Nursing Care of Client Experiencing Respiratory Dysfunction and Chronic Airflow Limitations

Disorders of Chronic Airflow Limitation
- Physiologic impedance of conduction of air to structures of gas exchange
  - Asthma
  - COPD
    - Chronic bronchitis
    - Pulmonary emphysema

Nursing Care of Clients Experiencing Asthma

Incidence and Etiology of Asthma
- 4,487 deaths from Asthma (2000)
- Approximately 17.7 million adults (18 and over) reported having asthma (1998)
- females (10.5 million) > males (7.1 million)

Pathophysiology of Asthma
- Conducting airways exposed to an irritant (trigger) initiates two responses
  - inflammation
  - bronchoconstriction

Alterations in Conducting Airways during Asthmatic events

Airway changes in Chronic Asthma
- Can progress form an intermittent, episodic disorder.
- Seen in clients with long-standing, severe or poorly controlled asthma.

Symptomotology
Condition marked by recurrent attacks of paroxysmal dyspnea, with wheezing due to spasmodic contraction of the bronchi

Triggers of Asthmatic Attacks
- Exposure to allergens
  - atopic asthma
- occupational exposure to irritants
- cigarette smoking
- respiratory infection
- medications
  - use of ASA, NSAIDS and propranolol may trigger increased inflammatory response in other pathways, causing asthma-like responses
- exercise induced
- exposure to cold weather
- esophageal reflux
Clinical Manifestations of an Acute Attack on a Continuum of Mild to Severe

• Audible wheeze and tachypnea, hyperpnea
tachycardia
  • A quiet-sounding chest is an alarm that the patient may have a severe respiratory problem that can quickly become life threatening. (Merck, 2000)
• Increased coughing (possible thick, tenacious sputum)
• Use of accessory muscles
  • Suprasternal retractions, nasal flare
• Barrel chest may be seen …..AP diameter ∆
• Respiratory cycle longer requiring greater effort
  • Prolonged exp phase …..I<E…attempt to exhale trapped air
• Cyanosis, dyspnea
• Restlessness, anxiety ⇒ Decreased LOC (ominous sign)

Asthma: The Step System

I: Mild or Intermittent
Symptoms occur < ~2x week, symptom free b/w episodes. Symptoms short lasting only few hours PFT normal b/w episodes

II: Mild Persistent
Symptoms occur >2x week, not daily. Present @ night 2x mos. Activity affected

III: Moderate Persistent
Symptoms occur daily. Persist for days. Symptoms present @ night at least once/week

IV: Severe Persistent
Symptoms continuously present. Limited physical activity. Episodes frequent.

Lab Tests/Diagnostics of Airflow Limitations

• Peak expiratory flow rate (PEFR)
  • percentile reduction from personal best
• Pulmonary function tests (PFTs)
  • Forced expiratory volume (FEV₁) < 80% of predicted value
  • ratio FEV₁ to Forced Vital Capacity (FVC) is reduced
• Chest XRAY shows hyperinflation
  • R/O respiratory infection

Lab Tests/Diagnostics of Allergens

• Allergy skin testing in suspected atopy
  • ambulatory care setting
• RAST
  • blood test to measure amounts of IgE
• Differential in CBC
  • increased percentage of eosinophils from baseline (0%-7%)

Lab tests/Diagnostics of Infections

• Differential in CBC
  • increased percentage of neutrophils from baseline 18%-77% (called a shift to the left)
- Eosinophilia
  - Response to allergens
  - Elevated WBC count
    - May not be increased with a client on corticosteroid therapy
- Chest X-ray shows infiltrate
- Sputum C & S

15 Lab/Diagnostics: Gas Exchange
- Pulse Oximetry
  - Less than 91% requires arterial blood gas measures
    - ABGs are performed for PO2 < 95% in clients with heart disease
- Arterial blood gases (ABGs)
  - Generally performed in clients who don’t respond to medical therapy and present with evidence of O2 desaturation
    - PaO2 < 60 mm Hg indicates hypoxemia with a rising PaCO2 associated with a decline in pH indicates need for mechanical ventilation due to respiratory failure
    - Frequently seen in status asthmaticus

16 PULSE OXIMETRY IS A PIECE OF EQUIPMENT. TREAT THE PATIENT, NOT THE MACHINE.

17 How does the clinician treat the asthma client according to peak flow measures?

18 Medical Management of Asthma
- Education
- Drug therapy
  1. Bronchodilators
  2. Anti-inflammatory agents
  3. Corticosteroids
  5. Mast cell stabilizers
  6. Leukotriene antagonists
- Exercise/activity
  - Aerobic exercise is encouraged to improve overall pulmonary function
    - Instruct patient to use inhaler prior to exercise
- Prevention and early identification of complications airway remodeling

19 Expected Outcome in the treatment of Asthma
- Decrease in the inflammation and bronchospasm that are associated with asthma
- Eliminate/control symptoms
- Maintain normal respiratory function
- Minimize complications associated with the disease and its therapy
21 Where medications work

Mast cell stabilizers
cromolyn

Anti-inflammatory agents
corticosteroids
leukotriene antagonists
inhaled anti-inflammatories

Bronchodilators
beta2 agonists
methylxanthines
anticholinergics

22 Collaborative Care for Asthma

• Education
  – use and maintenance of peak flow records
  – avoidance of triggers
    • May need to modify their lifestyle, home & work environment to control their disease
  – correct use of medication
  – smoking cessation
    • Counsel, refer, and instruct on behavior modification - including their presence around second-hand smoke.
  – exercise/activity instruction
    » Exercise induced exacerbation

• Monitoring effectiveness of medication therapy

• Prevention of respiratory infection
  – Pneumovax, flu vaccine

• Identification of complications of progressive disease

23 Drug therapy: Bronchodilators

• Beta2 agonists relax bronchial smooth muscle & are used as first line therapy due to the rapid effect...
  • Inhaled, PO, SC
    • Inhalers have particular rapid effect
    • Short acting inhaled used for rescue
      • Proventil, albuterol
    • Long acting inhaled used for maintenance
      • Serevent
    • PO preparations associated with greater systemic side effect
      • Terbutaline, proventil, repetabs
    • SC used in emergency management
      • Brethine, epinephrine

24 Nursing Considerations for Beta2 Agonists

• Monitor for s/s of toxicity especially with systemic preparations
  – palpitations, chest pain, hypertension

• Client teaching regarding use of short acting preparations as rescue medication

25 Nursing Considerations for Methylxanthines

• Used when other drug therapy is ineffective
  • PO, IV preparations
    • theodur, aminophylline
  • requires loading dose on initiation
  • monitor therapeutic blood levels (5-15 mcg/ml)
    • serum level > 20 mcg/ml is toxic
      • Therefore - Narrow therapeutic margin
  • side effects include:
    • restlessness, GI upset, tachycardia
    • caffeine potentiates side effects
      • Therefore - Poorly tolerated
• methylxanthines
• anticholinergics

26 Nursing Considerations for Anticholinergics
• Inhaled preparation
  – atrovent (ipratropium)
• used infrequently as an *adjunct to rescue medication*
  – more often included in daily maintenance
• side effects:
  – dry mouth, headache, n/v, palpitations

27 Nursing Consideration with Anti-inflammatories
Corticosteroids / Glucocorticoids
• administered as PO, IV, Inhaled
  – Prednisone, Solumedrol, Beclomethasone
  – Side effects enhanced in PO and IV route
  – monitor for s/s of infection as it may be masked by medication
    • inhaled steroids may cause candidiasis
  – monitor for GI ulceration, impaired wound healing
  – monitor for hyperglycemia
  – monitor for weight gain, fluid retention

  *Goal - prevent permanent structural damage to lungs.*

28 Nursing Consideration with Anti-inflammatories
• Leukotriene inhibitors
  – PO preparation
    • Accolate (Zafirlukast) & Singulair (Montelukast)
  – usually added to clients unresponsive to inhaled steroids
  – Zafirlukast side effects:
    • increased concentration if taken with Aspirin
    • impaired absorption with food
  • Tilade (Nedocromil)
    – inhaled therapy for maintenance only

29 Nursing Considerations with Mast Cell Stabilizers
• Cromolyn Sodium (Intal)
  – inhaled preparations
  – preventative therapy in allergic/environmental triggers
    • *take several weeks before allergy season*
  – requires consistent, regular use to be effective
    • *not used as a rescue drug*
  – causes throat irritation and coughing if powder is swallowed

30 Further nursing considerations
• Administer sedatives with caution…if @ all!
• Administer supplemental O2….
  - What do we want to prevent?…hypoxemia

31 Nursing Care of Clients Experiencing Asthma
- Risk for ineffective respiratory function
  - r/t excessive secretions secondary to inflammation or allergic response
- Potential for: Hypoxemia
- Potential for: Medication therapy adverse effects; bronchodilator, anti-inflammatories
- Potential for: Respiratory acidosis
- Risk for ineffective therapeutic regimen management r/t insufficient knowledge regarding asthma management

32 Test your asthma I.Q.

33 What is the nurse’s best action?
• Client develops an audible wheeze?
• Client asks for a cough suppressant?
• Client is unable to breathe deeply when using a ventolin inhaler?
• Pulse oximetry drops from 92%-88%?
• Vital signs show HR-124 and B/P 160-100?
• Client reports a sore throat?
• Elderly client can not demonstrate use of MDI?
• Client expresses relief that they only have asthma?

34 Remember you ABC’s……..
• Patients who have inaudible breath sounds, those using accessory muscles to breathe, & those who have tachypnea/tachycardia are in danger of respiratory arrest and require immediate emergency medical intervention!!!!!!!

35 Test Time…..
1 Asthma can be caused by:
   a. air pollution
   b. food
   c. Warm moist air
   d. animal dander

2 In what population does asthma typically occur?
   a. < age 25
   b. > age 50
   c. of all ages
   d. can occur at any time in life, yet more common < age 25

36 Selected Teaching Topic:
Peak flow measurement
Understanding Peak Flow Results

- **Green Zone:**
  80 to 100 percent of usual or "normal" Peak Flow Rate signals all clear. Under reasonably good control.

- **Yellow Zone:**
  50 to 80 percent of usual or "normal" Peak Flow Rate signals caution. May require additional medication.

- **Red Zone:**
  Less than 50 percent of usual or "normal" Peak Flow Rate signals a Medical Alert. Take rescue medications and contact MD. Clients generally instructed to go to emergency room.

Using Peak flow meters in a teaching plan...

Nursing Care of Clients Experiencing Chronic Airway Limitations of COPD

Distinguishing Between Emphysema & Chronic Bronchitis

- **Emphysema**
  - destruction of alveoli and loss of elastic recoil of lung
  - overdistended alveoli called bullae
  - result in hyperinflation of lung and decreased gas exchange

- **Chronic Bronchitis**
  - inflammation of bronchioles causing mucus gland hypertrophy and hyperplasia
  - excess sputum production with chronic airflow reduction, mucus plugs block gas exchange increase infection

Incidence & Etiology

- 16 million people had COPD in 1994
- prevalence, incidence, & mortality increase with age
- cigarette smoking and/or exposure to smoke/irritants
- air pollution
- family history of $\alpha_1$-antitrypsin
  ($\alpha_1$-antiprotease inhibitor) deficiency

Complications of COPD

- Hypoxemia and acidosis
- Respiratory tract infections
- Right sided heart failure (Cor Pulmonale)
- Cardiac dysrhythmias

Clinical Manifestations COPD

BLUE BOATER versus PINK PUFFER

- General: thin, ↓ muscle mass, slow moving, slightly stooped, assume tripod position in exacerbation
- Respiratory
  1. Rapid, shallow, paradoxical respirations
  2. Use of accessory muscles, abnormal breathing patterns
  3. Decreased chest excursion, fremurs, hyperresonant
  4. Crackles, dyspnea
Chronic bronchitis aka Blue Bloater

**Pathogenesis**
- Excessive production of mucus
- Chronic cough that lasts 3 mos/year
  \(x2\) consecutive years
  - Particularly after a nights sleep
  - Thick, purulent sputum-breeding ground for m/o’s
- Result of prolonged exposure to respiratory irritants
  - Tobacco, air pollution, toxic fumes, dust
  - Resulting in chronic inflammation, swelling and thickening in bronchioles and enlarged mucus-producing glands
  - Scarring and damage to mucociliary lining of resp. tract eventually leading to destruction of small airways.

Advanced disease - right sided heart failure and chronic severe hypoxia

Emphysema aka Pink Puffer

**Pathogenesis**
- Enlarged distal air spaces and destruction of alveoli
  - Centrilobular - correlated with tobacco smoke
  - Panlobular - familial tendency

**Clinical manifestations**
- Increasing breathlessness
- Prolonged expiratory phase in resp cycle
- Chronically malnourished
- Barrel chest, pursed breathing opens distal airways

Progressive, incurable disease
- Demise secondary to: resp acidosis-coma, heart failure, massive pneumothorax

Lab/Diagnostics

- ABGs (50-50 Club)
  - Hypercarbia, hypoxemia
    - Hypercarbia seen in advanced COPD (also known as CO2 retainers)
  - May be stable
    - ABG will show full compensation
  - May be unstable:
    - Respiratory acidosis with partial compensation

Lab/Diagnostics

- Chest Xray shows hyperinflation and flattening of diaphragm
• PFTs
  – decreased FEV1 and VC
  – increased residual volume due to air trapping

51 Medical Management of COPD
• Oxygen therapy PaO2>55-60
  – minimal amount in clients with chronic hypercarbia to maintain hypoxic drive
• Bronchodilator therapy
  – inhaled prep preferred to minimize systemic effect
  – atrovent is preferred adjunct to beta agonists
• Anti-inflammatories
  – corticosteroids

52 Medical Management of COPD continues…..
• Mucolytics
  – acetylcysteine (mucomist) inhaler
  – guaifenesin elixir
    • cough suppressant are avoided
• Hydration up to 3 liters/day
• Smoking cessation
• Nutrition recommendations to prevent malnutrition

53 Medical Management of COPD still continues……..
• Antibiotics in acute exacerbations
• Pulmonary rehabilitation
• Prevention of respiratory infection
• Surgical interventions
  – Lung reduction surgery
  – lung transplantation
    • in case of \( \alpha_1 \)-antitrypsin (\( \alpha_1 \)-antiprotease inhibitor) deficiency

54 Nursing Diagnoses/Collaborative Problems
• CAN YOU IDENTIFY THE DEFINING CHARACTERISTICS?
  • Impaired gas exchange
  • Ineffective breathing pattern
  • Ineffective airway clearance
  • Altered nutrition
  • Anxiety
  • Activity intolerance
  • High risk for infection

55 Nursing Diagnoses/Collaborative Problems
• Can you identify the defining characteristics/signs and symptoms when present?
  • Potential for: Hypoxemia
• Potential for: Right-sided heart failure
• Potential for: Pneumothorax
• Potential for: Respiratory acidosis
• Risk for ineffective therapeutic regimen management (See table 30-11 page 552)

56 Nursing Interventions for COPD Clients (Table 33-9, pg. 601)
• Can you implement a plan?
  – Airway management
  – Cough enhancement
  – Oxygen therapy
  – Energy management

57 Test your nursing knowledge. What would you do if...?
• Your client becomes anxious?
• Chest is hyperresonant to percussion on right side?
• Client eats only 20% of meals?
• Neck veins are distended and dependent edema is noted?
• pH is 7.36, PCO2 is 52, HCO3 29 with PaO2 of 51?
• Client is unable to participate in breathing exercises?
• Asks you “what are pursed lip breathing exercises anyway?”
• Your client has ten visitors in the room while he or she is trying to eat lunch and they insist on seeing the dressing change to a wound immediately?

58 Discharge Planning: Oxygen therapy at home
• Patient teaching
  – electrical hazards
  – smoking hazards
  – safety strategies with portable oxygen
  – maintenance of mucosal integrity
  • identify risks of petroleum based lubricants