medpath

Chronic Obstructive Pulmonary Disease

Pathophysiology

- COPD is characterized by airflow obstruction that is caused by chronic bronchitis or emphysema
- The obstruction is caused by inflammation which changes the structural function of the lung making it harder to expire CO2
- The air becomes trapped causing the chest to hyperexpand and become barrel shaped. This prevents more air from being expired
- Because of low expiration the pt will become hypercapnic (high CO2) and hypoxic (low O2)
- The excess pressure can damage alveoli further causing a snowball effect of decreased function

Risk Factors

- **Smoking** – the major risk factor for developing COPD – hyperplasia, high mucus, low cilia
- **Occupational** – chemicals and dusts – dusts, vapors, irritants and fumes can increase the risk of COPD
- **Air Pollution** – urban air pollution coal and biomass fuels used for heating
- **Infection** – recurring infections in childhood are linked to reduced function
- **Genetics** – or
- **AAT Deficiency** – liked to poor lung function
- **Aging** – loss of renal, stiffening of chest wall and impaired gas exchange
- **Asthma** – can be secondary to COPD or contribute to progression of

Possible Complications

- **Pulmonary insufficiency** – impaired gas exchange d/t backflow from the pulm. artery to right ventricle
- **Pulmonary hypertension** – excess pressure in lungs
  - Tx: diuretics, vasodilators, anticoagulants and Ca++ channel blockers
- **Acute exacerbation** – worsening of symptoms
  - Tx: assess ABGs, maintain fowler's position, suction airway if necessary.
- **Cor pulmonated** – r ventricle hypertrophy
  - Tx: treated with diuretics and management of underlying cause

Signs and Symptoms

Early Stages

- Symptoms develop slowly chronic intermittent cough
- Dyspnea that increases in severity
- Inability to take a deep breath
- Prolonged expiration and low lung sounds

Late Stages

- Dyspnea at rest
- Relies on accessory muscles to breathe
- Wheezing and chest tightness
- Fatigue, weight loss and anorexia

Diagnosis

- History and physical exam
- Spirometry – required
- Chest x-ray
- A1 – antitrypsin levels (AAT)
- Blood gases – in severe stage
- 6 min walk test

Spirometry measures FEV

Low FEV1 = high obstruction

FEV1/FVC <70% = COPD

FEV1 = forced expiratory volume/ 1 sec

Classification	Severity	FEV_1
Stage I	Mild	≥80% predicted
Stage II	Moderate	50-80% predicted
Stage III	Severe	30-50% predicted
Stage IV	Very Severe	<30% predicted

Treatment

Minimally Invasive

- Smoking cessation
- Airway clearance techniques
- Hydration (if indicated)
- Long-term O2 (if indicated)
- Exercise plan – esp. walking and upper body

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Pharmacological

- Bronchodilators – low dyspnea and high FEV1
- Anticholinergics – low exacerbations
- Corticosteroids

Surgical

- Lung volume reduction
- Bullectomy
- Lung transplant

Pulmonary Rehab

- Exercise training – ambulation and upper limb exercises
- Smoking cessation
- Nutrition counseling
- Education – importance of sleep and good nutrition

Nursing Management

Assessment

Subjective Data

- Hx of exposure to pollutant / irritants?
- Hx of recent infection or hospital stay?
- Do they use O2 therapy?
- Medications they're on?
  - Bronchodilators
  - Corticosteroids
  - Anticholinergics
  - Abx
  - OTC
- Smoker? – pack years/ quit date
- Weight loss or anorexia?
- Exercise/ activity level?
- Anxiety/depression?
- Sleep pattern?

Objective Data

- General
  - Restlessness, fatigue, sitting upright
- Integument
  - Cyanosis, poor turgor, clubbing, bruising, edema, thin skin
- Respiratory
  - Rapid and shallow breathing, prolonged exp., low breath sounds, accessory muscle breathing, low diaphragm movement, resp. acidosis
- Cardiovascular
  - Tachycardia, jugular vein distention, edema in feet, dysrhythmias

Diagnosis

- Ineffective breathing pattern
- Impaired gas exchange
- Ineffective airway clearance

Planning

GOAL

- Prevent disease progression
- Maintain ability to care for self
- Relieve symptoms
- Avoid complications

Implementation

Interventions

- Counsel smoking cessation
- Breathing retraining
  - Pursed-lip (PLB) – to prolong expiration – easier to learn and should be 1st choice in acute situation.
  - Diaphragmatic breathing – use of abdomen instead of accessory muscles to prevent fatigue and slow R rate.
- Airway clearance (ACTs) – loosen mucus/secretions then cleared by huff coughing
- Chest physiotherapy (CPT) – percussion/vibration loosens mucus
- Postural drainage – repositioning to drain secretions from specific areas

Education

- Encourage pt to avoid or control exposure to pollutants
- Caution pt to avoid others who are sick and practice good hand hygiene
- Explain importance of reporting changes in condition to HCD
- Remind pt to follow O2 therapy as ordered to prevent oxygen toxicity
- Suggest nutritional meal options

Evaluation

- Assess need to change flow rate
- Evaluate compliance to meds
- Monitor for signs of complications
- Determine O2 therapy effectiveness

Oxygen Delivery

Device	Flow Rate & FiO2%	Treatment Usage	Disadvantages	Advantages
Nasal Cannula	1-6 LPM – 24%-44% FiO2	Long Term	Can cause dermatitis and mucosal drying	Patient can talk and eat – safe and simple- inexpensive
 **Simple Mask**	6-12 LPM – 30%-50% FiO2	Short Term (<4hrs)	Can build up on low flow rates – mask must fit snug and an cause claustrophobia	Can have humidification added
 **Non-Rebreather**	10-15LPM – 60%-90% FiO2	Short Term (<4hrs)	Can be uncomfortable on pts face	High FiO2% – expired air escapes easily
 **Oxymizer**	8 LPM – 30%-60% FiO2	Long Term	Breathing pattern affects FiO2%	High FiO2 comfortably – pt can eat, drink and speak easily
 **Big-valve Mask**	15+LPM – 90% FiO2	Emergent situations only	Requires manual ventilation	High %FiO2 for unconscious patients
Nasal Cannula	Variable: 4 LPM = 24-28% 8 lpm = 35-40% 12LPM = 50-60%	Short Term	Can be claustrophobic – patient can't eat, drink or talk	Precise FiO2 adjustment – doesn't require humidification

Complications of Oxygen Therapy

Combustion

- O2 causes a huge fire risk because it accelerates the rate of combustion. Patients should know to keep away from open flame and smoke.

O2 Toxicity

- High levels of oxygen can cause an inflammatory response which damages alveolar-capillary membranes. This can cause severe pulmonary edema and hypoxemia. Patients receiving >60% should be monitored closely

CO2 Narcosis

- COPD patients can develop a high tolerance for CO2 levels which leaves hypoxemia as the only stimulus to breathe. Delivering excessive oxygen can reduce the stimulus to breathe which is even more harmful.

Infection

- Heated nebulizers pose greatest risk for bacteria growth d/t heat and humidity
- Educate pt how to properly clean or replace equipment