Chapter 24 Clients with Respiratory System Disorders

Structure and Function of the Respiratory System
- Respiration (ventilation: inspiration, expiration) – gas exchange person & environment
- Oxygen to alveoli, into blood, to tissues
- Carbon dioxide (waste product) from cells to lungs and out of body

Functions
- To move air (gas exchange)
- To eliminate waste products
- To maintain acid–base balance
- To protect the airway from infection

Structure – lungs and passage leading to lungs
- Upper respiratory [corresponds to Figure 24-1]
  - Mouth
  - Nose – nares or nostrils, nasal turbinates
    - Clearing foreign matter - sneezing
  - Pharynx - throat
  - Larynx (Adam’s apple), speech
    - Epiglottis closes on swallowing
- Lower Respiratory [corresponds to Figures 24-2 & 24-3]
  - Trachea [windpipe]
    - Mucus cells of trachea and bronchi trap foreign matter Cilia sweep particles upward
    - Coughing reflex
  - Lungs:
    - Bronchi and bronchioles
    - Alveoli
      - Diffusion - very thin walls allow gas exchange (alveoli to capillaries)
      - Hemoglobin, normally 97 percent of the oxygen combines loosely with hemoglobin in RBCs
      - Hematocrit – percent RBCs in blood
        - Normal men 5,000,000 per ml
        - Normal women 4,500,000 per ml
    - Pulmonary capillary network
    - Pleural membranes – parietal & visceral
      - Parietal fluid prevents friction during the breathing movements and keeps the layers together
  - Diaphragm supports breathing

Respiratory regulation
- Medulla – responds to increases in CO₂
- Nerve receptors – respond to decreases in O₂, CO₂, and hydrogen in blood
- Hypoxic drive, COPD, emphysema – [oxygen can depress respiratory drive]
Factors affecting rate of oxygen transport from lungs to tissues

- Cardiac output
- Number of erythrocytes (red blood cells)
- Exercise.

Alterations in Respiratory Function

Three major alterations in respiration

- Hypoxia – insufficient oxygen
  - Terms: hypoventilation, hypercarbia, hypercapnia, cyanosis, clubbing
  - Manifestations [corresponds to Box 24-2]

- Altered breathing patterns
  - Terms: tachpnea, bradypnea, apnea, Cheyne-Stokes breathing, hyperventilation, Kussmaul's breathing, dyspnea, shortness of breath (SOB)
  - Anxious appearance, flared nostrils, dusky skin color, increased heart rate

- Obstructed or partially obstructed airway.
  - Terms: patent, intercostals retractions, stridor, adventitious sounds [corresponds to Box 14-11]

- Upper airway obstruction can be caused by a foreign object (low-pitched snoring), by tongue, by secretions (sounds gurgly or bubbly);
- Lower airway obstruction can be caused by bronchospasm (stridor during inspiration, restlessness, dyspnea, and adventitious breath sounds); with complete obstruction, extreme inspiratory effort with no chest movement, intercostal retractions

May be altered arterial blood gas levels

Factors That Affect Oxygenation: disease, medication, stress, anger, gender

Collaborative Care

- Pulse Oximeter – oxygen saturation level [correlates to Procedure 24-1]
  - Normal SaO₂ is 95 to 100 percent.
  - An SaO₂ below 70 percent is life threatening.
  - Pulse oximetry measures only the amount of hemoglobin that is bound with oxygen, not bound with CO₂ or other

- Sputum lab tests [corresponds to Box 24-3 Collecting Sputum]
- Throat cultures, skin testing for allergies, pulmonary function tests, and visualization procedures.
  - Check facility’s policy for specimens that LPN/LVN is responsible for collecting.
  - Sputum collection
  - Pulmonary function tests
    - Pulmonary function tests measure lung volume and capacity, test painless but often tiring
    - Normal total lung capacity is 6000 mL and vital capacity is 4800 mL.
- PFTs also measure inspiratory reserve volume (3100 mL), expiratory reserve volume (1200 mL), and residual volume (1200 mL).

  **Visualization Procedures**
  - Roentgenography (x-ray), lung scan, endoscopy (tube threaded into the bronchus or [bronchoscopy or laryngoscopy] for direct visualization), angiography, echocardiography

**Oxygen Therapy**
- Prescribed by physician (concentration, method of delivery, rate) but nurse may initiate in emergency
- Low-flow essential for clients with COPD
- Safety precautions with oxygen therapy [corresponds to Box 24-4]
- Oxygen delivery systems [corresponds to Procedure 24-2]
  - Wall outlets at bedside, tanks or cylinders, portable systems
  - Most often delivered via cannula or face mask.
  - Humidified oxygen. (liter flows of 2 L per minute or less by nasal cannula do not require humidification)
  - Humidifying devices provide 20 –40% humidity; follow facility’s policy for changing humidifier water, to avoid risk of infection.

**Artificial Airways**
- Oropharyngeal and Nasopharyngeal
  - Easy to insert, few complications
  - Used to keep the upper air passages open when secretions or the tongue may obstruct these airways.
- Endotracheal Tubes
  - Most common for clients with general anesthetics or emergency with mechanical ventilation; client cannot speak
- Tracheostomy
  - Surgical incision in the trachea below larynx, tracheostomy tube is inserted; used for long-term airway support
  - Parts: outer cannula, flange, obturator used to insert outer cannula and then removed; some have inner cannula removable for cleaning
  - Cuffed trach tube [corresponds to Figure 24-12]
  - Obturator kept at the bedside for reinsertion.
  - Tracheotomy care [corresponds to Procedure 24-3]

**Chest Tubes**
- May be inserted into the pleural cavity to restore negative pressure and drain collected fluid or blood.
  - Tubes for pneumothorax often placed in upper anterior thorax (air rises)
  - Tubes to drain blood or fluid usually in lower lateral chest wall, connected to sealed drainage system or a one-way valve (allows air & fluid out, prevents air from entering)
  - Suctioning [corresponds to Procedure 24-4]
- Nursing care of clients with chest tubes and drainage systems
• Assist with insertion and removal of tube
• Maintain water seal and patency of drainage system.
• Assess VS, cardiovascular status, and respiratory status as baseline markers.
• Keep drainage system below client’s chest.
• Keeping rubber-tipped clamps and a sterile occlusive dressing near client to clamp quickly if connections are broken or air leak develops.
• If chest tube is inadvertently pulled out, cover wound immediately with sterile occlusive dressing.

° Breathing and coughing exercises [corresponds to Box 24-5]
° Incentive spirometry
  o Promotes improved ventilation [corresponds to Box 24-6]
° Hydration of Inspired Air
  o Term: nebulizers
  o Percussion, vibration, and postural drainage loosen thick secretions [corresponds to Figure 24-17]
° Suctioning equipment
  o Suctioning
    ↑ Aspirating secretions, catheter connected to suction
    ↑ Suction catheters open-tipped or whistle-tipped.
    ↑ Thumb port on the side to control suction. Catheter connected to tubing, which is connected to collection chamber & suction control gauge.

° Nursing Care
  o Interventions to maintain normal respirations
    • Semi-Fowler’s or high-Fowler’s
    • Frequent changes in position.
    • Ambulation
    • Comfort measures
    • Deep breathing exercises and coughing, controlled or huff coughing technique, incentive spirometer
    • Monitor humidifiers or nebulizers
    • Percussion as ordered according to training and facility policy
    • Provide suctioning as ordered, using sterile technique
    • Be prepare to perform CPR
  o Nursing Process Care Plan: Client with Hemothorax

UPPER RESPIRATORY DISORDERS
Infections and Inflammations
° Diagnosis and treatment [corresponds to Table 24-1]
° Rhinitis
  o Caused by viruses, bacteria or allergens.
    • Viral/bacterial spread by droplet and direct contact.
    • Allergic rhinitis –seasonal or perennial, hay fever
° Sinusitis
- Inflammation of one or more sinus cavity, narrowed or blocked passages.
- Manifestations: headache, sinus tenderness, and nasal drainage or congestion, possible fever (not typical), malaise, nausea, and dizziness.
- Treatment [corresponds to Table 24-1]

- Influenza
- Acute viral respiratory tract infection transmitted by airborne droplet or direct contact, incubation period 18 to 72 hours.
- Elderly clients, infants, most susceptible
- Symptoms
  - Rapid onset, rhinorrhea, cough and sore throat, fever, chills, gastrointestinal disturbances and neuralgia
- Treatment [corresponds to Table 24-1].

- Pharyngitis
- Viral, bacterial (most commonly Strep), or fungal (such as Candidiasis); environmental irritants
- Bacterial or viral spread by airborne droplet, may be transmitted for several days during disease process.
- Manifestations: sudden onset of a sore throat, pus may be noted.
  - Anterior lymph nodes may be tender and enlarged.
- Treatment [corresponds to Table 24-1]

- Tonsillitis - inflammation of palatine tonsils, adenoids may also be inflamed
- Sometimes viral, usually streptococcal infection.
- Manifestations: extremely sore throat, difficulty swallowing, high fever, tachycardia, otalgia and malaise, tender enlarged cervical lymph nodes, tonsils bright red, edematous, with white exudate. The uvula may be enlarged.
- Possible complications otitis media, spontaneous rupture of the eardrum, or quinsy (peritonsillar abscess)
- Treatment [corresponds to Table 24-1]

- Laryngitis
- Viral or bacterial infection (often URI), overuse of voice, exposure to allergens, injury to larynx; can become chronic
- Manifestations: mild hoarseness, inability to speak, sore or scratchy throat, decreased appetite, and dry cough.; possibly impaired breathing.
  - Chronic laryngitis - voice change or chronic hypertrophic laryngitis
- Treatment [corresponds to Table 24-1]

- Epiglottis or Supraglottis
- Potentially life-threatening
- Haemophilus influenzae type b (most common), other bacteria, viruses, fungi, or trauma.
Manifestations: sore throat and painful swallowing, possible swelling causing dyspnea, drooling and stridor, airway obstruction

Treatment [corresponds to Table 24-1]

Trauma and Obstruction

° Nasal trauma

○ Fracture of the nose
  • Bilateral, unilateral or complex
  • Manifestations: may cause epistaxis or nose bleeds, ecchymosis of the eyes, bony crepitus and septal hematomas.
  • Treatment [corresponds to Table 24-1]

° Epistaxis

○ From rupture of small blood vessels of nasal septum.
○ Trauma, foreign body, nasal irritation, substance abuse, or nasal polyps or tumor; also related to menstruation, hypertension, leukemia, thrombocytopenia, arteriosclerosis, and liver disease; seen in clients receiving anti-inflammatory drugs, anticoagulants, or antiplatelet drugs.

○ Treatment [corresponds to Table 24-1]

° Deviated septum

○ Alters passage of air, may significantly hinder breathing.
○ Client may snore and have epistaxis

○ Treatment [corresponds to Table 24-1]

° Obstructive sleep apnea

○ Periods of apnea and hypopnea in transition phase from NREM to REM sleep.

○ Pharyngeal collapse [corresponds to Figure 24-21A]

○ Continuous positive airway pressure (CPAP) or BiPaP ventilator,

Tumors

° Benign laryngeal

○ Polyps and nodules of the larynx from environmental pollutants or voice strain

○ Papillomas from viral infection

  • Hoarse or breathy voice, dyspnea or stridor

  • Vocal rest, smoking cessation, steroids or surgery

° Malignant tumors

○ Laryngeal cancer

  • Easily cured if detected early.

  • Risk factors

    ↑ Male gender

    ↑ Compromised immune system

    ↑ Cigarette smoking

    ↑ Intake of alcohol

    ↑ Poor nutrition, particularly lack of vitamins A and B

    ↑ History of HPV infection

    ↑ Exposure to asbestos and other pollutants

    ↑ African Americans have a higher incidence of the disease.

  • Signs and symptoms related to site.
Hoarseness, halitosis, difficulty swallowing with unilateral pain, dyspnea, otalgia and palpable nodule in neck, possible leukoplakia or erythroplakia of the larynx.

- **Treatment**
  - Radiation, chemotherapy, surgery
  - Speech restoration with artificial devices [corresponds to Figure 24-22]
  - Priorities in nursing care: patent airway, monitor for complications; oxygen as ordered, high Fowler’s, elevated temperature, evidence of spread of infection, as to middle ear

### LOWER RESPIRATORY DISORDERS

#### Pulmonary Embolism

- **Risks:** immobilization, obesity, age, trauma to legs & pelvis, surgery (lower body), cancer, cardiovascular disease, diabetes mellitus, chronic lung disease, oral contraceptive use
- **Often sudden dyspnea, intense chest pain, tachypnea, tachycardia, hypotension, diaphoresis, hemoptysis, cyanosis, anxiety; crackles and S3/S4 gallop**
- **Prevention is key:** dorsiflexion, lung exercises, early ambulation, sequential compression devices
- **Pulmonary hypertension**
  - Pulmonary artery systolic pressure > 33 mm Hg or pulmonary artery mean pressure > 22 mm Hg
  - Primary – rare, linked to appetite suppressants, HIV; dyspnea & chest pain on exertion, fatigue
  - Secondary – r/t chronic lung disease, sleep apnea, emphysema, pulmonary embolus, left ventricular heart failure, mitral stenosis; dyspnea & chest pain on exertion, fatigue plus specific symptoms of cause
    - Cor pulmonale from prolonged pulmonary hypertension
      - Symptoms like those of CHF
  - **Treatment** [corresponds to Table 24-2]

#### Chest trauma

- **Blunt or penetrating**
  - Contusions from crush and release injuries that may fracture ribs
  - Flail chest [corresponds to Figure 24-23]
- **Inhalation injuries**
  - Term: asphyxiation
  - **Treatment** [corresponds to Table 24-2]
- **Near-drowning**
  - Fresh water causes hypervolemia, hemodilution, hemolysis, electrolyte imbalance, possible renal or respiratory failure
  - Salt water causes hypovolemia and hemoconcentration
  - **Treatment** [corresponds to Table 24-2]
- **Priorities in nursing care**
• Support client, institute emergency measures, monitor closely, reassure client

**Infections and Inflammations**

- **Bronchitis** – one or more bronchi inflamed
  - Viral or bacterial or from irritants or prolonged rhinitis
  - Chronic bronchitis with COPD
  - Treatment [corresponds to Table 24-2]
- **Pneumonia** – lung inflammation causing consolidation and exudate
  - Infectious – from bacteria, virus, fungus, or protozoa (and from normal flora in immunocompromised client)
  - Noninfectious – from aspiration or inhalation
  - Symptoms r/t type and site, often fever, chills, purulent sputum, chest pain, confusion in older adult, diminished breath sounds, crackles, rales, pleural friction rub
  - Treatment [corresponds to Table 24-2]
- **Acute Respiratory Distress Syndrome**
  - Shock lung, wet lung, pulmonary edema
  - Dyspnea, tachypnea, tachycardia, cyanosis, hypoxemia
- **Pleuritis** – pleura inflamed
  - Dry (fibrinous) – layers of pleura rub together causing pain
  - Wet (pleural) – excess fluid in pleural space; may cause collapse
  - Cough, fever, chills, pain worsening on inhalation, rapid shallow breaths, limited chest excursion, diminished breath sounds, pleural friction rub
  - Treatment [corresponds to Table 24-2]
- **Lung Abscess** – necrotic area that forms with consolidation, contains pus
  - Symptoms develop slowly – dry cough, chest pain, fever, chills, headache, dyspnea, odorous sputum, hemoptosis, malaise
  - Treatment [corresponds to Table 24-2]
- **Tuberculosis** – chronic infectious reportable disease
  - Airborne droplets
  - Pathophysiology complex [corresponds to Figure 24-24]
  - Terms: tubercle, induration, pneumothorax
  - Fatigue, anorexia, weight loss, fever, night sweats, dry cough, purulent or blood-tinged sputum
  - Mantoux test
  - Treatment [corresponds to Table 24-2]

**Priorities in Nursing Care**

- Support effective airway clearance, pain management, prevent complications
- Maintain airborne or droplet precautions
- Elevate head of bed, encourage deep breathing & coughing
- Monitor VS
- Reinforce education about completing pharmacologic treatment, especially for TB

**Obstructive Disorders**

- **Asthma**
Chronic inflammatory condition resulting in airway obstruction
Cultures and ethnic groups [corresponds to Box 24-7]
Triggers – allergy, RTI, exercise in cold temperatures, GERD, stress
Two phases: bronchospasm and inflammation
  • Status asthmaticus life-threatening
Treatment [corresponds to Table 24-2]

Chronic obstructive pulmonary disease – airway obstruction from chronic bronchitis or emphysema
Primary cause smoking, also recurrent RTIs
Thick sputum, cyanosis, right-sided heart failure, loud rhonchi & wheezing
Treatment [corresponds to Table 24-2]

Emphysema – overinflation and destruction of alveoli walls, loss of elasticity
Dyspnea, barrel chest, sits leaning forward
Related to smoking
Treatment is supportive [corresponds to Table 24-2]

Cystic Fibrosis – inherited disorder with thick adhesive mucus, abnormal sweat and saliva excretion
Dyspnea, Clubbing, green-colored sputum, impaired digestion, steatorrhea, infertility
Treatment [corresponds to Table 24-2]

Atelectasis - collapsed and airless lungs, commonly caused by obstruction
Dyspnea, cyanosis, fever, hypotension, or shock, diminished or asent breath sounds, reduced chest excursion
Treatment [corresponds to Table 24-2]

Bronchiectasis – chronic dilation of bronchi, weakens elasticity and musculature of bronchial wall
Sputum, hemoptysis, foul breath, anorexia, anemia, fever, pneumonia, wheezing, SOB, right-sided heart failure
Managed like atelectasis
Priorities in nursing care: relieve anxiety, conserve energy, maintain effective oxygenation, assess respiratory rate q 2-4 hr, auscultate lung sounds, monitor for cyanosis
Treatment [corresponds to Table 24-2]

Lung Cancer
Leading cause of cancer death, more common in men, directly related to smoking
Early symptoms absent or vague so disease advanced when diagnosed, metastasis common; dry cough, hemoptysis, wheezing, dyspnea, chest pain, dysphagia
Management depends on type and stage (see Ch 34)
Treatment [corresponds to Table 24-2]

Interstitial Disorders - often occupational – inhaling hazardous substances
Pneumoconioses (chronic, like black lung, asbestos)
Mesothelioma tumor of pleura or peritoneal membranes
Hypersensitivity pneumonitis – allergy
Treatment supportive, no cure

Sarcoidosis – chronic granuloma formation, accelerated immune response
- May be asymptomatic; symptoms by body system: dyspnea, arthralgias, myalgias, fatigue, weight loss, fever, skin lesions
- Treatment steroid or antibiotics

Pneumothorax and hemothorax
- Pneumothorax – Accumulation of air or gas in pleural space causing collapse of lung
  - Cause unknown or COPD, asthma, cystic fibrosis, ARDS, or TB; or traumatic (from blunt or penetrating trauma)
- Hemothorax – blood in pleural space; from injury, TB, tumors, sugery, or infections
- Closed – air from lung enters pleural space
- Iatrogenic – air enters as result of medical procedure
- Chest pain, SOB, tachypnea, tachycardia, hypotension, assymetrical chest wall movement
- Tension hemothorax medical emergency – air flows into pleural cavity but can’t escape [corresponds to Figure 24-29]
- Treatment chest tube to sealed drainage with one-way valve, must be assessed often
- Mechanical ventilation
  - Negative pressure type draws chest out
  - Positive pressure type pushes air into lungs (requires endotrach tube or tracheotomy)

Critical Thinking Care Map: Caring for a Client with Pneumonia