Chapter 39

Drugs for Asthma and Other Pulmonary Disorders

Respiratory System

- Respiration: process of bringing O2 into body and moving carbon dioxide out
  - Involves two main processes
    - Ventilation moves air into and out of lungs
    - Perfusion is flow of blood through lungs

Autonomic Control of Airways

- Bronchioles
  - Lined with smooth muscle that controls amount of air entering lungs
- Diameter of airways controlled by autonomic nervous system
  - Dilation occurs when sympathetic nervous branch is stimulated
  - Constriction occurs when parasympathetic branch is stimulated
  - Bronchospasm may also occur

Administration by Inhalation

- Common route of administration for pulmonary drugs
- Rapid and efficient
- Rich blood supply allows for quick absorption and onset of action
- Delivers drugs directly to sites of action

Slide 42  Salmeterol Animation
Aerosol Therapy

- Suspension of droplets or particles in a gas
- Onset of action almost immediate
- Drugs administered for local effect
  - Immediate relief of bronchospasm
  - Loosens thick mucus
- Side effects are reduced; systemic effects can still occur

Devices Used for Aerosol Therapy

- Nebulizer
  - Vaporizes liquid drug into fine mist
  - Uses small machine and face mask
- Metered dose inhaler (MDI)
  - Propellant delivers measured dose of drug
  - Client times inhalation to puffs of drug
- Dry powder inhaler (DPI)
  - Client inhales powdered drug
  - Device activated by inhalation

Disadvantages of Aerosol Therapy

- Difficult to measure precise dose
  - Usually, only 10–50% of drug is placed
- Instruction may be complicated for some clients
- Side effects occur if client swallows drug or does not rinse mouth after inhalation
Asthma Is Chronic Disease

- Has both inflammatory and bronchospasm components
- Symptoms occur
  - From exposure to triggers
  - Upon exertion (exercise induced)
- Status asthmaticus—prolonged attack
- Drugs used to
  - Prevent asthmatic attacks
  - Terminate attack in progress

Goals of Therapy

- Asthma has both bronchoconstriction component and inflammation component
- Goals of drug therapy are twofold
  - To terminate acute bronchospasms in progress
  - To reduce the frequency of asthma attacks
- Different medications needed to achieve each goal
- Client with asthma can present with acute or chronic symptoms

Beta-Adrenergic Agonists

- Most effective drugs for relieving acute bronchospasm
- Activate beta2-receptors in bronchial smooth muscle to cause bronchodilation
- Fewer cardiac side effects than older nonselective beta-adrenergics
- Range from ultrashort to long acting

Inhalation versus Oral Therapy

- Inhalation Therapy
  - Produces rapid bronchodilation
  - Little systemic toxicity

Inhalation versus Oral Therapy (continued)

- Oral Therapy
  - Longer duration of action
  - Frequent side effects
  - Tolerance may develop
Anticholinergics

- Block parasympathetic nervous system with bronchodilator effect
- Occasionally used as alternative to beta-agonists in asthma therapy
- Used in inhaled form

Anticholinergics (continued)

- Ipratropium (Atrovent) is the most common anticholinergic prescribed for chronic obstructive pulmonary disease (COPD) and asthma.
- Most effective when used in combination with beta-agonist
  - Example: Combivent (ipratropium and albuterol)
- Tiotropium is the newest drug in this class

Methylxanthines

- Group of bronchodilators related to caffeine
- Once mainstay of chronic asthma pharmacotherapy
  - Example: theophylline
- Narrow margin of safety
- Interact with numerous drugs

Methylxanthines (continued)

- Side effects common
  - Nausea, vomiting, CNS stimulation
- Administered by intravenous or oral routes
- Primarily used for long-term prophylaxis of asthma that is unresponsive to beta-agonists or glucocorticoids

Glucocorticoids

- Potent anti-inflammatory drugs
- Inhaled, are drugs of choice for long-term prophylaxis of asthma
  - Must be taken daily
  - Systemic side effects rarely observed
- Oral drugs used for short-term therapy of severe, acute asthma
  - Limit therapy to under 10 days

Leukotriene Modifiers

- Leukotrienes are mediators of immune response
  - Involved in allergic and asthmatic reactions
- Leukotriene modifiers primarily used for asthma prophylaxis
  - Reduce inflammatory component of asthma
- Oral medication used when persistent asthma not controlled with other drugs
Mast-Cell Stabilizers

- Inhibit mast cells from releasing histamine and other chemical mediators
- Are safe for prophylaxis of asthma
- Less effective than inhaled glucocorticoids
- Ineffective at relieving acute bronchospasm

Role of the Nurse

- Monitor client’s condition
- Provide client education
- Obtain medical, surgical, drug history
- Assess lifestyle and dietary habits
- Obtain description of symptomology and current therapies

Beta-Adrenergic Agonist Therapy for Asthma

- Assess vital signs prior to administration
  - Respiratory and pulse rate, lung sounds
  - Respiratory effort, skin color, oxygen-saturation level
- Should not be used if client has history of dysrhythmia or MI
- Use limited in children younger than 6 years
- Not recommended for women who are breast-feeding

Anticholinergic Therapy for Asthma

- Assess respiratory rate before and after first dose of MDI
- Monitor vital signs
  - Respiratory rate and pulse, respiratory effort
  - Skin color, oxygen-saturation level, lung sounds
- Assess for history of narrow-angle glaucoma, benign prostatic hyperplasia, renal disorders, urinary bladder neck obstruction
  - Contraindicated in clients with history of these and in elderly
- Ipratropium not recommended in children younger than 12 years
**Anticholinergic Therapy for Asthma (continued)**

- Ipratropium not recommended in children younger than 12 years
- Tiotropium not recommended in clients younger than 18 years
- Anticholinergics not recommended for women who are breast-feeding

**Methylxanthine Therapy for Asthma**

- Assess vital signs
  - Respiratory and pulse rate, cardiac rhythm, lung sounds
  - Respiratory effort, skin color, oxygen-saturation level
- Contraindicated with certain conditions
  - Coronary artery disease, angina pectoris
  - Severe renal or liver disorders, peptic ulcer
  - Benign prostatic hyperplasia, diabetes mellitus

**Methylxanthine Therapy for Asthma (continued)**

- Use cautioned in elderly clients and children
- Not recommended in women who are breast-feeding

**Glucocorticoid Therapy for Asthma**

- Assess client for presence/history of conditions
  - Asthma, allergic rhinitis, hypertension, heart disease
  - Blood clots, Cushing’s syndrome
  - Fungal infections, diabetes mellitus

**Glucocorticoid Therapy for Asthma (continued)**

- Monitor vital signs
  - Respiratory and pulse rates, respiratory effort, lung sounds
  - Skin color, oxygen-saturation level, body weight
- Assess for signs and symptoms of infection
- Steroid inhalers
  - Use cautiously with hypertension, GI disease, congestive heart failure, thromboembolic disease

**Glucocorticoid Therapy for Asthma (continued)**

- Not recommended for pregnant or breast-feeding women
- Primary purpose of inhaled glucocorticoids is to prevent respiratory distress
  - Do not use this medication during acute asthma attack
**Glucocorticoid Therapy for Asthma (continued)**

- Client should watch for signs and symptoms of simple infections
  - Rinse mouth after using steroid inhalers
  - Closely monitor blood-glucose levels

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**Leukotriene Therapy for Asthma**

- Monitor vital signs
  - Respiratory and pulse rates, respiratory effort, lung sounds
  - Skin color, oxygen-saturation level
- Monitor CBC and periodic liver-function tests

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**Leukotriene Therapy for Asthma (continued)**

- Closely monitor prothrombin time (PT) and international normalized ratio (INR) in clients taking warfarin (Coumadin)
- Closely monitor phenytoin level with concurrent phenytoin therapy
  - Reduce theophylline dose; monitor zileuton levels
- Assess for signs and symptoms of infection, especially in elderly
- Advise clients not to use leukotriene modifiers during acute asthma attack

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**Bronchodilators—Beta-Adrenergic Agonists**

- **Prototype drug:** salmeterol (Serevent)
- **Mechanism of action:** selectively binds to beta2-adrenergic receptors in bronchial smooth muscle to cause bronchodilation

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**Salmeterol Animation**

Click here to view an animation on the topic of salmeterol.
**Bronchodilators—Beta-Adrenergic Agonists (continued)**

- **Primary use:** prevention of exercise-induced bronchospasm
  - Best suited for management of chronic asthma
  - Not indicated for termination of acute bronchospasm
- **Adverse effects:** headaches, throat irritation, nervousness, restlessness, tachycardia

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**Bronchodilators—Anticholinergic**

- **Prototype drug:** ipratropium (Atrovent)
- **Mechanism of action:** causes bronchodilation by blocking cholinergic receptors in bronchial smooth muscle

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**Bronchodilators—Anticholinergic**

- **Primary use:** relief of acute bronchospasm
  - Sometimes combined with beta-agonists or glucocorticoids
  - Also prescribed for chronic bronchitis and for symptomatic relief of nasal congestion
- **Adverse effects:** cough, drying of nasal mucosa, hoarseness, bitter taste

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**Anti-inflammatory Agents—Glucocorticoids**

- **Prototype drug:** beclomethasone (Beclovent, Beconase, Vancenase, Vanceril)
- **Mechanism of action:** acts by reducing inflammation
- **Primary use:** to decrease frequency of asthma attacks
  - Also for allergic rhinitis
  - Should not be used to terminate asthma attacks in progress
- **Adverse effects:** oropharyngeal candidiasis

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**Leukotriene Modifiers**

- **Prototype drug:** zafirlukast (Accolate)
- **Mechanism of action:** prevents airway edema and inflammation by blocking leukotriene receptors in airways
- **Primary use:** for prophylaxis of persistent, chronic asthma
- **Adverse effects:** headache, nausea, diarrhea

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**Beta-adrenergic agonists**

- Most effective drugs for relieving acute bronchospasm
- Activate beta2-receptors in bronchial smooth muscle to cause bronchodilation
  - Inhalation therapy produces rapid bronchodilation
  - Oral therapy has longer duration of action
### Anticholinergics
- Block parasympathetic nervous system for bronchodilator effect
- Occasionally used as alternative to beta-agonists in asthma therapy

### Methylxanthines
- Group of bronchodilators related to caffeine
- Once mainstay of chronic asthma pharmacotherapy
  - Example: theophylline

### Methylxanthines (continued)
- For long-term prophylaxis of asthma that is unresponsive to beta-agonists or glucocorticoids
  - Less effective and produce more side effects than beta-agonists

### Glucocorticoids
- Potent anti-inflammatory drugs
- When inhaled, often drugs of choice for long-term prophylaxis of asthma
- Oral drugs used for short-term therapy of severe, acute asthma

### Leukotriene Modifiers
- Act by reducing inflammatory component of asthma
- Primarily used for asthma prophylaxis
  - When persistent asthma not controlled with other drugs

### Mast-Cell Stabilizers
- Inhibit mast cells from releasing histamine and other chemical mediators
- Safe drugs for prophylaxis of asthma
- Ineffective at relieving acute bronchospasm
- Less effective than inhaled glucocorticoids
Assessment

• Obtain complete health history
• Assess for symptoms related to respiratory deficiency
• Obtain vital signs
• Auscultate bilateral breath sounds for air movement and adventitious sounds
• Assess pulmonary function with pulse oximeter, peak expiratory flow meter, and/or arterial blood gases

Nursing Diagnoses

• Impaired gas exchange, related to bronchial constriction
• Ineffective tissue perfusion, related to adverse effects of drugs
• Deficient knowledge, related to drug therapy

Nursing Diagnoses

• Anxiety, related to difficulty in breathing
• Disturbed sleep pattern, related to side effects of drugs
• Activity intolerance, related to ineffective drug therapy

Planning—client will

• Exhibit adequate oxygenation
• Report a reduction in subjective symptoms of respiratory deficiency
• Demonstrate understanding of drug’s action
• Report at least six hours of uninterrupted sleep

Implementation

• Monitor vital signs, including pulse, blood pressure, respiratory rate
• Monitor pulmonary function
• Monitor client’s ability to use inhaler
• Observe for side effects

Implementation (continued)

• Maintain environment free of respiratory contaminants
• Maintain dietary intake adequate in essential nutrients and vitamins
• Ensure adequate hydration (3–4 L/day)
• Provide emotional and psychosocial support
• Monitor client compliance with pharmacotherapy
Evaluation

- Client reports decrease in respiratory-deficiency symptoms
- Client accurately states drug's action and side effects
- Breath sounds and pulmonary-function values demonstrate adequate oxygenation
- Client reports having at least six hours of uninterrupted sleep

 Bronchodilators for Asthma

Table 39.2 Bronchodilators for Asthma

Anti-inflammatory Drugs for Asthma

Table 39.3 Anti-inflammatory Drugs for Asthma