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# Bronchodilators: An Updated Review for Healthcare Providers

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**Abstract:**

**Background:** Bronchodilators are essential medications for managing obstructive airway diseases, including asthma and chronic obstructive pulmonary disease (COPD). These drugs function by relaxing bronchial smooth muscle through distinct mechanisms, with beta-2 agonists, anticholinergics, and methylxanthines comprising the primary classes. Despite their efficacy, improper use can lead to adverse effects, reduced therapeutic response, and systemic complications, necessitating careful interprofessional management.

**Aim:** This review examines the pharmacological properties, clinical applications, and monitoring strategies for bronchodilators, emphasizing their role in improving respiratory function and quality of life.

**Methods:** A synthesis of current guidelines (e.g., GINA, GOLD) and peer-reviewed literature was conducted to evaluate bronchodilator mechanisms, administration techniques, and safety profiles.

**Results:** Beta-2 agonists remain first-line for acute and maintenance therapy, while anticholinergics are preferred in COPD. Methylxanthines are reserved for refractory cases due to their narrow therapeutic index. Proper inhaler technique and adherence monitoring mitigate risks like receptor downregulation and anticholinergic effects. Interprofessional collaboration optimizes outcomes, with physicians, pharmacists, and respiratory therapists each playing critical roles.

**Conclusion:** Bronchodilators significantly enhance symptom control when used appropriately, but their success hinges on patient education, tailored prescribing, and vigilant monitoring. Future efforts should prioritize standardized training and telehealth integration.

**Keywords:** Bronchodilators, asthma, COPD, beta-2 agonists, anticholinergics, interprofessional care

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**Introduction:**

Bronchodilators are medications prescribed for patients experiencing reduced airflow in their lungs. The primary treatment involves beta-2 agonists, which act on the smooth muscles of the bronchioles to widen the airways. These drugs are commonly used to manage respiratory disorders such as asthma and chronic obstructive pulmonary disease (COPD), either to relieve acute asthma symptoms or to enhance lung function in COPD patients. Pulmonary function tests (PFTs) are crucial in evaluating lung performance, and bronchodilators help in both diagnosis and treatment by assessing their impact on these tests. One key measurement is the FEV1/FVC ratio, which compares the volume of air exhaled in the first second (forced expiratory volume) to the total air expelled in a full breath (forced vital capacity). A normal ratio is around 0.7. In conditions like asthma, where airway resistance is reversible, PFT results before bronchodilator use often show a ratio below 0.7, but this may improve to normal levels after administering a short-acting bronchodilator. In contrast, COPD—a largely irreversible condition—typically does not show significant improvement in PFT values even after bronchodilator use.[1][2]

In many cases, inhaled corticosteroids are combined with beta-2 agonists to reduce airway inflammation and prevent further constriction. While beta-2 agonists provide symptomatic relief, they do not address the root cause of lung disease, making corticosteroids a key component in managing mild to moderate reversible conditions, sometimes alongside long-acting beta-2 agonists. Another class of bronchodilators, anticholinergics, works by blocking the parasympathetic nervous system's effects, which can otherwise lead to excessive bronchial secretions and airway narrowing. Examples include short-acting ipratropium bromide (lasting 4-6 hours) and long-acting tiotropium bromide (effective for 24 hours). Anticholinergics are primarily used in COPD, whereas asthma patients typically achieve symptom control with beta-2 agonists and corticosteroids.[1]

For reversible conditions like asthma, treatment follows a stepwise approach. Patients with intermittent symptoms may only need short-acting bronchodilators (e.g., albuterol) as needed. More persistent symptoms require adding low-dose inhaled corticosteroids, followed by long-acting bronchodilators if necessary. Severe cases may require specialist intervention. Once symptoms are controlled, doctors may gradually reduce medication doses to minimize side effects. Poorly managed asthma or COPD can lead to permanent lung damage, making regular monitoring through PFTs and peak flow measurements essential for successful treatment.[3]

**Mechanism of Actions:**

Bronchodilators work primarily by stimulating beta-2 receptors, which are G-protein coupled receptors located in the airways of the lungs. Activation of these receptors causes relaxation of the smooth muscles in the bronchial tubes, leading to improved airflow for a certain duration. However, prolonged use of beta-2 agonists can result in decreased effectiveness due to receptor downregulation, requiring higher doses to achieve the same therapeutic effect. These drugs are metabolized in the gastrointestinal tract by cytochrome P-450 enzymes, with approximately 80–100% being excreted through the urine and less than 20% through feces. Short-acting bronchodilators typically have a half-life of 3 to 6 hours, whereas long-acting variants remain effective for 18 to 24 hours.[4][5] Another class of bronchodilators, anticholinergics, functions by blocking receptors of the parasympathetic nervous system in the airways. Since this system promotes bronchoconstriction and increases mucus production, inhibiting its activity leads to bronchodilation and reduced secretions. This mechanism is particularly useful in conditions like chronic obstructive pulmonary disease (COPD), where excessive secretions and airway narrowing are common issues.[6]

**Classes of Bronchodilators in Respiratory Medicine**

Bronchodilators constitute a fundamental pharmacological intervention for obstructive airway diseases, with three primary classes utilized in clinical practice: beta-2 adrenergic agonists, anticholinergics, and methylxanthines. Each class operates through distinct mechanisms of action, offering unique therapeutic advantages and limitations that guide their clinical application [6].

**Beta-2 Adrenergic Agonists** represent the most widely prescribed bronchodilators, functioning through selective stimulation of beta-2 receptors in bronchial smooth muscle. This activation triggers a cascade of intracellular events culminating in smooth muscle relaxation and bronchodilation. These agents are further categorized into short-acting beta-agonists (SABAs) and long-acting beta-agonists (LABAs). SABAs, such as albuterol and levalbuterol, provide rapid relief within minutes and are essential for acute symptom management, though their duration is limited to 4-6 hours. LABAs, including salmeterol and formoterol, exhibit prolonged effects lasting 12-24 hours, making them suitable for maintenance therapy in conjunction with inhaled corticosteroids. A critical consideration with chronic beta-agonist use is receptor downregulation, which may diminish therapeutic response over time and necessitates careful monitoring of usage patterns [6-7].

**Anticholinergic Bronchodilators** exert their effects through competitive inhibition of muscarinic receptors in the airways, thereby reducing parasympathetic-mediated bronchoconstriction and mucus secretion. Short-acting muscarinic antagonists (SAMAs) like ipratropium bromide provide rapid bronchodilation with a duration of 4-6 hours, while long-acting muscarinic antagonists (LAMAs) such as tiotropium and glycopyrronium offer 24-hour coverage. These agents are particularly valuable in COPD management, where cholinergic tone plays a significant pathophysiological role. The anticholinergic side effect profile—including dry mouth, urinary retention, and potential cognitive effects in elderly patients—requires careful patient selection and monitoring [6-7].

**Methylxanthines**, exemplified by theophylline, represent the oldest class of bronchodilators with a complex mechanism involving phosphodiesterase inhibition and adenosine receptor antagonism. While historically significant, their use has declined due to a narrow therapeutic index requiring serum level monitoring (8-15 mcg/mL) and frequent drug interactions mediated by cytochrome P450 metabolism. Modern guidelines reserve methylxanthines for refractory cases due to their unfavorable risk-benefit ratio compared to newer agents. The selection of bronchodilator class depends on multiple factors, including disease severity, patient comorbidities, and therapeutic goals. Current treatment paradigms emphasize combination therapies, particularly LABA/LAMA regimens in COPD and LABA/inhaled corticosteroid combinations in asthma, to optimize bronchodilation while minimizing adverse effects. Ongoing research continues to refine the role of each class, with emerging agents targeting novel pathways to address unmet needs in respiratory therapeutics [6-7].

**Administration of Bronchodilators**

Bronchodilators are most effectively administered via inhalation devices, which are designed to deliver medication directly to the bronchioles of the lungs. These devices vary in design, but their primary objective is to optimize drug deposition in the lower airways. Despite optimal inhalation technique, the systemic bioavailability of bronchodilators remains relatively low due to factors such as oropharyngeal deposition and incomplete lung absorption. To enhance drug delivery, patients should follow a structured inhalation protocol: first exhaling fully, then placing the inhaler in the mouth, and inhaling deeply to ensure the medication reaches the distal airways. After inhalation, patients should hold their breath for approximately 10 seconds to allow the drug particles to settle within the lung tissue, followed by a slow, controlled exhalation to minimize drug loss.[7]

Improper inhalation technique significantly reduces therapeutic efficacy, as suboptimal drug delivery may fail to achieve the desired bronchodilatory effect. Short-acting bronchodilators, such as albuterol, exert rapid relief—typically within seconds to minutes—with clinical benefits lasting up to four hours. Due to their quick onset of action, these agents are often referred to as "rescue inhalers" and are essential for

managing acute bronchospasm in conditions like asthma. In contrast, long-acting bronchodilators, such as salmeterol or formoterol, have a delayed onset and are not suitable for emergency use. Instead, they are prescribed for maintenance therapy to provide sustained bronchodilation over 12 to 24 hours, thereby improving long-term symptom control in chronic respiratory diseases like asthma and chronic obstructive pulmonary disease (COPD).[8] Proper patient education on inhaler technique is crucial to ensure optimal drug delivery and therapeutic outcomes. Healthcare providers should routinely assess and reinforce correct usage to prevent inadequate symptom control and unnecessary escalation of therapy. Additionally, the selection of an appropriate inhalation device (e.g., metered-dose inhalers, dry powder inhalers, or nebulizers) should be tailored to the patient's ability, ensuring adherence and maximizing clinical efficacy.

**Adverse Effects of Bronchodilators**

Bronchodilators, particularly beta-2 agonists, exert their effects through sympathetic nervous system activation, which can lead to a range of adverse reactions. The most commonly reported side effects include tremors, nervousness, palpitations, and muscle cramps due to systemic beta-adrenergic stimulation. More severe but less frequent complications may include paradoxical bronchospasm (a sudden worsening of airway constriction), hypokalemia (due to intracellular potassium shifts), and, in rare cases, myocardial infarction, particularly in patients with preexisting cardiovascular disease. Given these risks, patients with comorbidities such as hypertension, arrhythmias, or ischemic heart disease should consult their healthcare provider before using these medications.[9] Anticholinergic bronchodilators, such as ipratropium and tiotropium, produce side effects related to decreased vagal tone. These include dry mouth, urinary retention, constipation, gastrointestinal discomfort, and tachycardia. Older adults are particularly susceptible to anticholinergic adverse effects, including confusion and acute delirium, due to age-related changes in drug metabolism and increased blood-brain barrier permeability. Consequently, caution is advised when prescribing these agents to elderly patients, and alternative therapies should be considered if cognitive side effects emerge.[5] Both classes of bronchodilators require careful patient monitoring to balance therapeutic benefits against potential risks. Clinicians should assess individual risk factors, such as age and comorbid conditions, to minimize adverse effects while optimizing respiratory symptom control.

**Contraindications and Precautions for Bronchodilator Use**

Bronchodilators are contraindicated in patients with known hypersensitivity to the drug or its components, particularly if they have experienced severe allergic reactions (e.g., anaphylaxis, angioedema) that could compromise hemodynamic stability or airway patency. Additionally, caution is warranted in patients with preexisting cardiovascular conditions, including ischemic heart disease, cardiac arrhythmias, and hypokalemia, as bronchodilators—especially beta-2 agonists—may exacerbate these conditions by increasing sympathetic stimulation. Special consideration is required for vulnerable populations, such as pregnant women during labor and delivery, due to potential effects on uterine blood flow and fetal heart rate. Elderly patients are also at higher risk of adverse effects, including tachycardia and anticholinergic side effects (e.g., confusion, urinary retention), necessitating dose adjustments or alternative therapies. Furthermore, high-dose bronchodilator administration in patients with renal impairment requires careful monitoring, as altered drug clearance may increase the risk of systemic toxicity.[1][10] Clinicians must weigh the benefits of bronchodilator therapy against these risks, particularly in patients with comorbidities, and consider alternative treatments when appropriate.

**Monitoring Considerations for Bronchodilator Therapy**

Effective use of bronchodilators requires careful patient education regarding proper dosing and administration techniques. While routine laboratory monitoring is not typically necessary for this medication class, clinicians must remain vigilant for potential adverse effects that may necessitate immediate medical intervention. Serious complications associated with bronchodilator use include paradoxical bronchospasm, hypersensitivity reactions (including anaphylaxis), cardiovascular events (such as hypertension, hypotension, or even cardiac arrest), and metabolic disturbances like hypokalemia and hyperglycemia. Patients taking anticholinergic bronchodilators may experience antimuscarinic effects, including dry mouth, constipation, urinary retention, and, particularly in elderly patients, delirium or

cognitive impairment. Any concerning symptoms following bronchodilator administration should prompt urgent medical evaluation. A particularly important monitoring consideration involves patients who rely on short-acting beta-2 agonists (SABAs) for symptom relief. Chronic overuse of these medications can lead to receptor downregulation, a phenomenon where prolonged agonist exposure causes desensitization and internalization of beta-2 adrenergic receptors. This pharmacological tolerance results in diminished therapeutic response, requiring progressively higher doses to achieve the same bronchodilatory effect. Such diminished efficacy not only indicates suboptimal disease control but also increases the risk of medication-related adverse effects due to escalating doses.

To mitigate these risks, clinicians should regularly assess:

1. **Symptom control and rescue medication use** (e.g., tracking SABA usage frequency)
2. **Technique adherence** through periodic inhaler demonstrations
3. **Therapeutic response** via pulmonary function tests when indicated
4. **Emergent side effects**, particularly in high-risk populations

Patients demonstrating excessive SABA use (typically >1-2 canisters monthly) or worsening symptoms despite bronchodilator therapy require comprehensive reevaluation of their treatment regimen. This may involve step-up therapy with controlled medications (e.g., inhaled corticosteroids) or consideration of alternative diagnoses. Regular follow-up ensures optimal disease management while minimizing complications from prolonged or excessive bronchodilator use. [9]

**Toxicity of Bronchodilators**

Bronchodilator toxicity requires prompt medical evaluation when patients exhibit severe adverse effects, including respiratory distress, systemic manifestations, or neurological symptoms. Patients experiencing paradoxical bronchospasm, fever, chills, tremors, seizures, or significant gastrointestinal disturbances should seek immediate emergency care. In acute settings, clinicians must first stabilize the patient by assessing vital signs and obtaining laboratory tests to evaluate electrolyte imbalances, particularly hypokalemia and hyperglycemia, which are common with beta-2 agonist overdose. Additional testing may include arterial blood gas analysis to assess acid-base status and cardiac biomarkers if myocardial ischemia is suspected. Initial management consists of supportive care, including intravenous fluid administration with normal saline for hypotension or signs of hypoperfusion. Electrolyte abnormalities, especially hypokalemia resulting from intracellular potassium shifts, require cautious correction under cardiac monitoring due to the risk of arrhythmias. Respiratory support ranges from supplemental oxygen to mechanical ventilation in cases of severe bronchospasm or respiratory failure. For paradoxical bronchoconstriction, nebulized anticholinergics such as ipratropium may provide relief, while benzodiazepines are indicated for seizure control. Anticholinergic toxicity presents distinct challenges, including urinary retention, delirium, and gastrointestinal hypomotility. Management focuses on symptomatic treatment, with catheterization for urinary retention and consideration of physostigmine only in severe cases of anticholinergic delirium. Prevention of bronchodilator toxicity hinges on proper patient education regarding appropriate use and early recognition of warning signs. Clinicians should emphasize adherence to prescribed dosing regimens and regular follow-up to monitor for developing tolerance or adverse effects [11].

**Enhancing Healthcare Team Outcomes in Bronchodilator Therapy**

The prescription and management of bronchodilators involve a collaborative effort among various healthcare professionals, including primary care physicians, nurse practitioners, physician assistants, pulmonologists, and emergency medicine clinicians. Effective interprofessional coordination is essential to ensure optimal therapeutic outcomes while minimizing adverse effects. All prescribing clinicians must provide comprehensive patient education regarding proper inhaler technique, potential side effects, and warning signs that warrant medical attention. Key adverse effects to emphasize include anticholinergic symptoms (e.g., dry mouth, urinary retention, and confusion) and cardiovascular manifestations (e.g.,

palpitations, tachycardia, or chest pain). Patients should be advised to seek prompt medical evaluation if they experience persistent or severe symptoms, as timely intervention can prevent complications. Pharmacists play a critical role in reinforcing proper medication use, verifying dosing regimens, and identifying potential drug interactions. Respiratory therapists can further optimize therapy by assessing inhalation technique and recommending appropriate delivery devices based on individual patient needs. Nurses contribute by monitoring adherence, documenting symptom control, and facilitating communication between the patient and prescribing providers. When used appropriately, bronchodilators are a safe and effective treatment that significantly enhances quality of life for patients with asthma and chronic obstructive pulmonary disease (COPD). However, their benefits depend on correct administration and vigilant monitoring by the entire healthcare team. Structured follow-up, patient empowerment through education, and interprofessional collaboration are fundamental to achieving long-term therapeutic success [12].

**Role of Healthcare Providers:**

Bronchodilators are a cornerstone in the management of obstructive airway diseases, including asthma and chronic obstructive pulmonary disease (COPD). Their efficacy depends not only on pharmacological action but also on proper prescribing, administration, and monitoring by healthcare providers. An interprofessional approach involving physicians, pharmacists, nurses, and respiratory therapists is essential to optimize therapeutic outcomes, minimize adverse effects, and improve patient adherence. This paper examines the roles of different healthcare providers in bronchodilator therapy and highlights strategies for enhancing patient care.

**Roles of Healthcare Providers in Bronchodilator Management**

**1. Physicians and Advanced Practice Providers**

Primary care physicians, pulmonologists, allergists, and advanced practice providers (e.g., nurse practitioners and physician assistants) are primarily responsible for diagnosing respiratory conditions and prescribing bronchodilators. Their key responsibilities include:

- **Accurate Diagnosis:** Proper patient assessment, including pulmonary function tests (PFTs) and clinical history, ensures appropriate bronchodilator selection.
- **Individualized Treatment Plans:** Providers must choose between short-acting beta-agonists (SABAs) for acute relief and long-acting bronchodilators (LABAs or anticholinergics) for maintenance therapy.
- **Monitoring for Adverse Effects:** Since bronchodilators can cause tachycardia, tremors, and paradoxical bronchospasm, clinicians must assess patients for these complications during follow-ups.
- **Step-Up/Step-Down Therapy:** Adjusting treatment based on symptom control (e.g., Global Initiative for Asthma (GINA) guidelines) helps prevent overuse of rescue inhalers and receptor desensitization.

**2. Pharmacists**

Pharmacists play a crucial role in ensuring safe and effective bronchodilator use through:

- **Medication Reconciliation:** Verifying prescriptions to prevent drug interactions (e.g., beta-blockers antagonizing bronchodilator effects).
- **Patient Education:** Demonstrating proper inhaler technique and discussing common side effects (e.g., dry mouth with anticholinergics).
- **Adherence Monitoring:** Identifying patients refilling SABAs too frequently, which may indicate poor asthma control.

- **Cost-Effective Alternatives:** Recommending generic versions or formulary-approved options to improve accessibility.

**3. Nurses**

Nurses contribute to bronchodilator management by:

- **Assessing Inhaler Technique:** Observing patients during administration to correct errors (e.g., improper coordination with metered-dose inhalers).
- **Symptom Tracking:** Documenting exacerbation frequency and medication responses in electronic health records (EHRs).
- **Patient Counseling:** Reinforcing the importance of adherence and distinguishing between maintenance and rescue therapies.
- **Emergency Response:** Recognizing severe bronchospasm or anaphylaxis in hospitalized patients and escalating care.

**4. Respiratory Therapists**

Respiratory therapists specialize in optimizing bronchodilator delivery through:

- **Device Selection:** Recommending spacers, nebulizers, or dry powder inhalers based on patient ability (e.g., elderly patients may struggle with MDIs).
- **Lung Function Monitoring:** Conducting PFTs or peak flow measurements to evaluate therapeutic efficacy.
- **Acute Care Management:** Administering nebulized bronchodilators during asthma exacerbations in emergency settings.

**Interprofessional Collaboration for Optimal Outcomes**

Effective bronchodilator therapy requires coordination among providers:

- **Case Discussions:** Regular team meetings to review complex cases (e.g., COPD patients with comorbidities).
- **Shared Decision-Making:** Involving patients in treatment choices to enhance adherence.
- **Closed-Loop Communication:** Ensuring all providers are updated on medication changes or adverse reactions.

Bronchodilators are highly effective when used correctly, but their success depends on a collaborative healthcare approach. Physicians, pharmacists, nurses, and respiratory therapists each contribute unique expertise to ensure proper prescribing, administration, and monitoring. By working together, healthcare teams can reduce hospitalizations, improve quality of life, and prevent complications related to bronchodilator misuse. Future efforts should focus on standardized education programs and telehealth follow-ups to further enhance patient outcomes [12].

**Conclusion:**

Bronchodilators represent a cornerstone therapy for asthma and COPD, offering both symptomatic relief and functional improvement. Their efficacy is well-established, with beta-2 agonists providing rapid bronchodilation and anticholinergics targeting cholinergic tone in COPD. However, the benefits of these medications are contingent upon precise administration, individualized treatment plans, and multidisciplinary oversight. The pharmacological diversity of bronchodilators—spanning SABAs, LABAs, SAMAs, and LAMAs—enables tailored regimens but also introduces complexity. For instance, while SABAs are indispensable for acute relief, their overuse risks receptor downregulation and masked disease progression. Conversely, LABAs and LAMAs excel in maintenance therapy but require combination

strategies (e.g., with corticosteroids) to address underlying inflammation. Methylxanthines, though largely obsolete, retain niche utility in severe cases, underscoring the need for serum monitoring. Administration challenges further complicated treatment. Inhaler misuse, reported in up to 70% of patients, compromises drug delivery and clinical outcomes. This highlights the imperative for repeated technique assessments by respiratory therapists and pharmacists. Similarly, adverse effects—ranging from tachycardia (beta-2 agonists) to delirium (anticholinergics)—demand vigilant monitoring, particularly in elderly and comorbid populations. Interprofessional collaboration is paramount. Pulmonologists and primary care providers must align prescriptions with disease severity, while pharmacists mitigate interactions (e.g., beta-blockers) and nurses reinforce adherence. Respiratory therapists bridge gaps through device optimization and lung function testing. Such teamwork reduces hospitalizations and prevents irreversible lung damage from uncontrolled disease. Looking ahead, advancements in bronchodilator delivery (e.g., smart inhalers) and biomarker-guided therapy promise to refine precision medicine approaches. However, these innovations must be paired with patient education initiatives and telehealth follow-ups to address disparities in access and literacy. In summary, bronchodilators are transformative when integrated into a comprehensive care framework. By combining evidence-based prescribing, robust monitoring, and collaborative practice, healthcare teams can maximize therapeutic benefits while minimizing risks, ultimately improving long-term respiratory health.

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**موسعات الشعب الهوائية: مراجعة حديثة لمقدمي الرعاية الصحية**


**ملخص:**

**الخلفية :**تُعد موسعات الشعب الهوائية أدوية أساسية لعلاج أمراض المسالك الهوائية الانسدادية، بما في ذلك الربو ومرض الانسداد الرئوي المزمن .(COPD) تعمل هذه الأدوية على إرخاء العضلات الملساء في الشعب الهوائية من خلال آليات مختلفة، حيث تشمل الفئات الرئيسية ناهضات بيتا-2، ومضادات الكولين، والزانثينات. على

الرغم من فعاليتها، فإن الاستخدام غير السليم يمكن أن يؤدي إلى آثار جانبية، وانخفاض الاستجابة العلاجية، ومضاعفات جهازية، مما يتطلب إدارة دقيقة من قبل فريق متعدد التخصصات.

**الهدف :**تهدف هذه المراجعة إلى دراسة الخصائص الدوائية، والتطبيقات السريرية، واستراتيجيات المراقبة لموسعات الشعب الهوائية، مع التركيز على دورها في تحسين وظائف الجهاز التنفسي ونوعية الحياة.

**الطرق :**تم إجراء تحليل للتوجيهات الحالية) مثلGINA ، (GOLDوالأدبيات العلمية المنشورة لتقييم آليات عمل موسعات الشعب الهوائية، وتقنيات إعطائها، وملفاتها الأمانية.

**النتائج :**تظل ناهضات بيتا-2 الخط الأول للعلاج الحاد والمزمن، بينما تُفضل مضادات الكولين في مرض الانسداد الرئوي المزمن. تُحفظ الزانثينات للحالات المقاومة للعلاج بسبب ضيق مداها العلاجي. تقلل تقنية الاستنشاق الصحيحة ومراقبة الالتزام من المخاطر مثل تنظيم المستقبلات للأسفل والآثار المضادة للكولين. يعمل التعاون بين التخصصات على تحسين النتائج، حيث يلعب الأطباء والصيادلة وأخصائيو العلاج التنفسي أدوارًا حاسمة.

**الاستنتاج :**تعمل موسعات الشعب الهوائية على تحسين السيطرة على الأعراض بشكل كبير عند استخدامها بشكل مناسب، لكن نجاحها يعتمد على تثقيف المرضى، والوصف الدوائي المخصص، والمراقبة اليقظة. يجب أن تركز الجهود المستقبلية على التدريب الموحد ودمج الرعاية الصحية عن بُعد.

**الكلمات المفتاحية :**موسعات الشعب الهوائية، الربو، مرض الانسداد الرئوي المزمن، ناهضات بيتا-2، مضادات الكولين، الرعاية متعددة التخصصات