Focus on
Chronic Obstructive Pulmonary Disease (COPD)

(Relates to Chapter 29, "Nursing Management: Obstructive Pulmonary Diseases," in the textbook)

COPD
Description
• Airflow limitation not fully reversible
  • Generally progressive
  • Abnormal inflammatory response of lungs to noxious particles or gases

COPD
Description
• Includes
  • Chronic bronchitis
  • Emphysema
COPD

Significance
- Fourth leading cause of death in the United States
- More women die than men
- Death rates in Hispanics are lower than in any other ethnic group

COPD

Etiology
- Risk factors
  - Cigarette smoking
  - Occupational chemicals and dust
  - Air pollution
- Infection
- Heredity
- Aging
COPD

Cigarette Smoking

- Clinically significant airway obstruction develops in 15% of smokers.
- 80% to 90% of COPD deaths are related to tobacco smoking.

Effects of nicotine

- Stimulates sympathetic nervous system
  - Increases HR
- Causes peripheral vasoconstriction
  - Increases BP and cardiac workload

Amount of functional hemoglobin
- Platelet aggregation
  - Compounds problems in CAD
COPD

**Cigarette Smoking**

- Effects on respiratory tract
  - Increased production of mucus
  - Hyperplasia of mucous glands
  - Lost or decreased ciliary activity

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COPD

**Cigarette Smoking**

- Carbon monoxide
  - \( \downarrow \) \( \text{O}_2 \) carrying capacity
  - \( \uparrow \) Heart rate
  - Impaired psychomotor performance and judgment

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COPD

**Cigarette Smoking**

- Passive smoking (second-hand smoke)
  - \( \downarrow \) Pulmonary function
  - \( \uparrow \) Risk of lung cancer
  - \( \uparrow \) Respiratory symptoms
COPD

**Occupational & Environmental**

- COPD can develop with intense or prolonged exposure to
  - Dusts, vapors, irritants, or fumes
  - High levels of air pollution
  - Fumes from indoor heating or cooking with fossil fuels

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COPD

**Infection**

- Recurring infections impair normal defense mechanisms.
- Risk factor for COPD
- Intensify pathologic destruction of lung tissue

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COPD

**Heredity**

- α-Antitrypsin (AAT) deficiency
  - Genetic risk factor for COPD
  - Accounts for 3% of COPD
COPD

Aging

• Some degree of emphysema is common because of physiologic changes of aging lung tissue.

COPD

Pathophysiology

• Defining features
  • Irreversible airflow limitations during forced exhalation due to loss of elastic recoil
  • Airflow obstruction due to mucous hypersecretion, mucosal edema, and bronchospasm

COPD

Pathophysiology

• Primary process is inflammation.
  • Inhalation of noxious particles
  • Mediators released cause damage to lung tissue.
  • Airways inflamed
  • Parenchyma destroyed
COPD Pathophysiology

- Supporting structures of lungs are destroyed.
  - Air goes in easily, but remains in the lungs.
  - Bronchioles tend to collapse.
  - Causes barrel-chest look

- Pulmonary vascular changes
  - Blood vessels thicken.
  - Surface area for diffusion of O₂ decreases.
COPD
Pathophysiology

- Common characteristics
  - Mucous hypersecretion
  - Dysfunction of cilia
  - Hyperinflation of lungs
  - Gas exchange abnormalities

Commonly, emphysema and chronic bronchitis coexist.
Distinguishing symptoms can be difficult with co-morbidities.

Pulmonary Blebs and Bullae

Fig. 29-10. Pulmonary blebs and bullae.
COPD

Clinical Manifestations

- Develops slowly
- Diagnosis is considered with
  - Cough
  - Sputum production
  - Dyspnea
  - Exposure to risk factors

Dyspnea usually prompts medical attention.
- Occurs with exertion in early stages
- Present at rest with advanced disease

Causes chest breathing
- Use of accessory and intercostal muscles
- Inefficient
COPD

**Clinical Manifestations**

- Characteristically underweight with adequate caloric intake
- Chronic fatigue

**Physical examination findings**

- Prolonged expiratory phase
- Wheezes
- Decreased breath sounds
- ↑ Anterior-posterior diameter

**Bluish-red color of skin**

- Polycythemia and cyanosis
COPD

Classification

- Classified as
  - Mild
  - Moderate
  - Severe
  - Very severe

Stages of COPD and Therapy

<table>
<thead>
<tr>
<th>Stage</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
<th>Very Severe</th>
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</thead>
<tbody>
<tr>
<td>FEV1/FVC</td>
<td>&gt; 80% predicted</td>
<td>50% - 79% predicted</td>
<td>≤ 40% predicted</td>
<td>≤ 30% predicted</td>
</tr>
<tr>
<td>Active smoking cessation and/or smoking cessation intervention</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Management of exacerbations</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Treatment for co-morbidities</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Rehabilitation</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Use of inhaled long-acting bronchodilators</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Use of inhaled corticosteroids</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Use of oxygen therapy</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Use of long-term oxygen therapy</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Use of mechanical ventilation</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Use of non-invasive ventilation</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Use of tracheostomy</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Use of mechanical ventilation</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Fig. 29-11. Stages of COPD and therapy by stages.

COPD

Complications

- Cor pulmonale
- Exacerbations of COPD
- Acute respiratory failure
- Peptic ulcer disease
- Depression/anxiety
**COPD**  
**Cor Pulmonale**
- Hypertrophy of right side of heart
- Result of pulmonary hypertension
- Late manifestation of chronic pulmonary heart disease
- Eventually causes right-sided heart failure

**Pathophysiology of Cor Pulmonale**

Fig. 29-12. Mechanisms involved in the pathophysiology of cor pulmonale secondary to chronic obstructive pulmonary disease.

**COPD**  
**Cor Pulmonale**
- Dyspnea
- Distended neck veins
- Hepatomegaly with upper quadrant tenderness
- Peripheral edema
- Weight gain
COPD

Exacerbations

• Signaled by change in usual
  • Dyspnea
  • Cough
  • Sputum

Exacerbations

• Associated with poorer outcomes
• Primary causes
  • Infection
  • Air pollution

Acute Respiratory Failure

• Caused by
  • Exacerbations
  • Cor pulmonale
  • Discontinuing bronchodilator or corticosteroid medication
COPD

Acute Respiratory Failure

Caused by
- Overuse of sedatives, benzodiazepines, and opioids
- Surgery or severe, painful illness involving chest or abdomen

COPD

Depression/Anxiety

Approximately 50% of COPD patients experience depression.
- If patient become anxious because of dyspnea, teach pursed lip breathing.

COPD

Diagnostic Studies

Diagnosis confirmed by pulmonary function tests
- Chest x-rays, spirometry, history, and physical examination are also important in the diagnostic workup.
COPD
Diagnostic Studies

- Spirometry typical findings
  - Reduced FEV/FVC ratio
  - Increased residual volume

COPD
Diagnostic Studies

- ABG typical findings
  - Low PaO₂
  - ↑ PaCO₂
  - ↓ pH
  - ↑ Bicarbonate level found in late stages of COPD

COPD
Diagnostic Studies

- 6-Minute walk test to determine O₂ desaturation in the blood with exercise
- ECG can show signs of right ventricular failure.
COPD

Collaborative Care

- Primary goals of care
  - Prevent progression.
  - Relieve symptoms.
  - Prevent/treat complications.

- Promote patient participation.
- Prevent/treat exacerbations.
- Improve quality of life and reduce mortality risk.

- Irritants should be evaluated and avoided.
- Exacerbations treated promptly.
COPD
Collaborative Care

- Smoking cessation
  - Most effective intervention
  - Accelerated decline in pulmonary function slows and usually improves.

- Drug therapy
  - Bronchodilators
    - Relax smooth muscle in the airway
    - Improve ventilation of the lungs
    - ↓ Dyspnea and ↑ FEV₁
    - Inhaled route is preferred.

- Commonly used bronchodilators
  - β₂-Adrenergic agonists
  - Anticholinergics
  - Methylxanthines
COPD
Collaborative Care

- Drug therapy
  - Long-acting anticholinergic
    - Tiotropium (Spiriva)
  - Inhaled corticosteroid therapy
    - Used for moderate to severe cases

- \( \text{O}_2 \) therapy is used to
  - Reduce work of breathing
  - Maintain \( \text{PaO}_2 \)
  - Reduce workload on the heart

- Long-term \( \text{O}_2 \) therapy improves
  - Survival
  - Exercise capacity
  - Cognitive performance
  - Sleep in hypoxemic patients
Methods of Oxygen Administration

Pendant-Type Oxygen-Conserving Cannula

Unn. Fig. 29-2. Methods of Oxygen Administration: Low-Flow Delivery Devices: Nasal Cannula

Unn. Fig. 29-3. Methods of Oxygen Administration: Low-Flow Delivery Devices: Simple Face Mask

Unn. Fig. 29-4. Methods of Oxygen Administration: Low-Flow Delivery Devices: Partial and Non-Rebreathing Masks

Pendant-Type Oxygen-Conserving Cannula (cont’d)

Unn. Fig. 29-5. Methods of Oxygen Administration: Low-Flow Delivery Devices: Oxygen-Conserving Cannula

Unn. Fig. 29-6. High-Flow Delivery Devices: Tracheostomy Collar

Unn. Fig. 29-7. High-Flow Delivery Devices: Venturi Mask
Helios Liquid Portable Oxygen System

Fig. 29-14. A portable liquid O$_2$ unit can be refilled from a liquid O$_2$ reservoir.

COPD

Collaborative Care

- O$_2$ delivery systems are high or low flow.
  - Low flow is most common.
  - Low flow is mixed with room air, and delivery is less precise than high flow.

Humidification

- Used because O$_2$ has a drying effect on the mucosa
- Supplied by nebulizers, vapootherm, and bubble-through humidifiers
COPD

**Collaborative Care**

- Complications of oxygen therapy
  - Combustion
  - CO₂ narcosis
  - O₂ toxicity
  - Absorption atelectasis
  - Infection

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COPD

**Collaborative Care**

- Chronic O₂ therapy at home improves
  - Prognosis
  - Mental acuity
  - Exercise intolerance

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COPD

**Collaborative Care**

- Chronic O₂ therapy at home reduces
  - Hematocrit
  - Pulmonary hypertension
COPD
**Collaborative Care**
- Chronic O₂ therapy at home
- Periodic reevaluations are necessary to determine duration of use.

COPD
**Collaborative Care**
- Surgical therapy
  - Lung volume reduction surgery
    - Remove diseased lung to enhance performance of remaining tissue

COPD
**Collaborative Care**
- Surgical therapy
  - Bullectomy
    - Used for emphysema
    - Large bullae are resected to improve lung function.
COPD

Collaborative Care

- Surgical therapy
  - Lung transplantation
    - Single lung—Most common because of donor shortages
    - Prolongs life
    - Improves functional capacity
    - Enhances quality of life

- Respiratory and physical therapy
  - Breathing retraining
  - Effective coughing
  - Chest physiotherapy
    - Percussion
    - Vibration
    - Postural drainage

- Airway clearance devices
- High-frequency chest wall oscillation
COPD
Collaborative Care

• Breathing retraining
  • Decreases dyspnea, improves oxygenation, and slows respiratory rate
  • Pursed lip breathing

COPD
Collaborative Care

• Pursed lip breathing
  • Prolongs exhalation and prevents bronchiolar collapse and air trapping

COPD
Collaborative Care

• Effective coughing
  • Main goals
    • Conserve energy.
    • Reduce fatigue.
    • Facilitate removal of secretions.
COPD
Collaborative Care

• Chest physiotherapy indicated for
  • Excessive, difficult-to-clear bronchial secretions
  • Retained secretions in artificial airway
  • Lobular atelectasis from mucous plug

Postural drainage
  • Gravity assists in bronchial drainage.
  • Techniques are individualized according to patient's pulmonary condition and response to initial treatment.
  • Commonly ordered 2 to 4 times per day
COPD Collaborative Care

• Percussion
  • Hands in a cuplike position to create an air pocket
  • Air-cushion impact facilitates movement of thick mucus.

Cupped-Hand Position

Fig. 29-16

Fig. 29-15. Cupped-hand position for percussion. The hand should be cupped as though scooping up water.

COPD Collaborative Care

• No percussion over
  • Kidneys
  • Sternum
  • Spinal cord
  • Bony prominences
  • Tender or painful area
COPD Collaborative Care

- Vibration
  - Facilitates movement of secretions to larger airways
  - Mild vibration tolerated better than percussion

Flutter Mucus Clearance Device

Fig. 29-16. Flutter mucus clearance device is a small hand-held device that provides positive expiratory pressure (PEP) therapy. It is used to facilitate removal of mucus from the lungs. A, It consists of a hard plastic mouthpiece, a plastic perforated cover, and a high-density stainless steel ball resting in a circular cone. B, The Flutter effects occur during expiration. Before exhalation, the ball blocks the conical canal of the Flutter. During exhalation, the position of the ball is the result of an equilibrium between the pressure of the exhaled air, the force of gravity on the ball, and the angle of the cone where contact with the ball occurs. As the steel ball rolls and moves up and down, it creates an opening and closing cycle that repeats itself resulting in the "fluttering" sensation. C, These vibrations loosen mucus from the airway walls and facilitate their movement up the airways.
COPD
Collaborative Care

- High-frequency chest wall oscillation
  - Inflatable vest that vibrates the chest
  - Works on all lobes
  - More effective than CPT

Acapella

- Vibrates lungs to shake free mucous plugs
- Improves clearance of secretions
- Faster and more tolerable than CPT

Acapella

Fig. 29-17. Acapella.
COPD

Collaborative Care

- Nutritional therapy
  - Weight loss and malnutrition are common.
  - Pressure on diaphragm from a full stomach causes dyspnea.
  - Difficulty breathing while eating leads to inadequate consumption.

- To decrease dyspnea and conserve energy
  - Rest at least 30 minutes before eating.
  - Use bronchodilator.
  - Prepare foods in advance.

- Eat five to six small meals to avoid bloating and early satiety.
  - Cold foods may cause less fullness than hot foods.
COPD
Collaborative Care

• Nutritional therapy
  • Avoid
    • Foods that require a great deal of chewing
    • Exercises and treatments 1 hour before and after eating
    • Gas-forming foods

High-calorie, high-protein diet is recommended.
Fluids (intake of 3 L/day) should be taken between meals.

Nursing Management
Nursing Assessment

• Obtain complete health history and conduct a complete physical assessment.
• See Table 29-24 in textbook for COPD-specific information.
Nursing Management

Nursing Diagnoses

- Ineffective airway clearance
- Impaired gas exchange
- Imbalanced nutrition: Less than body requirements
- Risk for infection
- Insomnia

Planning

Goals

- Prevention of disease progression
- Ability to perform ADLs
- Relief from symptoms
- No complications related to COPD

Goals

- Knowledge and ability to implement long-term regimen
- Overall improved quality of life
Nursing Management
**Nursing Implementation**

- Health promotion
  - Abstain from or stop smoking.
  - Avoid or control exposure to occupational and environmental pollutants and irritants.

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Nursing Management
**Nursing Implementation**

- Health promotion
  - Early detection of small-airway disease
  - Early diagnosis and treatment of respiratory tract infection

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Nursing Management
**Nursing Implementation**

- Health promotion
  - Awareness of family history of COPD and AAT deficiency

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Nursing Management

**Nursing Implementation**

- **Acute intervention**
  - Required for pneumonia, cor pulmonale, or acute respiratory failure
  - Degree and severity of underlying respiratory problem should be assessed.

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Nursing Management

**Nursing Implementation**

- **Ambulatory and home care**
  - Most important aspect is teaching.
    - Pulmonary rehabilitation
    - Activity considerations
    - Sexual activity
    - Sleep
    - Psychosocial considerations

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Nursing Management

**Nursing Implementation**

- **Pulmonary rehabilitation**
  - Increase exercise performance.
  - Reduce dyspnea.
  - Improve quality of life.
Nursing Management

Nursing Implementation

- Activity considerations
  - Exercise training leads to energy conservation.
  - In upper extremities, it may improve muscle function and reduce dyspnea.

- Modify ADLs to conserve energy.
- Walk 15 to 20 minutes a day at least 3 times a week with gradual increases.
- Adequate rest should be allowed.

- Exercise-induced dyspnea should return to baseline within 5 minutes after exercise.
Nursing Management  
**Nursing Implementation**

- Sexual activity
  - Plan when breathing is best.
  - Use slow, pursed lip breathing.
  - Refrain after strenuous activity.
  - Do not assume dominant position or prolong foreplay.

Nursing Management  
**Nursing Implementation**

- Sleep
  - Can be difficult because of medications, postnasal drip, or coughing
  - Nasal saline sprays, decongestants, or nasal steroid inhalers can help.

Nursing Management  
**Nursing Implementation**

- Psychosocial considerations
  - Healthy coping is difficult.
  - May feel guilt, depression, anxiety, social isolation, denial, and dependence
Nursing Management
Evaluation

• Expected outcomes
  • Normal breath sounds
  • Effective coughing
  • Return of PaO₂ to normal range for patient
  • Improved mental status

Nursing Management
Evaluation

• Expected outcomes
  • Maintenance of normal body weight
  • Normal serum protein levels
  • Feeling of being rested
  • Improvement in sleep pattern

Nursing Management
Evaluation

• Expected outcomes
  • Awareness of need to seek medical attention
  • Behaviors minimizing risk of infection
  • No infection