Caring for Adults and Children with Respiratory Disorders

Purpose of the Respiratory System:
- Provide O2 for metabolism; removal of CO2
- Maintain acid-base balance
- Produce speech
- Facilitate smell
- Maintain body water levels
- Ensure heat balance

Upper Respiratory Tract
- Nose: filter, heat, humidify
- Sinuses: resonance for speech
- Pharynx: passageway for resp. & digestive tracts
- Larynx: produces speech
- Epiglottis: covering over larynx

Lower Respiratory Tract
- Trachea: in front of esophagus
- Mainstem bronchi: R is wider & shorter
- 5 lobar bronchi
- Bronchioles
- Alveoli: gas exchange
- Lungs: extend above clavicle to diaphragm
  - R = 3 lobes
  - L = 2 lobes

Pleura: lining of the lung

Muscles of Respiration
- Diaphragm
- Intercostal muscles

Accessory Muscles of Respiration
- scalenii
- sternocleidomastoids
- trapezii
- rhomboids

Regulation of Respiration
- Neural control: medullary and pontine centers
- Humoral/chemical
- medullary central chemoreceptors: respond to CO2 & H+
- Peripheral chemoreceptors: respond to O2
**Differences in Infants**

- Narrower passageways: nares & airways
- Chest cavity: relatively round at birth
- Ribs: more horizontal and less lung capacity; more compliant and easier to distort
- Diameter of bronchi is greater during inspiration than during expiration
- Breathing is primarily diaphragmatic
- Diaphragm can’t contract as forcefully as in older children
- Epithelium below vocal cords—more susceptible to edema
- Less surface area in alveoli at birth: 9x as many alveoli by age 12
- Carries mother’s antibodies until about 3 mos. of age; starts own antibody production about 6 mos. of age.

**Differences in the Elderly**

- Increase in anterior/posterior diameter
- Thorax becomes shorter
- Progressive kyphoscoliosis
- Vital capacity decreases
- Chest wall elasticity diminishes
- Osteoporosis may be present
- Muscle strength in diaphragm & intercostals decreases
- Ability to cough decreases
- Airways close early on expiration
- Reduced efficiency of O2 & CO2 exchange
- Pulmonary capillary blood volume decreases
- Cilia become less effective
- Decrease in cell mediated immunity

**Assessment in Children & Adults**

**Health History for Respiratory Problems**

- Age, sex, race
- Current problem
- Particular symptoms experienced/seen (i.e. coughing, sputum production, change in resp. rate)
- Length of time experienced/seen
- Known precipitating events
- Behavioral changes (i.e. irritability, depression)
- Recent level of nutrition & fluid intake
- Recent sleep patterns
- Activity tolerance
- History of previous similar problems
- Medications used
- History of smoking and/or environmental exposure
- Recent travel

**General Appearance**

- Facial expression
  - Tense, tired
  - In pain
  - Nasal flaring

- Posture
  - Erect, slumping
  - Holds body part in non-alignment

- Positioning
  - Lying
  - Sitting
  - Slumped over a table

- Behavior
  - Active
  - Passive
  - Irritable
  - Withdrawn
  - Interactions with others

- Hygiene
  - Level of interest
  - Issues of possible neglect
  - Inadequate finances

**Respiratory Evaluation**

- Respiratory Rate – normal for age?
  - Tachypnea present?
    - Disorders contributing to low lung compliance (i.e. pneumonia etc.)
    - Inadequate alveolar gas exchange
    - Anxiety
    - Fever
- Respiratory Patterns
  Regular/irregular
  Dyspnea
  Kussmaul
  Cheyne-Stokes

- Character of Respirations
  Quiet/noisy

- Symptoms of distress
  Nasal flaring
  Retractions
  Head bobbing
  Grunting

- Coughing Ability
  Croupy
  Frequency
  Effectiveness
  Productivity

- Sputum Production
  Volume
  Color
  Consistency
  Odor

- Skin
  Color changes (mottling, pallor, cyanosis etc.)
  Turgor

- Clubbing

Neurologic Assessment
- Oriented/confused
- Alert
- Restless
- Pupil size & reactivity
- Movement of extremities

Cardiovascular Assessment
- Pulse rate & rhythm
- BP
- Peripheral circulation (acrocyanosis in newborns, Raynaud’s disease etc.)
Interventions for Ineffective Airway Clearance

Assessment

- Monitor breath sounds at least every 4 hrs
- Assess cough & sputum

Deep Breathing & Coughing

- Diaphragmatic breathing: enlarges the tracheo-bronchial tree
- Incentive Spirometer
- Effective coughing
  - pneumonia vs. person with obstructive disease
  - assisting children
- Purse-lipped breathing
- Disposal of secretions

Liquefy Secretions

- Increase fluid administration
  - By mouth: 2500 – 3000 cc/day
  - By I.V.

Assist Removal of Secretions

- Postural Drainage – use of gravity to facilitate removal
  - Must continue to monitor resp. status
  - Do before meals
  - Do after bronchodilator therapy
  - Treatment last for 20 – 30 min
  - Can prop patient with pillows
  - Hold infants
  - Contraindicated in head injuries, casts, traction, some surgeries
- Chest Physiotherapy (PT)
  - Percussion/vibration used to help mobilize secretions
  - Contraindicated with osteogenesis imperfecta, pulmonary hemorrhage or embolism, minimal cardiac reserves
- Suctioning
  - Sterile procedure in the hospital
  - Pre & post-oxygenate
  - Do on prn basis
  - Proper size of catheter
  - Vacuum pressure: 80-100 mm Hg in children; 120 – 140 mm Hg in adults
  - Time inside the trachea: 5 sec with infants & children; 10 sec. in adults
  - Rest periods in-between
- Disposal of secretions
Interventions for Ineffective Gas Exchange

Assessment

- Closely monitor vital signs
- Monitor for signs of hypoxia: inc. RR & HR, irritability, confusion, inc. BP
- Do pulse oximetry
- Monitor ABG results

Oxygen Administration

- Masks – not tolerated by children, used in adults to deliver precise O2 conc.
- Hood – used in infants, constant flow of O2, can give high conc.
- Oxygen tent/face tent – lower conc. of O2, can eat & play inside, better for toddlers & older children, lots of humidity
- Nasal cannula – easily tolerated, lower O2 concentration, little humidity, can cause abdominal distension in children, very good for CO2 retainers, permits mobility

Aerosol Therapy

- Used to administer bronchodilators, steroids, antibiotics
- Medication suspended in particulate form to reach airways
- Hand-held nebulizers – for older children and adults
- MDI – metered dose inhalers
  Spacers best for young children and people with difficulty synchronizing breath
  Review correct method

Body Position

- Very important for adequate ventilation
  - Elevate HOB

Nutritional Supplements

- Necessary to maintain muscle strength
- Frequent, small feedings
- Liquid supplements

Interventions for Ineffective Breathing Pattern

Assessment
Position
Reassurance
Pain Control
Relaxation Techniques
**Infectious Diseases**

**Upper Airway Disorders**

- **Upper Respiratory Infections**
  - Rhinitis
  - Pharyngitis
  - Sinusitis
  - Laryngitis
  - Viral Influenza-increased risk in elderly & very young never exposed

- **Croup Syndromes** – preceded by URI; swelling and some obstruction of upper airways

  **General Characteristics:**
  - Associated with “barking” cough, inspiratory stridor, resp. distress
  - Boys more at risk than girls
  - 6 mos. – 3 yrs @ greatest risk; the youngest children most at risk
  - 1 – 15% require hospitalization

  **Epiglottitis** – occurs in older children-ages 2-5
  - Usually caused by Haemophilus Influenzae
  - Other symptoms of drooling, high temp, rapid pulse, dysphagia,
    - Orthopnea, chin thrust out, protruding tongue
  - At risk for complete airway obstruction – throat examined in ER

  **Laryngotracheobronchitis** – occurs in very young children
  - RSV, para-influenza virus, mycoplasma pneumoniae
  - May have substernal retractions
  - Cough/hoarseness

  Maintain airway and provide for adequate gas exchange
  - High humidity & cool mist – reduce swelling
  - Increase fluids – p.o. vs. I.V.
  - Vigilant monitoring
  - Pharmacotherapeutics – corticosteroids, antibiotics, epinephrine
  - Body position
  - Conserve energy

- **Aspiration**
  - Foreign object – symptoms of choking, gagging, coughing, can’t talk
  - Infants/Children/Adult interventions
  - Gastric contents – esp. in patients with dec. LOC
Lower Respiratory Disorders

-Respiratory Syncytial Virus (RSV)/ Bronchiolitis
  Winter & spring-more prevalent
  Affects children < 2 yrs., esp. premies & newborns
  Many children have had the infection by age 4
  5% are hospitalized (91,000)
  Swelling of bronchiole mucosa – fills with mucus & exudate
  Bronchiolar obstruction esp. during expiration air trapping, hyperinflation
  Patchy atelectasis
  Treatment: humidity, incfluid intake, rest, meds, O2 monitoring, separate Rooms
  Prophylaxis: Synagis ($5,000 for 5 monthly injections)
    Makes symptoms less severe
    Used in premies or infants at risk

-Bronchitis
  Usually self-limiting
  Dry hacking cough esp @ night
  Productive by 2 –3 days
  Symptomatic Tx: rest, fluids, antipyretics; antibiotics if bacterial
  Codeine elixers suppress cough center

-Pneumonia
  High mortality in infants & elderly
  Viral/Bacterial causes
  Colonization of alveoli causes inflammation and immune response
  Edema & exudate in alveoli Consolidation
  Symptoms: fever, chills, productive cough, pleuritic pain
  Signs: dec. BS, crackles, dullness to percussion, tactile fremitus
  Treatment: O2 therapy, cool mist for children, fluids, rest, positioning,
    Postural drainage & chest PT, help with ADLs
  Medications: antibiotics, liquify secretions, bronchodilators, cough Suppressant @ night

Obstructive Lung Disease

General Characteristics

-Resistance to airflow in upper or lower respiratory tract
-Resistance to airflow may be greater on expiration
-Loss of interstitial support to maintain open airways
-Often associated with air-trapping
-Anterior/Posterior diameter of chest increases
-May see changes in alveolar structure
-Lumen of airways is obstructed by secretions generally
Asthma

- Reversible airway obstruction
- Airways become reactive to stimuli (intrinsic vs. extrinsic causes)
- Childhood asthma begins in infancy; 80% have 1st attack by age 3
- ACUTE inflammatory response causes thick mucus production
- Symptoms: chest tightness, dyspnea, wheezing, cough, retractions, inc. HR & RR, pCO2 is usually low, can’t speak in full sentences
- Status Asthmaticus: pCO2 is normal or high, inaudible breath sounds
- Treatment: eliminate causative agents, corticosteroids, bronchodilators, fluids, frequent assessment, observe LOC, positioning, purse-lipped breathing

COPD

- Usually a combination of chronic bronchitis & emphysema
- Often develop Rt-sided CHF
- Bronchitis:
  - Increased sputum production & cough
  - Plugging of airways
  - Hypoxia
  - May have inc. CO2 due to alveolar hypoventilation
  - Wheezing, rhonchi, crackles
  - “Blue Bloaters”
- Emphysema:
  - Loss of alveolar walls
  - Hypoxia
  - Air trapping due to loss of elastic lung recoil
  - Hyperinflation of lungs
  - Increased A/P diameter
  - Hyperresonant breath sounds
  - “Pink -Puffers”
- Treatment
  - Hydration
  - Stop irritants
  - Improve exercise tolerance
  - Improve breathing pattern
  - Improve nutrition
  - Assist family to cope
  - Medications: corticosteroids, bronchodilators, supplemental oxygen
Cystic Fibrosis

- Inherited disorder of exocrine glands
- Lungs primarily affected: mucus production, atelectasis, scaring fibrosis, chronic hypoxia, clubbing
- GI Tract: thick intestinal secretions, steatorrhea
- Pancreatic insufficiency: poor digestion, malnutrition, lack of Vit A, D, E, & K absorption
- Increased NaCl loss in sweat causing dehydration
- Diabetes may also be present
- Treatment: immunize against resp. infection, airway clearance measures, bronchodilators, antibiotics during acute infections, inc. fluids, diet high in protein, fat, & calories. Supplemental vitamins
- Possible lung transplant