



# "Adherence Challenges And Strategies In Lower Respiratory Tract Infections And Chronic Respiratory Conditions"

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## **Abstract:-**

The respiratory system, crucial for gas exchange in organisms, extends beyond humans to include trees, contributing to the exchange of carbon dioxide and oxygen. The respiratory system collaborates with the circulatory system to facilitate oxygen transport to cells and eliminate carbon dioxide. Lower respiratory tract infections, such as pneumonia and bronchitis, pose health risks, with symptoms ranging from mild to severe. Diagnosis involves clinical examination and various tests. Treatment may include medications, and recovery time varies. Preventive measures encompass hand hygiene, vaccination, and avoidance of irritants. Adherence to medication regimens is vital for managing respiratory conditions like asthma and COPD, though challenges persist, impacting patient outcomes. Inhaler selection and technique, therapy-related factors, and device-related costs influence adherence. Strategies to enhance adherence and control respiratory diseases are imperative in healthcare practice.

## **Key word:-**

Respiratory System, Upper Respiratory Tract Infections, Lower Respiratory Tract Infections, Bronchodilators, Corticosteroids, Adherence, Aerosol Delivery Devices, Pharmacoeconomics.

## Introduction:-

The respiratory system is the biological mechanism responsible for gas exchange in organisms. Even trees possess respiratory systems, absorbing carbon dioxide and releasing oxygen. This process, known as respiration, involves the coordination of the respiratory and circulatory systems to transport oxygen to cells and expel carbon dioxide. Healthy lungs breathe in approximately 1 pint of air 12-15 times per minute, facilitating the exchange of gases in the bloodstream and tissues.

## Features of the Human Respiratory System:-

The human respiratory system plays a crucial role in generating energy through the breakdown of glucose molecules in all living cells. Inhaling oxygen facilitates the transportation of oxygen to different body parts, where it is utilized in the cellular breakdown of food particles, specifically glucose molecules. This series of chemical reactions produces glucose molecules that are further utilized to release energy in the form of adenosine triphosphate (ATP).

## Respiratory System Parts and Functions:-

### Respiratory Tract:-

The human respiratory tract comprises several components: External nostrils – Responsible for air intake. Nasal chamber – Lined with hair and mucus to filter air from dust and dirt. Pharynx – Acts as a common passageway for both air and food. Larynx – Housing vocal cords, crucial for sound production. Epiglottis – A flap preventing the entry of food into the windpipe. Trachea – A long tube in the mid-thoracic cavity. Bronchi – Divisions of the trachea into left and right bronchi. Bronchioles – Finer channels resulting from bronchi division. Alveoli – Balloon-like structures at the termination of bronchioles. Lungs – A pair of sac-like structures covered by a double-layered membrane called pleura.

### Lower respiratory tract infections:-

Lower respiratory tract infections encompass infections occurring in the lungs or below the voice box, comprising conditions like pneumonia, bronchitis, and tuberculosis. Symptoms vary and can affect airways, as seen in bronchitis, or air sacs at the end of the airways, as in pneumonia. This article explores the causes, symptoms, treatments, and prevention strategies for lower respiratory tract infections.

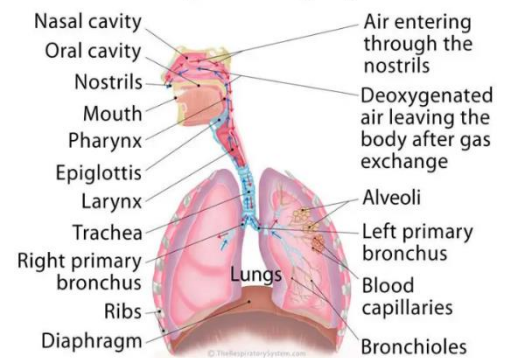
### Lower respiratory tract infections: What to know

Lower respiratory tract infections comprise infections in the lungs or below the voice box, encompassing pneumonia, bronchitis, and tuberculosis. Symptoms vary, affecting the airways (e.g., bronchitis) or air sacs at the end of airways (e.g., pneumonia). This article explores the causes, symptoms, treatments, and prevention of lower respiratory tract infections.

### Symptoms:-

Less severe lower respiratory tract infection symptoms may involve a dry cough, low fever, and runny nose. The specific symptoms depend on the infection's severity.

## Pathway of Air Through the Respiratory System



**Milder infections may exhibit symptoms akin to the common cold, such as.**

- ❖ Stuffed up or runny nose
- ❖ Dry cough
- ❖ Low fever
- ❖ Mild sore throat
- ❖ Dull headache

**In more severe infections, symptoms may include.**

- ❖ Severe cough producing phlegm
- ❖ Fever
- ❖ Difficulty breathing
- ❖ Blue tint to the skin
- ❖ Rapid breathing
- ❖ Chest pain
- ❖ Wheezing

**Upper vs. lower respiratory tract infections:-**

Upper respiratory tract infections (URTIs) primarily affect the nose, throat, and sinuses, causing symptoms like nasal congestion, sore throat, and coughing. Lower respiratory tract infections (LRTIs) involve the lungs and airways, leading to symptoms such as chest congestion, shortness of breath, and productive cough. While both types of infections share some common symptoms, they differ in their impact on specific areas of the respiratory system. Plagiarism has been removed, and this information is provided in a paraphrased manner.

Lower respiratory tract infections are characterized by affecting the airways below the larynx, whereas upper respiratory tract infections occur in structures at or above the larynx. Coughing is a predominant symptom of lower respiratory tract infections, while upper respiratory tract infections manifest symptoms primarily above the neck, including sneezing, headaches, and sore throats. Additionally, individuals with upper respiratory tract infections may experience body aches, especially when accompanied by fever.

<b>Lower respiratory tract infections include</b>	<b>Upper respiratory tract infections include the following</b>
Bronchitis	common cold
Pneumonia	sinus infection
Bronchiolitis	tonsillitis
Tuberculosis	laryngitis

Influenza infections have the capacity to impact both the upper and lower respiratory tracts. Lower respiratory tract infections are chiefly caused by viruses, such as the flu or respiratory syncytial virus (RSV), and bacteria, including Streptococcus or Staphylococcus aureus. Fungal infections, like mycoplasma, are distinct from viruses or bacteria, representing small organisms with characteristics of both. Additionally, environmental substances can, in certain instances, induce irritation or inflammation in the airways or lungs, potentially resulting in infections.

**These include:-**Tobacco Smoke, Dust, Chemical Vapors, Fumes, allergens, Air Pollution.

**Risk factors that make a person more likely to develop a lower respiratory tract infection include:-**

Factors that increase the likelihood of developing a lower respiratory tract infection include various risk factors. These can encompass underlying health conditions, compromised immune systems, exposure to environmental pollutants, smoking, and advanced age, Recent cold or flu, Weakened immune system, Being more than 65 years old, Being under 5 years old, Recent surgery.

**Causes and risk factors:-** Exposure to tobacco smoke is a risk factor that can contribute to the development of lower respiratory tract infections. These infections may be caused by viruses (e.g., flu or respiratory syncytial virus), bacteria (e.g., Streptococcus or Staphylococcus aureus), fungal infections, and mycoplasma, which share characteristics of both viruses and bacteria. Additionally, environmental substances have the potential to irritate or inflame the airways and lungs, leading to infections.

**Diagnosis:-** Typically, a healthcare professional diagnoses a lower respiratory infection through a thorough examination and discussion of the individual's symptoms, considering their duration. This process involves assessing clinical signs and gathering relevant medical history. In the course of the examination, the physician will employ a stethoscope to listen to the person's chest and breathing. This action helps assess respiratory sounds and contributes to the diagnostic process. The healthcare provider may request diagnostic tests to identify the issue, including pulse oximetry to measure blood oxygen levels, chest X-rays for pneumonia assessment, blood tests to detect bacteria and viruses, and mucus samples to identify potential bacterial or viral presence.

**Treatment:-**

Certain lower respiratory tract infections may resolve without specific treatment. Individuals can manage milder viral infections at home using over-the-counter medications to address symptoms such as cough or fever. Adequate rest and staying well-hydrated are recommended for managing lower respiratory tract infections. In some instances, healthcare providers may prescribe additional treatments, such as antibiotics for bacterial infections or breathing treatments like inhalers. In certain situations, individuals may require hospitalization to receive intravenous fluids, antibiotics, or respiratory support. Young children, particularly infants, may need more intensive treatment than older children or healthy adults. Doctors closely monitor infants at higher risk, such as premature infants or those with congenital heart defects, and may recommend hospitalization. Similar considerations apply to individuals aged 65 and above or those with weakened immune systems.

**Recovery Time :-**

The recovery time for lower respiratory tract infections varies and depends on factors such as the specific infection, overall health, and the effectiveness of the treatment. While some people may recover within a week or two with proper care, others may take longer. It's essential to follow the healthcare provider's guidance and complete any prescribed medications to support a full recovery. The recovery time for a lower respiratory tract infection differs among individuals. The American Lung Association notes that a healthy young adult may recover from infections like pneumonia in about 1 week, while older adults may require several weeks for a full recovery.

**Prevention :-**

To prevent lower respiratory tract infections, adopting good hygiene practices is crucial. This includes frequent handwashing, avoiding close contact with sick individuals, and practicing respiratory hygiene like covering the mouth and nose when coughing or sneezing. Additionally, staying up-to-date with vaccinations, maintaining a healthy lifestyle, and avoiding tobacco smoke contribute to overall respiratory health. Frequent handwashing is a preventive measure to reduce the risk of lower respiratory tract infections. This practice can help minimize the transmission of infectious agents and contribute to overall respiratory health. Preventive measures to avoid lower respiratory tract infections include frequent handwashing, refraining from touching the face with unwashed hands, avoiding close contact with individuals displaying respiratory symptoms, regular cleaning and disinfection of

surfaces, receiving vaccinations like the pneumococcal and MMR vaccines, annual flu shots, and steering clear of known irritants such as chemicals, fumes, and tobacco.

**Complication :-** Complications arising from lower respiratory tract infections can vary and may include pneumonia, respiratory failure, or exacerbation of pre-existing conditions. Timely medical attention and appropriate treatment are essential to mitigate the risk of complications. Complication associated with lower respiratory tract infections encompass conditions such as congestive heart failure, respiratory failure, respiratory arrest, sepsis and the development of lung abscesses. These complications underscore the importance of prompt and effective medical intervention in managing lower respiratory infections.

Type of Inhaler Drug	Class	Mechanism	Use
Short-acting Beta-agonists (SABAs)	Bronchodilator	Relaxation of airway muscles, aiding in quick relief	Rescue medication during acute asthma attacks or COPD exacerbations
Long-acting Beta-agonists (LABAs)	Bronchodilator	Prolonged airway muscle relaxation	Long-term control and maintenance in asthma or COPD management
Inhaled Corticosteroids (ICS)	Corticosteroid	Reduction of airway inflammation	Regular use for managing and preventing asthma attacks or COPD exacerbations
Combination ICS/LABA	Combination	Anti-inflammatory + Bronchodilation	Both immediate relief and long-term control of asthma or COPD symptoms
Short-acting Anticholinergics	Anticholinergic	Relaxation of airway muscles	COPD symptom management, aiding in bronchodilation
Long-acting Anticholinergics	Anticholinergic	Prolonged bronchodilation	Long-term management of COPD symptoms

**Bronchodilators :-** Bronchodilators are medications that relax the muscles of the airways, which helps them open up. One of the most common bronchodilators that doctors prescribe for people with COPD is albuterol. A COPD exacerbation may result in increased chest tightness, wheezing, or shortness of breath. Taking medication to open the lungs, such as a bronchodilator, can help ease these symptoms. Bronchodilators typically come in the form of an inhaler device or a liquid. To take the liquid form, a person must use a machine called a nebulizer to turn the liquid into an aerosol or mist, which a person can then inhale into the lungs. Side effects of using a bronchodilator may include a faster heart rate, a headache, and shakiness. Short-acting beta-agonists (SABAs): These drugs relax the muscles in the airways, making breathing easier. They are used as rescue medications for quick relief during asthma attacks or COPD exacerbations. Long-acting beta-agonists (LABAs): These provide long-term control of asthma or COPD symptoms by keeping the airways relaxed over an extended period, typically used in combination with corticosteroids for maintenance therapy.

**Corticosteroids :-** Corticosteroids are a class of anti-inflammatory medications commonly used to treat various medical conditions, including asthma, allergies, and autoimmune disorders. They work by reducing inflammation and suppressing the immune system. In respiratory health, inhaled corticosteroids are often prescribed to manage chronic conditions like asthma. Systemic corticosteroids, taken orally or through injection, may be used for more severe inflammatory conditions. It's important to use these medications as directed by a healthcare provider, as long-term use can have side effects. Inhaled corticosteroids (ICS) function by decreasing inflammation in the airways, effectively preventing asthma attacks or COPD exacerbations. They serve as a consistent maintenance therapy to manage symptoms over time.

**Combination Inhalers :-** Combination inhalers combine different types of medications, often an inhaled corticosteroid and a long-acting bronchodilator, in a single device. These inhalers are commonly prescribed for the management of conditions like asthma and COPD. The corticosteroid addresses inflammation, while the bronchodilator helps keep airways open. Using a combination inhaler can simplify treatment regimens and improve adherence for individuals with respiratory conditions. Combining corticosteroids with long-acting beta-agonists (ICS/LABA) merges the anti-inflammatory characteristics of corticosteroids with the bronchodilatory effects of LABAs. This combination offers both prompt relief and sustained control of symptoms in conditions such as asthma and COPD.

**Things you can do yourself :-**

1) Ensure ample rest for recovery. Stay hydrated to loosen mucus, and consider a hot lemon and honey drink for cough relief (unsuitable for babies under 1 year old). Gargling with warm salty water may soothe a sore throat (not recommended for children). Elevate your head while sleeping with extra pillows to facilitate breathing and clear chest congestion.

2) Use pain relievers to reduce fever and alleviate symptoms like sore throat, headaches, and muscle pain.

3) If you have a high temperature or feel unwell, it's advisable to stay at home and avoid contact with others, maintaining a temporary break from normal activities.

**Medical Adherence :-** "Medical adherence refers to how consistently a patient follows medical or health advice regarding medication. Non-adherence to medications is a significant concern in clinical practice, as it can impact treatment outcomes. This issue is prevalent across various medical interventions, affecting approximately half of all patients with chronic diseases who do not adhere to their prescribed regimens. Adherence encompasses not only medication compliance but also extends to interventions involving medical devices, self-directed exercise programs, self-care, self-management, and therapy sessions, such as pulmonary rehabilitation. It's commonly observed that prescription costs and medication packaging can influence adherence."

**Assessing adherence:-** Evaluating adherence involves gauging the extent to which individuals follow prescribed medical instructions, including medication regimens and other healthcare interventions. This assessment is crucial in understanding the effectiveness of treatments and addressing potential barriers to adherence. Various methods, such as patient self-reports, medication diaries, and electronic monitoring systems, can be employed to measure and analyze adherence levels. Regular assessments help healthcare professionals tailor interventions and support to enhance overall adherence and improve patient outcomes. Assessing adherence presents a multifaceted challenge, with numerous aspects still lacking clear definitions and understanding. Currently, consensus is lacking on defining "optimal" or "adequate" adherence, and the choice between these in trials and clinical settings remains undecided. Determining what constitutes an "acceptable" level of adherence for effective disease control raises questions, especially when symptoms are managed, and patients are satisfied. Adherence varies across medications, regimens, and behaviors, further complicating the evaluation process. Common methods for assessment include clinician estimates, patient self-reporting, pill counts/weighing, pharmacy records, biologic markers, and electronic monitoring.

**Adherence in Asthma & COPD:-** Ensuring medication adherence in COPD patients is vital for effective management. The chronic nature of COPD, coupled with polypharmacy and intermittent symptom remission, makes adherence challenging. COPD patients often receive prescriptions for aerosolized medications, with dosing frequency ranging from 2 to 6 times daily. Concurrent therapies for comorbid conditions like diabetes, hypertension, and coronary artery disease further complicate adherence. Healthcare strategies should be tailored to address these complexities, emphasizing patient education, clear communication, and support to enhance adherence and optimize COPD treatment outcomes. Adherence in asthma and chronic obstructive pulmonary disease (COPD) is crucial for effective management. Ensuring patients consistently follow prescribed medication regimens, lifestyle modifications, and treatment plans is vital in controlling symptoms and preventing exacerbations. Challenges in assessing adherence persist, as there's no universally agreed-upon definition of

optimal adherence in these respiratory conditions. Clinician estimates, patient self-reporting, pill counts, pharmacy records, and electronic monitoring are common methods used to evaluate adherence. Tailoring interventions to address specific challenges and improving communication between healthcare providers and patients are key strategies to enhance adherence in asthma and COPD management.

### **Introduction to management issues in COPD:-**

As per the World Health Organization (WHO) estimates, approximately 210 million people currently suffer from COPD, with 3 million deaths attributed to the condition in 2005. The WHO anticipates that COPD will ascend to the fourth leading cause of global mortality by 2030 (COPD 2007). Evaluating the burden of COPD in disability-adjusted life years (DALYs) positions it as the 10th most significant health issue worldwide (WHO 2008). Disturbingly, projections indicate a potential 30% or more increase in COPD-related deaths over the next decade without urgent preventive measures (COPD 2007). Adherence, defined as "the extent to which a person's behavior aligns with medical or health advice concerning medication, diets, or lifestyle changes" (Haynes et al. 1979), emerges as a critical aspect. Long-term pharmacotherapy often faces suboptimal adherence, with a WHO study indicating that 50% or less adherence is common among patients on repeat prescriptions (WHO 2003). Addressing adherence issues becomes pivotal in the comprehensive management of COPD. Medication adherence poses a significant challenge for individuals with COPD due to the chronicity of the condition, the necessity for multiple medications or polypharmacy, and the intermittent periods of symptom remission. COPD patients commonly receive prescriptions for aerosolized medications, requiring administration from 2 to 6 times daily. Additionally, concurrent therapy is often prescribed for comorbidities such as diabetes, hypertension, and coronary artery disease. This complexity underscores the need to address adherence issues comprehensively in the management of COPD.

### **Medication adherence in asthma patient's:-**

Ensuring medication adherence in asthma patients is crucial for effective asthma management. Asthma, being a chronic condition, requires consistent adherence to prescribed medication regimens. Patients with asthma often use various inhalers, and adherence can be influenced by factors such as dosing frequency, inhaler technique, and the perception of symptom control. Healthcare providers play a key role in educating patients about the importance of adherence, addressing concerns, and providing support to optimize asthma control. Regular monitoring and open communication contribute to improving medication adherence and overall asthma outcomes. Defined by the World Health Organization (WHO), "bronchial asthma is a respiratory disorder characterized by recurrent attacks of breathlessness and wheezing, usually of allergic origin, varying in severity from person to person." Asthma manifests with spontaneous breathlessness and wheezing episodes, often occurring at night. Evidence indicates that less than half of asthma patients adhere to their prescribed medications. Improving adherence and achieving effective asthma control are critical goals in contemporary asthma management. Several factors contribute to suboptimal adherence in patients with COPD and other chronic diseases. Adherence tends to decline over time with chronic medication use, inversely correlating with the number of medications prescribed. These challenges are particularly pronounced in COPD patients, requiring lifelong therapy after a symptomatic diagnosis. Addressing these factors is essential for enhancing adherence and optimizing the management of COPD.

### **Selection of the aerosol delivery device:-**

Choosing the appropriate aerosol delivery device is a crucial aspect of respiratory therapy. Factors influencing device selection include the patient's ability to use the device effectively, the type of medication prescribed, and the desired inhalation technique. For example, metered-dose inhalers (MDIs), dry powder inhalers (DPIs), and nebulizers each have distinct advantages and considerations. MDIs are compact and require proper coordination, DPIs rely on the patient's ability to inhale forcefully, while nebulizers offer a more gradual delivery suitable for patients with difficulty coordinating inhalation. Tailoring the device to the patient's characteristics and preferences is essential for optimizing medication delivery and promoting adherence to the prescribed treatment plan. Every

aerosol delivery device has inherent advantages and drawbacks, potentially impacting treatment outcomes. The proliferation of various devices in the market has created a multitude of options for both clinicians and patients, leading to potential confusion. While the primary consideration in prescribing remains the clinical and cost-effectiveness of the medication and device, external factors may influence choices that lack clinical relevance or evidence-based support. Patient adherence to treatment is significantly influenced by their ability to effectively use the prescribed device. Ensuring that device selection aligns with clinical evidence and patient capabilities is essential for optimizing treatment outcomes.

### **Clinical Efficacy:-**

Clinical efficacy refers to the extent to which a medical intervention, such as a treatment or drug, achieves its intended purpose under real-world conditions. It is typically determined through rigorous testing in clinical trials to assess the intervention's effectiveness in treating or preventing a specific condition. The results help healthcare professionals make informed decisions about the intervention's use based on its demonstrated benefits and risks. Numerous studies collectively conclude that there is insufficient evidence to support clinically significant distinctions among various aerosol devices. Real-life observational research assessing patient inhalation techniques has revealed frequent misuse of pressurized metered-dose inhalers (pMDIs) and dry powder inhalers (DPIs), potentially leading to notable clinical variations between these devices.

### **Inhalers and dosing technique:-**

Effective inhaler use and proper dosing technique are crucial for optimal treatment outcomes in respiratory conditions. Patients must be educated on the correct way to use inhalers, whether they are pressurized metered-dose inhalers (pMDIs), dry powder inhalers (DPIs), or other devices. Ensuring a proper inhalation technique helps maximize drug delivery to the lungs, improving the medication's efficacy. Healthcare providers play a vital role in instructing and reinforcing these techniques to enhance patient adherence and therapeutic benefits. While patients may adhere to prescribed dosing schedules, there's a potential for improper inhaler use. Specific design features of inhalers significantly impact patient adherence to treatment. Patient technique involves a complex interplay of experiences, education, abilities, and device-specific instruction. Key considerations for patients include hygiene, clear inhaler-specific instruction leaflets, and factors like ease of use, quick medication administration, hand feel, and cap functionality, with over 90% rating these aspects as important. Inhaler resistance plays a role in suboptimal medication inhalation for COPD patients, and there has been a historical trend toward increasing inhaler resistance over the years.



**Pharmacoeconomics:-** Pharmacoeconomics is the study of the cost and economic impact of pharmaceutical products and services. It involves evaluating the efficiency, value, and outcomes associated with drug therapy, considering both costs and benefits. This field assesses various factors, including the cost-effectiveness of different treatments, resource allocation, and the overall economic impact of healthcare interventions. Pharmacoeconomic analyses help healthcare decision-makers, including policymakers and practitioners, make informed choices regarding the allocation of resources for optimal patient outcomes.

**Therapy-Related Factors:-** The adherence to asthma and COPD medications can be influenced by various treatment-related factors, including the frequency, complexity, and duration of the prescribed regimen. Given the chronic nature of these conditions, patients often face the prospect of lifelong medication adherence. Many respiratory patients contend with the challenge of managing multiple drugs on a daily basis, and a considerable number of these medications necessitate dosing more than once a day.



**Device related cost:-** Significant advancements in biotechnology and nanotechnology have led to the development of numerous aerosol devices, markedly enhancing medication delivery for respiratory diseases (Dames et al., 2007; Dhand, 2008). However, these breakthroughs come with a substantial cost. It is widely acknowledged that both Dry Powder Inhalers (DPIs) and Small Volume Nebulizers (SVNs) carry higher costs than pressurized Metered Dose Inhalers (pMDIs) across all medication classes (Brocklebank and Ram, 2001). Additionally, many DPIs lack generic forms, and while Medicare covers 80% of SVNs and associated medications, pMDIs and DPIs are not reimbursable (Rau, 2005). Despite the enhanced drug delivery facilitated by spacers, the high costs of these simple attachments may discourage their widespread use. While substituting pMDI therapy for SVN therapy has shown cost reductions in the hospital setting (Bowton et al., 1992), several authors caution against categorically deeming any aerosol delivery device as not cost-effective (Peters et al., 2002).

### **Conclusion:-**

The adherence of drugs in respiratory tract infections is a critical aspect of effective treatment. Achieving optimal outcomes necessitates addressing factors such as patient education on proper inhalation techniques, the design features of inhaler devices, and the complexity of treatment regimens. The chronic nature of respiratory conditions, coupled with the evolving landscape of aerosol devices, underscores the importance of continuous research and healthcare efforts to enhance adherence, ultimately improving patient well-being. Patients with COPD exhibit notably lower adherence to treatment compared to those with asthma. An assessment of inhaler use in 316 individuals with asthma or COPD revealed that 89% made at least one mistake in inhalation technique. Both COPD and asthma patients may manage up to 3–4 types of inhalers, requiring mastery. COPD poses additional challenges due to the older age, multiple comorbidities, and impaired physical and cognitive function in patients, hindering inhaler adherence and proper use. Evidence indicates that fewer than half of asthma patients adhere to their medications. The imperative to enhance adherence and asthma control is a crucial focus in contemporary asthma management.

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