CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

Protocol for the patient with a COPD

COPD is a common lung disease known to affect approximately 4% of Canadians over the age of 35; however, the prevalence may be much higher, as it is believed that upwards of 50% of cases in the community remain undiagnosed. In Canada, COPD is the 4\textsuperscript{th} leading cause of death in males and females.

Background
The illness involves progressive airway obstruction from chronic bronchitis and/or emphysema. An individual with COPD may have elements of both of these two types:

- Chronic bronchitis is characterized by excess sputum causing chronic productive cough with intermittent shortness of breath.
- Emphysema is characterized by lung tissue destruction and dilatation causing constant shortness of breath.

The diagnosis of COPD should be considered in anyone who has shortness of breath, chronic cough or sputum production, or a history of exposure to risk factors. Diagnosis is confirmed with a lung function test called spirometry.

Predisposing Factors
Pertinent major risk factors for development of COPD include increasing age, exposure to particulate matter (tobacco smoke, occupational dusts, indoor/outdoor air pollution), respiratory infections, low socioeconomic status, and poor nutrition. Cigarette smoking is believed to be linked with 90% of COPD cases.

Managing Stable COPD

Laboratory tests for staging and monitoring:
In patients with suspected or known COPD, a lung function test called spirometry should be performed in order to confirm the diagnosis and/or aid in staging the severity of the disease, as this helps to guide treatment. Staging is based on a spirometry value called FEV\textsubscript{1} in the following way:

- STAGE I: FEV\textsubscript{1} ≥ 80% of predicted
- STAGE II: 50% ≤ FEV\textsubscript{1} < 80% of predicted
- STAGE III: 30% ≤ FEV\textsubscript{1} < 50% of predicted
- STAGE IV: FEV\textsubscript{1} < 30% of predicted \textbf{or} FEV\textsubscript{1} < 50% of predicted \textit{plus} chronic respiratory failure

Treatment for all stages:
- In all stages, the single most effective intervention in patients with COPD is smoking cessation, and this can reduce the decline in lung function and long-term mortality.
- Patients in all stages should receive yearly influenza vaccines, as these can reduce the amount of exacerbations.
- A pneumococcal polysaccharide vaccine is also recommended in all COPD patients once in their lifetime and should be repeated every 5-10 years in those patients older than 65 or having a FEV\textsubscript{1} <40%.
- Exercise training programs aimed at improving exercise tolerance will also help decrease symptoms in all COPD patients.
Stage-specific treatment:
Different medications are given in an additive fashion with worsening stages of disease. Although none of the current medications have been shown to halt the progressive decline in patient lung function, they are given to control symptoms.

- **STAGE I:**
  - Add short-acting bronchodilators (SABD) as needed
    - Either of:
      - Short-acting anticholinergic (SAAC): Ipratropium (Atrovent)
        - Metered-dose inhaler (18 mcg/puff): 2 inhalations QID; maximum 12 inhalations/24 hours
      - Short-acting beta-agonist (SABA): Salbutamol (Ventolin)
        - Metered-dose inhaler (90 mcg/puff): 2 inhalations every Q4-6 hours as needed
  - Add regular treatment with long-acting bronchodilators if patient has persistent symptoms/disability
    - Either of:
      - Long-acting anticholinergic (LAAC): Tiotropium (Spiriva)
        - Powder for inhalation (18 mcg/inhalation): 1 inhalation daily
      - Long-acting beta-agonist (LABA): Salmeterol (Serevent)
        - Powder for inhalation (50 mcg/inhalation): 1 inhalation Q12 hours
  - When adding long-term medications to short-acting medications, the following combinations are preferred:
    - LAAC + SABA or
    - LABA + SAAC

- **STAGE II:**
  - Add regular treatment with a long-acting bronchodilator if not already in use (LAAC or LABA dosed as above)
  - Add regular treatment with both long-acting bronchodilators in combination if patient has persistent symptoms/disability (LAAC and LABA dosed as above)
  - Add regular inhaled corticosteroids (ICS) if patient has persistent symptoms/disability
    - Use lower dose steroids if infrequent acute exacerbations (<1/year); use higher dose steroids if exacerbations more frequent (≥1/year)
    - Usually given as a combination medication with both LABA + ICS:
      - Fluticasone + Salmeterol (Advair)
        - Low steroid dose
          - Powder for inhalation (Fluticasone 100 mcg and Salmeterol 50 mcg/ inhalation): 1 inhalation Q12 hours
        - High steroid dose
          - Powder for inhalation (Fluticasone 250 mcg and Salmeterol 50 mcg/ inhalation): 1 inhalation Q12 hours

- **STAGE III:**
  - Add regular inhaled corticosteroids if not already in use. Dosed as above depending on frequency of exacerbations.
• STAGE IV:
  o Add long-term administration with oxygen for any patients with chronic respiratory failure (PaO2 ≤ 55mmHg or ≤ 60mmHg with other signs of pulmonary hypertension)
    ▪ Continuous oxygen for 15 hours/day or more to achieve an oxygen saturation of 90% or greater.

COPD exacerbations
COPD manifests in most patients as a chronic issue that is exacerbated when the individual becomes exposed to certain pollutants, allergens, or infections. Exacerbations are defined as an acute change in the patient’s baseline shortness of breath, cough, and/or sputum that is beyond normal day-to-day variations. Infection and irritant exposure of the lungs are the most common causes of COPD exacerbations, but no trigger is found in roughly 30% of cases. There is no cure for a COPD exacerbation; the symptoms must be managed and the patient's airways optimized. The severity of an exacerbation can vary greatly.

Signs/Symptoms of COPD exacerbation
• Increased difficulty breathing
• Wheezing
• Appearance of sucking air in or forcing air out
• Increased production of sputum
• Thicker, more colourful sputum

The patient may have trouble breathing in oxygen and/or trouble breathing out carbon dioxide. These factors are important to keep in mind, as it is dangerous to give some persons with COPD too much oxygen. Doing so with these people will result in more carbon dioxide than they will be able to breathe out; this increased level of carbon dioxide can be very damaging to their system.

Managing COPD exacerbations
The following are the steps you should follow when confronted with a patient who appears to be having an acute COPD exacerbation. Remember to continually monitor the patient's vitals.

1. Airway: Check the patient’s mouth to make sure there are no objects obstructing their airway. Make sure there are no reasons why the patient’s breathing may be obstructed from the outside.
2. Relevant vitals: Assess the patient’s oxygen saturation and respiratory rate; you should know these before proceeding. Reassess these as often as you can until the patient is stable. Pulse and blood pressure should be assessed after you have started providing oxygen to the patient (if necessary).
3. External oxygen source: If the percent oxygen saturation is low, give oxygen via a well-sealed oxygen mask or nasal canula to keep the oxygen saturation at 90-93%. Any lower and the amount of oxygen given should be increased; any higher and you risk over-production of carbon dioxide. If someone is known to be a CO2 retainer, then lower saturation percentages are targeted (88-92%).
4. Medications: If the patient is having a great deal of difficulty breathing, has a respiratory rate over 20, or requires oxygen via the mask/nasal canula to maintain their oxygen saturation, then give the two medications listed below. These should be given together in quick succession: if possible, give them with oxygen to allow more effective oxygen absorption by the airways. Continue to frequently reassess the patient’s status (whether
they look like they are having trouble breathing, their oxygen saturation, their respiratory rate).

1. Salbutamol (Ventolin) to open airways; it should be given as soon as possible.
   - It is best to give this medication with a nebulizer; the nebules come in 5 mg doses.
   - If the patient is relatively stable or if no nebulizer is available, this medication may instead be given via an inhaler, preferably with an aero chamber; if using an inhaler, a dose of 4 inhalations in a row should be given.
   - Doses can be given every 20 minutes until the patient improves.

2. Ipratropium (Atrovent) will also open airways; it should also be given immediately to patients with COPD exacerbation.
   - Again, it is best to give this medication with a nebulizer; the nebules come in 0.5 mg (500 mcg) doses.
   - If a nebulizer is not available, the medication can instead be given via an inhaler, preferably with an aero chamber; if using an inhaler, a dose of 4 inhalations in a row should be given.
   - Doses can be given every 4 hours. The puffer form of this medication should not be given to patients with soy or peanut allergies.

5. Airway management: If the patient continues to have moderate/severe shortness of breath or a respiratory rate >25, the patient should be taken emergently to the hospital for either non-invasive or invasive airway management.

6. Fluids: If the patient has stabilized and looks as though he/she may benefit from fluids, offer him/her some water.

7. Other medications to consider: Depending on the situation, the following medications may be necessary:
   1. Antibiotics
      - Antibiotics should be used to treat for possible lung infections in acute COPD exacerbations with increased sputum purulence
      - No single antibiotic has been shown superior
      - Commonly used antibiotic regimens in COPD populations:
        - COPD exacerbation + additional risk factors (Stage III or IV COPD; ≥4 exacerbations/year; heart disease; regular continuous oxygen use; chronic oral steroid use)
          - Amoxicillin-Clavulanate (Clavulin): 500 mg po TID for 7-10 days
          - Levofoxacin (Levaquin): 500 mg po daily x 7-10 days
        - COPD exacerbation without additional risk factors
          - Amoxicillin (Amoxil): 500 mg po TID for 7-10 days
          - Trimethoprim-Sulfamethoxazole (Septra): One double-strength tablet (Sulfamethoxazole 800 mg and trimethoprim 160 mg) BID for 10-14 days
          - Cefuroxime (Ceftin): 250-500mg po BID for 10 days
   2. Steroids
      - A short course of prednisone should be initiated during a severe exacerbation
      - Prednisone 30 mg po daily for 2 weeks

Complications and Prognosis of COPD
COPD is a disease associated with a poor long-term prognosis. Unfortunately, the main complication of COPD is decreasing quality-of-life with progressive airway obstruction often leading to death.