



Introduction to Clinical Pharmacology

- **Chapter 31**
Lower Respiratory System Drugs

Sympathomimetic Bronchodilators: Actions and Uses

- Actions: open the bronchi and allow more air to enter the lungs, which in turn completely or partially relieves respiratory distress
- The cholinergic blocking drug ipratropium bromide (Atrovent) is used for bronchospasm associated with COPD, chronic bronchitis, and emphysema in emergent situations.

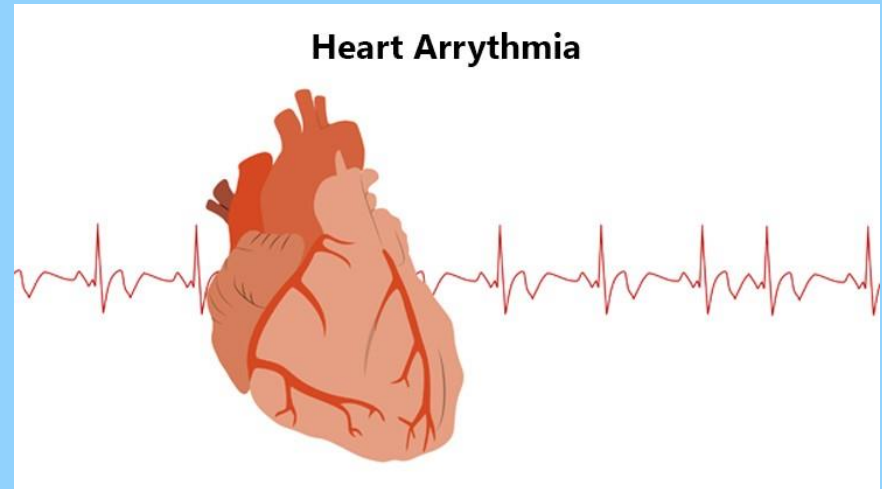


Sympathomimetic Bronchodilators: Adverse Reactions, Contraindications

- Adverse CNS effects: tachycardia, palpitations, and/or cardiac arrhythmias; nervousness; anxiety; hypertension; insomnia
- Contraindicated: patients with known hypersensitivity to the drug, cardiac arrhythmias associated with tachycardia, organic brain damage, cerebral arteriosclerosis, and narrow-angle glaucoma; salmeterol is contraindicated during acute bronchospasm

Sympathomimetic Bronchodilators: Precautions

- Used cautiously in patients with hypertension, cardiac dysfunction, hyperthyroidism, glaucoma, diabetes, prostatic hypertrophy, and history of seizures; during pregnancy and lactation



Sympathomimetic Bronchodilators: Interactions

Interactant drug	Effects of interactions
Adrenergic drugs	Possible additive adrenergic effects
Monoamine oxidase inhibitors	Increased risk for severe headache, hypertension, and hypertensive crisis
Beta blockers	Inhibition of the cardiac, bronchodilating, and vasodilating effects of sympathomimetic
Methyldopa/tricyclics	Possible hypotension
Oxytocic drugs	Possible severe hypotension
Theophylline	Increased risk for cardiotoxicity

Xanthine Derivative Bronchodilators: Uses and Adverse Reactions

- Uses: symptomatic relief or prevention of bronchial asthma; reversible bronchospasm associated with chronic bronchitis and emphysema
- Adverse reactions:
 - CNS reactions: restlessness, nervousness, tachycardia, tremors, headache, palpitations, increased respiration
 - Other: nausea, vomiting, fever, hyperglycemia, flushing, alopecia

Xanthine Derivative Bronchodilators: Contraindications and Precautions

- Contraindicated: those with known hypersensitivity, peptic ulcers, seizure disorders, serious uncontrolled arrhythmias
- Precautions: used cautiously in patients with cardiac disease, hypoxemia, hypertension, congestive heart failure, liver disease, older patients who use alcohol habitually
 - Aminophylline, dyphylline, oxtriphylline, and theophylline are used cautiously during pregnancy and lactation

Xanthine Derivative Bronchodilators: Interactions

- Interacts with barbiturates, charcoal, hydantoins, ketoconazole, rifampin, nicotine, adrenergic agents, isoniazid, loop diuretics—decreased theophylline levels
- Interacts with allopurinol, beta blockers, calcium channel blockers, cimetidine, oral contraceptives, corticosteroids, influenza virus vaccine, macrolide antibiotics, thyroid hormones, isoniazid, loop diuretics—increased theophylline levels

Antiasthma Drugs: Corticosteroids: Actions, Uses, and Adverse Reactions

- Actions: given by inhalation and act to decrease the inflammatory process in the airways of the patient with asthma; increase the sensitivity of the β_2 receptors
- Uses: used in the management and prophylactic treatment of the inflammation associated with chronic asthma or allergic rhinitis and polyps
- Adverse reactions:
 - Respiratory system reactions: throat irritation, hoarseness, URTI, fungal infection of the mouth and throat
 - Other: vertigo, headache

Corticosteroids: Contraindications, Precautions, and Interactions

- Contraindicated in patients with hypersensitivity to the corticosteroids, acute bronchospasm, status asthmaticus, or other acute episodes of asthma
- Precautions: used cautiously in patients with compromised immune systems, glaucoma, kidney disease, liver disease, convulsive disorders, and diabetes; those taking systemic corticosteroids; during pregnancy
- Interactions: ketoconazole may increase plasma levels of budesonide and fluticasone

Leukotriene Receptor Antagonists and Leukotriene Formation Inhibitors: Actions, Uses

- Actions:
 - Zileuton acts by decreasing the formation of leukotrienes
 - Montelukast and zafirlukast inhibit leukotriene receptor sites in the respiratory tract
- Uses:
 - Zileuton and montelukast are used in the prophylaxis and treatment of chronic asthma in adults and children older than 12 years

Leukotriene Receptor Antagonists and Leukotriene Formation Inhibitors: Adverse Reactions #1

- Zafirlukast:
 - CNS reactions include headache, influenza-like symptoms
- Montelukast:
 - CNS reactions include headache and dizziness



Leukotriene Receptor Antagonists and Leukotriene Formation Inhibitors: Adverse Reactions #2

- Montelukast (cont.)
 - gastrointestinal reactions include dyspepsia and abdominal pain
 - respiratory reactions include flu-like symptoms and cough
- Zileuton
 - headache; GI system reactions, nausea, abdominal pain, may cause liver damage



Leukotriene Receptor Antagonists and Leukotriene Formation Inhibitors: Contraindications and Precautions

- Contraindicated in patients with known hypersensitivity, bronchospasm in acute asthma attacks, liver disease (zileuton)
- Precautions: used cautiously in pregnancy and lactation

Leukotriene Receptor Antagonists and Leukotriene Formation Inhibitors: Interactions

- Zafirlukast interacts with aspirin—increased plasma levels of zafirlukast; warfarin—increased anticoagulant effect; theophylline, erythromycin—decreased level of zafirlukast
- Zileuton interacts with theophylline—increased serum theophylline levels; warfarin—increased prothrombin time (PT)

Mast Cell Stabilizers: Actions

- **Actions:** thought to stabilize the mast cell membrane, possibly by preventing calcium ions from entering mast cells, thus preventing the release of inflammatory mediators
- **Uses:** used in combination with other drugs in the treatment of asthma and allergic disorders, including allergic rhinitis (nasal solution), and to prevent exercise-induced bronchospasm

Mast Cell Stabilizers: Adverse Reactions, Contraindications, and Precautions

- Adverse reactions: CNS reactions: nasal or throat irritation when given intranasally or by inhalation, unpleasant taste sensation, cough or wheeze
- Contraindicated: patients with known hypersensitivity to the drug and during acute attacks of asthma
- Precautions: used cautiously during pregnancy and lactation and in patients with impaired renal or hepatic function

Nursing Process: Assessment #1

- Preadministration assessment:
 - Take the blood pressure, pulse, and respiratory rate before initiation of therapy with a bronchodilator or antiasthma drug
 - Note any dyspnea, cough, wheezing, “noisy” respirations, or use of accessory muscles when breathing; also note and record the general physical condition
 - Patients with chronic asthma: question the patient concerning allergies, frequency of attacks, severity of attacks, factors that cause or relieve attacks, and any antiasthma drugs used currently or taken previously

Nursing Process: Assessment #2

- Ongoing assessment:
 - Assess the respiratory status every 4 hours (or more often if needed) and whenever drug is administered; keep record of intake and output, report an imbalance; after administration observe the patient for the effectiveness of the drug



Nursing Process: Diagnoses

- **Anxiety** related to feelings of breathlessness
- **Ineffective Airway Clearance** related to bronchospasm
- **Impaired Oral Mucous Membranes** related to dryness or irritation
- **Imbalanced Nutrition: Less Than Body Requirements** related to decreased appetite caused by nausea, heartburn, or unpleasant taste

Nursing Process: Planning

- The expected outcomes for the patient depend on the specific reason for administering the drug but may include:
 - Optimal response to therapy
 - Meeting patient's needs related to the management of adverse reactions
 - Understanding of and compliance with the prescribed treatment regimen

Nursing Process: Implementation #1

- Promoting an optimal response to therapy:
 - Patients taking sympathomimetics: take great care in reading the primary health care provider's order when preparing these drugs for administration
 - Epinephrine: administer epinephrine subcutaneously for an acute bronchospasm; therapeutic effects—within 5 minutes after administration, last as long as 4 hours

Nursing Process: Implementation #2

- Promoting an optimal response to therapy (cont.)
 - Patients taking sympathomimetics: (cont.)
 - Salmeterol: not administered more frequently than twice daily (morning and evening)
 - Formoterol fumarate (Foradil Aerolizer): administered only by oral inhalation; dosage—12 mcg for every 12 hours

Nursing Process: Implementation #3

- Promoting an optimal response to therapy (cont.)
 - Patients taking xanthine derivatives: for acute respiratory symptoms, rapid theophyllinization using one of the xanthine derivatives may be required; monitor the patient for signs of theophylline toxicity; report any serum theophylline levels greater than 20 mg/mL or any symptoms associated with toxicity; when giving theophylline or aminophylline IV, monitor the patient for hypotension, cardiac arrhythmias, and tachycardia

Nursing Process: Implementation #4

- Promoting an optimal response to therapy (cont.)
 - Patients taking leukotriene receptor antagonists and leukotriene formation inhibitors: montelukast is administered once daily in the evening; zafirlukast is administered twice daily 1 hour before meals or 2 hours after meals; zileuton is administered four times daily
 - Patients taking oral or inhalant corticosteroids: administer bronchodilator first; after several minutes administer corticosteroid inhalant; when administering two inhalations of the same drug, it is advisable to wait at least 1 minute between puffs

Nursing Process: Implementation #5

- Promoting an optimal response to therapy (cont.)
 - Patients taking mast cell stabilizers: mast cell stabilizers, such as cromolyn (Intal), may be added to the patient's existing treatment regimen (e.g., bronchodilators); when administered orally, cromolyn is given half hour before meals and at bedtime

Nursing Process: Implementation #6

- Monitoring and managing patient needs:
 - Anxiety: patients who have difficulty breathing and are receiving a sympathomimetic drug may experience extreme anxiety, nervousness, and restlessness, which may be caused by their breathing difficulty or the action of the sympathomimetic drug; reassure patients that the drug being administered will most likely relieve the respiratory distress in a short time; closely monitor blood pressure and pulse; speak and act in a calm manner so as not to increase anxiety or nervousness

Nursing Process: Implementation #7

- Monitoring and managing patient needs (cont.)
 - Altered nutrition: less than body requirements: Patient with nausea should be offered frequent smaller meals rather than three large meals; provide pleasant, relaxed atmosphere for meals; heartburn is minimized if the patient remains in an upright position and sleeps with the head of the bed elevated; have the patient take frequent sips of water, suck on sugarless candy, or chew gum to alleviate unpleasant taste caused by antiasthmatic drugs

Nursing Process: Implementation #8

- Monitoring and managing patient needs (cont.)
 - Impaired oral mucous membranes: instruct the patient to use strict oral hygiene, cleanse the inhaler as directed in the package directions, and use the proper technique when taking an inhalation to decrease incidence of candidiasis and help soothe the throat
 - Ineffective airway clearance: during acute bronchospasm, check the blood pressure, pulse, respiratory rate, and response to the drug every 5 to 15 minutes until condition stabilizes and respiratory distress is relieved

Nursing Process: Implementation #9

- Educating the patient and family:
 - Provide a thorough explanation on the use of the aerosol inhalator for administration of bronchodilator
 - Carefully review any instruction sheets with the patient and provide information about how the unit is assembled, used, and cleaned
 - Teach the patient how to use the peak flow meter and when to notify the primary health care provider

Nursing Process: Evaluation

- The therapeutic effect is achieved, and breathing is easier and more effective
- Patient maintains adequate nutrition
- Oral mucous membranes are intact and integrity is maintained
- Airway is maintained with effective breathing pattern
- Anxiety is managed successfully
- Adverse reactions are identified, reported to the primary health care provider, and managed successfully
- The patient demonstrates an understanding of the drug regimen and use of the aerosol inhalator

Question #1

- Is the following statement true or false?
- Asthma is a acute lung condition causing spasmodic constriction of the bronchi and lung inflammation. Many Americans suffer from the ailment and it is one of the most common childhood chronic conditions.



Answer to Question #1

- False
- Asthma is a chronic lung condition causing spasmodic constriction of the bronchi and lung inflammation. Many Americans suffer from the ailment and it is one of the most common childhood chronic conditions.

Question #2

- Is the following statement true or false?
- Bronchodilators are used for patients with COPD who experience difficulty breathing (dyspnea) and the interference of gas exchange at the alveoli level in the lungs.

Answer to Question #2

- True
- Bronchodilators are used for patients with COPD who experience difficulty breathing (dyspnea) and the interference of gas exchange at the alveoli level in the lungs.

Question #3

- Is the following statement true or false?
- Antiasthma drugs are used for both long-term management and short-term breathing relief.

Answer to Question #3

- True
- Antiasthma drugs are used for both long-term management and short-term breathing relief. Guidelines for medication use are called the Step Method. Inhaled corticosteroids reduce inflammation, while bronchodilators relieve bronchospasm. Providers define parameters and help the patient to make an asthma action plan to help the patient in self-management of the condition.