A late diagnosis and early signs that are hard to see

Wei et al.'s 2022 study found that the irritation in the patient's airway got worse over time, even though the patient only had mild and occasional symptoms at first. Even though traditional textbooks say asthma symptoms are easier to see and more obvious. Clinical treatment often overlooks the condition's delayed onset and inadequate recognition.

Hypoxemia with Quietness

The patient had a SpO_2 level of 92%, but they didn't show many signs of respiratory distress on the outside. This simple but important clinical sign is not often mentioned in asthma books. Silent hypoxemia (Ernstmeyer et al., 2024) demonstrates that physiological damage can be considerably more severe than the accompanying symptoms.

Reasons for Variation

There are many reasons why a person's asthma symptoms might not always match what is said in books. Adults with asthma may find it harder to manage their condition and may need to see their doctor more often. Taking the right medicine is very important for good control, especially if you have more than one inflammatory disease at the same time, like allergic rhinitis or gastroesophageal reflux disease (GERD) (Trivedi & Denton, 2019).

Things in your environment and how you live your life can both cause asthma. Dust, cleaning chemicals, and seasonal allergens at work could make airway hyperresponsiveness worse and cause flare-ups more often. Louisias et al. (2019) say that stress, not getting enough sleep, and not getting enough exercise can all make symptoms worse, which makes it much harder to manage the disease.

The clinical environment can significantly influence the diagnosis and treatment of asthma and its related symptoms. This includes things like how easy it is to get medical care, how well the system works, and how much information it can handle. For example, some primary care facilities charge people to use modern diagnostic tools like spirometry.

This could mean that the wrong diagnosis is made or that the patient doesn't get enough treatment. People who have to wait a long time to see a doctor or who can't get specialized respiratory therapies sometimes find that their problems get worse. Nucera et al. (2022) found that the effectiveness of asthma medications is affected by pharmacological factors, the biology of the patient, environmental exposures, and the healthcare system.

The Clinical Pharmacology and Management of the Syndrome

Scientists have said that asthma treatment should include things that help with symptoms and things that help in the long term. GINA (2024) proposes a comprehensive approach to asthma management that both mitigates and eliminates symptoms. Albuterol and other first-line SABAs can help with sudden bronchoconstriction, but if you use them too often, it could mean that your asthma isn't being

controlled well. Levy et al. (2023) demonstrated that the monitoring of symptoms, inhaler usage, and adverse effects is crucial for maintenance.

Inhaled corticosteroids

People with asthma often use inhaled corticosteroids (ICS) to stay healthy. They stop inflammation in the airways by stabilizing mast cells, lowering eosinophils, and stopping pro-inflammatory cytokines. They stop flare-ups and help the lungs work better. They can also make it hard to swallow, cause oral candidiasis, and slow growth (Barnes, 2010).

Managing Clinical Cases

The patient takes both short- and long-acting medications to prevent her mild asthma symptoms from worsening. Albuterol, fluticasone propionate, and short-acting beta-agonists are all medicines that can help people with asthma for a long time. Short-acting beta-agonists are used to help with wheezing and shortness of breath. People take prednisone to help with moderate inflammation. Reddel et al. (2022) recommend the utilization of long-acting bronchodilators and corticosteroids to alleviate airway inflammation.

Doctors give albuterol, fluticasone, and prednisone to people who have lung inflammation, are showing symptoms, and need to stay in the hospital. These medications work together to reduce swelling and make it easier to breathe. The treatment plan involves ensuring the patient's safety, utilizing an inhaler, monitoring side effects, and assessing symptoms. Hattotuwa et al. (2002) contend that holistic care requires evidence-based oversight and proactive patient engagement in health management.

Nursing Implications

I think it's important to keep an eye on your symptoms and take care of them yourself because they can change over time. This is also what other studies have found. Scullion (2018) says that advanced practice nurses (APNs) are very helpful for people with asthma because they do thorough exams, keep an eye on them, teach them, and plan their care. APNs are very important for figuring out when someone has an asthma attack and what the pattern of their chronic illness is. They ask a lot of questions about your medical history to find out if you have any allergies, do any physical activity, or are exposed to anything at work that might be making your symptoms worse. They also check on the patient every day to see how they are doing, how their symptoms are at night, and how well their medications are working. Boehning et al. (2025) recommend an extensive physical examination for respiratory conditions.

DeVrieze et al. (2025) found that advanced practice nurses (APNs) use symptom diaries, spirometry, and peak flow meters to check lung function and find early signs of deterioration in comprehensive patient care. The patient's condition may not change, so they can switch therapies quickly. Early detection, ongoing monitoring, patient education, and follow-up can help people avoid going to the hospital and long-term effects. These examples show how important it is to have a full plan for treating asthma if you want to be successful.

Keeping an eye on how well the medicine works and its negative effects

The 2025 study by Boehning and Punsalan found that APNs make sure asthma medications work. We keep track of how well a medicine works, how safe it is, and how well people follow the rules by using both subjective and objective data. APNs should watch for overuse or bad illness management because short-acting beta-agonists (SABAs) like albuterol work in different ways to help with symptoms.

Nurses need to watch people who use inhaled corticosteroids (ICS) to make sure they are following their treatment plan and using the inhaler correctly. Watch for side effects, how well the medicine is working, and the dose. To avoid oral candidiasis, patients should rinse their mouths after taking the medicine. Using ICS for a long time may lower hormone levels and bone density.

Pharmacologic optimization relies on objective monitoring as it yields quantifiable data regarding lung function and therapeutic effectiveness. An evidence-based approach that enables clinicians to customize medications for individual patients can enhance the safety and effectiveness of asthma management. This also makes it easier to see if the treatment isn't working or if the disease is getting worse.

Patient Education

Teaching patients about asthma is an important part of their care. The goal is to give people the information they need to stay healthy. It is very important to know how to use your inhaler. It's important to show people how to use spacers and inhalers the right way. Also, to keep people from getting infections, the device should be cleaned and maintained on a regular basis (Bridgeman and Wilken, 2021).

You can feel better if you know how to stay away from dust, animals, cleaning products, and cold air. It is very important to stay away from work-related exposure. Patients should be aware that inhaled corticosteroids alleviate airway inflammation, short-acting beta agonists are more effective in the short term, and the use of rescue inhalers is not advisable (De Troeyer et al., 2022).

If people with asthma follow their doctor's instructions and make other changes to their lives, they may feel better. Advanced practice nurses say that people who are overweight or obese should keep their weight stable, stop smoking, and stay away from exercise-induced bronchospasm. Eating a lot of foods that are high in omega-3 fatty acids and antioxidants can help lower inflammation. Personalized therapies increase the chances of success and longevity (Perret et al., 2016).

Advanced nursing practice enhances asthma management by identifying patients at elevated risk for severe asthma attacks, formulating individualized action plans, and monitoring the efficacy of pharmacological and other disease management interventions. Patients can keep an eye on their health by scheduling follow-up appointments. Talking to someone can help you deal with your sadness or anxiety and get a better night's sleep. Majellano et al. (2019) contend that patient-centered asthma therapy improves health and well-being over time.

Evidence-Based Support

The main goal of the GINA 2023 asthma guidelines is to control symptoms and cut down on flare-ups. Inhaled corticosteroids should be used to treat mild asthma and ICS-formoterol should be used to treat intermediate asthma. GINA does not recommend using SABA alone due to the risks. ICS-formoterol was administered as needed and maintained (Dubin et al., 2024).

ATS/ERS Rules

The American Thoracic Society (ATS) and the European Respiratory Society (ERS) say that the best research should be used to make individualized treatment plans for people with severe asthma. Biologic therapy that targets IL-5 or IgE pathways is the best way to treat type 2 inflammation. This is because it lowers the number of flare-ups and the need for corticosteroids. Holguin et al. (2020) propose that optimal long-term outcomes are achieved through a staged approach to managing symptoms, lung function, and exacerbations.

The conclusion

The case study illustrates that individualized asthma management requires both theoretical and practical proficiency. There were indications of elevated IgE levels and allergic rhinitis. But the patient's lifestyle, personality, and access to healthcare could have an effect on their disease and treatment. This case highlights the imperative for individualized evaluations, continuous oversight, and flexible treatment approaches. Advanced practice nurses (APNs) assess patients with asthma, deliver evidence-based interventions, and offer education. Advanced nursing theory and practice make clinical judgment, critical thinking, and patient-centered care better.

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