Problem Assisted Learning (PAL)  
Dyspnea

This PAL is based on the following objectives:

1. **Diseases/Disorders of the Respiratory System**
   - Identify the risk factors and aggravating factors specific to patients suffering from asthma or chronic obstructive pulmonary disease (COPD) after conducting a medical history.
   - Describe the appropriate investigations to diagnose and treat a patient with asthma or COPD.
   - Choose an appropriate pharmacological treatment for a patient on the basis of the latest Canadian Asthma and COPD Consensus Guidelines.
   - Interpret pulmonary function test (PFT) values and differentiate asthma from COPD.

2. **Upper Respiratory Tract Infections**
   - List the various upper respiratory tract infection (URTI) etiologies.
     - viral
     - Strep
   - List the secondary conditions resulting from URTI.
     - sinusitis
     - otitis media
   - Establish the differential diagnosis for URTI.
   - Describe the appropriate management of an URTI.
   - List and describe the indications for over-the-counter (OTC) and prescription cough and cold medications.

**Case #1:**

Which systems are involved in causing Dyspnea?

1. Upper Respiratory Tract Infection/Sinusitis
2. Lower Respiratory Tract Infection (Tracheitis, Bronchitis, Pneumonia)
3. Asthma - Allergic  
   - Cardiac  
   - ? reflux
4. COPD (Bronchitis, Emphysema)  
   - cor pulmonale with right heart failure
5. Restrictive Lung Disease  
   - Interstitial  
   - Obesity
6. Pulmonary Embolus  
7. Pneumothorax  
8. Congestive Heart Failure - Ischemic - Valvular  
   - Cardiomyopathy: viral, alcohol, ischemic  
9. Ischemic Heart Disease  
10. Pleural Effusion: Transudate vs Exudate  
11. Deconditioning  
12. Anxiety  
13. Anemia  
14. Chest Wall Conditions: Trauma, Neuromuscular  
15. Pregnancy  

**Case #2:**

Ms. K.O. is a 74 yo woman who came to the office with a five-day history of facial pain, fever, night sweats, yellow nasal D/C, no anosmia. There is facial pressure in both maxillae and over forehead. On the day of visit began a cough productive of yellow sputum. No chest pain or SOB. Wants to travel to attend brother’s funeral in Calgary 4 days hence.

O/E:
Temp=37.0. Mild tenderness on palpation of left frontal and maxillary sinuses

**Questions:**

1. What is the diagnosis: What are the criteria for the diagnosis  
2. What is the likely etiology?  
3. What treatments would you consider?

**Case #3:**

Kendra is a 3 yo who comes to the clinic with her Dad. He tells you that that last night she did not want to eat, vomited once and had a temp. of 39 axillary.  
O/E: Kendra is lying on the examining table, is listless and looks unwell.

**Questions:**

1. What diagnoses are you considering? What are the criteria for those diagnoses?  
2. What treatment would you suggest?

**Case #4:**

Samuel is a 4 yo who comes to the clinic with his mom. She says he has been up all night crying and c/o ear pain. He has had a temp. of 37.5° axillary at home.
O/E: On palpating his neck you note shotty lymphadenopathy in the left posterior triangle of the neck. The right TM is grey with the malleus and light reflex visible. The left TM is bulging, angry and no light reflex is visible.

Questions:

1. What history would you like to ask?
2. What possible treatments are you considering?
3. If you prescribe medications, at what doses?

Case 5:

A 15 year-old teenager complains of chest pain, shortness of breath and coughing when playing basketball.

1. What aspects of the history are crucial?
2. What is the importance of the family history?
3. What physical examination should be done?
4. What diagnostic testing might be helpful?
5. What are the possible diagnoses?

Case #6:

The 48 year old mother of the above patient has 1 ½ month history of difficulty taking a full breath and awakes “choking”.

1. What questions do you wish to ask?
2. What is important on physical exam?
3. What are possible diagnoses?

Case #7:

A 30 year old man complains of shortness of breath even with walking <100 metres. He feels there is increased mucus in his airways and is awakened at night with a cough. He also finds his eczema worse and he is kept awake scratching. Present medication includes Salbutamol (Ventolin) which he is using 8 – 10x/day.

1. What is the likely diagnosis?
2. What history would you like to inquire about and what P/E would you do?
3. What treatments would be helpful and how will you follow response to retreatment?
4. What is the importance of the medication delivery system?

Case #8:

This patient is a 65 year old woman who complains of chest tightness and shortness of breath on exertion. She has been smoking 1 pack of cigarettes per day for 45 years. She has been having difficulty sleeping. Physical examination in the office reveals that her blood pressure is 154/88 with no pulsus paradoxus. There is a tracheal tug and visible use of Sternocleidomastoid. Patient
is speaking in short sentences. Percussion of the chest reveals hyper-resonance. There is no increased area of tactile fremitus. Auscultation reveals diffuse wheezing. See Appendix 1.

1. What diagnoses are important to consider?
2. What treatment would you suggest acutely and over the long term?
3. How can you decide on the urgency of therapy? Should our patient be referred to emergency?
4. What is the role of antibiotics?
5. How would you quantify dyspnea?
6. What diagnostic tests might be important?

Case #9:

This patient is a 56 year old woman with complaints of “gasping for breath” over a two week period. Her husband died with metastatic cancer one month previously and she feels tearful, absent-minded and has early awakening. She feels short of breath during the night; she awakens and gets out of bed. No cough or chest pain.

Past Hx: mild hypertension, Rx triamterene/hctz
smoking 1 – 2 cigarettes/day
menopausal - Rx: Premarin/Prometrium

O/E: BP 126/80, varies between 132 to 108 but regular
Occasional rale left base.
HS normal

1. What is differential dx for shortness of breath?
2. What history do you need?
3. What would you look for on Physical Examination
4. What diagnostic tests are helpful?

Case #10:

This unfolded over 4 months. This is a 72 year old woman who noticed increased shortness of breath while walking. No increased cough. She did notice a pleuritic pain at the level of the diaphragm with inspiration. See Appendix 2

Past Hx: Smoking 40 pack–years (number of years smoking x the number of packs/day)
Previous dx COPD
Hypertension
G.I. reflux

Meds: Fluticasone 500 ugms = 500 micrograms inhaled BID
Bricanyl Turbuhaler – QID PRN
Domperidone 10 mg TID
Ramipril 10 mgs daily
Doxazosin 2mg QUS

O/E: peak flow = 385 litres/min
Case #11 – Part 1

Mr T. is an 82 year old man who has a 1 day history of cough which he believes he caught from his wife. Awakened with myalgias. Possibly elevated temperature. Smokes ¼ pack per day. Complains of urinary hesitancy and some dysuria.

O/E:

- T=37.2 po  BP 150/60  RR = 36  HR 108
- Respiratory examination: diffuse expiratory wheeze
- JVP not elevated
- No edema

Lab:

- Urine shows: blood 2+ Protein 1 +

1. What is Dx? What are the possibilities?
2. What investigations would help with Dx?
3. What would you suggest as treatment?
4. What diagnostic tests would help with treatment decision?

Case #12 – Part 2

Patient returned 5 days later, awake q/hr with cough. Rx given 5 days previously helped to some extent.

O/E:

- T=37.5 po  BP 162/80  RR = 42  HR 90
- Mild cyanosis, percussion reveals dullness LLL & decreased A/E
- No tactile fremitus
- No bronchophony

1. What is the diagnosis?
2. What treatment do you suggest?

Things to cover using those cases:

Red Flags: fever, hemoptysis, chest pain and weight loss.

History: history of asthma or COPD, history of smoking, history of allergies, travel history, history of cough, menstrual history (perhaps think pulmonary emboli), social history and history of anxiety. Medication history.

Physical Exam: General appearance-look for cyanosis, vital signs including respiratory count and O2 sat. Heart and lung examination (what should the student be looking for when completing their examination)-look for deviation of trachea, decreased air entry into lungs, wheezing, signs of consolidation. Complete examination of the calf for signs of thrombosis.
**DDX:** Consider upper respiratory tract infection, asthma, COPD, CHF, pulmonary infections, neoplasms, pulmonary emboli, tuberculosis, pulmonary fibrosis and/or sarcoidosis, anemia as possible diagnosis depending on the presentation. The student should have a sense of what is most common in general practice as causes of dyspnea as well as what are the most worrisome causes of dyspnea.

**Anti-infective Guidelines for Community acquired Infections 2019**

[www.mumshealth.com](http://www.mumshealth.com)

[Email: guidelines@mumshealth.com](mailto:guidelines@mumshealth.com)

Sections on Pharyngitis, Otitis Media, AECOPD & Sinusitis

**Treatments:**

- *Non pharmacological:* The student should be able to describe an Asthma Action Plan. Smoking cessation is important in the management of any acute or chronic case of dyspnea.

- *Pharmacological:* The student should be able to describe the classes of inhalation medication used in the treatment of asthma and COPD as well as describe the method of use of an inhaler. The student should be able to appreciate the indications for an oral antibiotic and suggest possible antibiotic choices in the treatment of community acquired pneumonia and COPD exacerbation. The student should be able to describe when oral prednisone would be a good choice in the treatment of an asthma exacerbation or a COPD exacerbation. The student should be able to identify when the treatment solution lies outside of ambulatory medicine with indication for emergency room visit or admission to a hospital for treatment.
### Appendix 1: Case 5

#### spirometry

<table>
<thead>
<tr>
<th></th>
<th>Ref</th>
<th>Pre</th>
<th>% Ref</th>
<th>Post</th>
<th>% Ref</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>FVC</td>
<td>2.60</td>
<td>1.87</td>
<td>72</td>
<td>1.82</td>
<td>70</td>
<td>-3</td>
</tr>
<tr>
<td>FEV1</td>
<td>2.13</td>
<td>1.09</td>
<td>51</td>
<td>1.18</td>
<td>68</td>
<td>-8</td>
</tr>
<tr>
<td>FEV1/FVC</td>
<td>79</td>
<td>(96.7 - 88.4)</td>
<td>58</td>
<td>55</td>
<td>55</td>
<td>22</td>
</tr>
<tr>
<td>FEFF25-75%</td>
<td>1.92</td>
<td>0.48</td>
<td>25</td>
<td>0.58</td>
<td>30</td>
<td>22</td>
</tr>
<tr>
<td>PEF</td>
<td>6.43</td>
<td>3.62</td>
<td>67</td>
<td>3.65</td>
<td>71</td>
<td>8</td>
</tr>
<tr>
<td>FVC</td>
<td>3.15</td>
<td>1.81</td>
<td>57</td>
<td>1.80</td>
<td>57</td>
<td>-1</td>
</tr>
<tr>
<td>PEF</td>
<td>4.29</td>
<td>3.19</td>
<td>74</td>
<td>3.14</td>
<td>73</td>
<td>-2</td>
</tr>
</tbody>
</table>

#### Lung Volumes

<table>
<thead>
<tr>
<th></th>
<th>Ref</th>
<th>Pre</th>
<th>% Ref</th>
<th>Post</th>
<th>% Ref</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLC</td>
<td>4.44</td>
<td>4.93</td>
<td>111</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VC</td>
<td>2.69</td>
<td>1.97</td>
<td>73</td>
<td>73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IC</td>
<td>1.86</td>
<td>1.80</td>
<td>96</td>
<td>96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FRC-PL</td>
<td>2.39</td>
<td>3.33</td>
<td>139</td>
<td>139</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERV</td>
<td>0.83</td>
<td>0.36</td>
<td>44</td>
<td>44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RV</td>
<td>1.72</td>
<td>2.06</td>
<td>172</td>
<td>172</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FRC-RLC</td>
<td>4.10</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### diffusing Capacity

<table>
<thead>
<tr>
<th></th>
<th>Ref</th>
<th>Pre</th>
<th>% Ref</th>
<th>Post</th>
<th>% Ref</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>DLCO</td>
<td>18.7</td>
<td>8.8</td>
<td>47</td>
<td>8.8</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td>DL Adj</td>
<td>18.7</td>
<td>8.8</td>
<td>47</td>
<td>8.8</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td>DLCO/VA</td>
<td>4.20</td>
<td>2.43</td>
<td>57</td>
<td>2.43</td>
<td>57</td>
<td></td>
</tr>
<tr>
<td>DL/VA Adj</td>
<td>4.20</td>
<td>2.43</td>
<td>57</td>
<td>2.43</td>
<td>57</td>
<td></td>
</tr>
<tr>
<td>VA</td>
<td>3.60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Resistance

<table>
<thead>
<tr>
<th></th>
<th>Ref</th>
<th>Pre</th>
<th>% Ref</th>
<th>Post</th>
<th>% Ref</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw</td>
<td>1.73</td>
<td>3.15</td>
<td>182</td>
<td>1.53</td>
<td>88</td>
<td>-51</td>
</tr>
</tbody>
</table>

#### Comments:

- Flow (pre)
- Flow (post)
- RAW (pre)
- RAW (post)
Appendix 2: Case 7

Pulmonary Function Report

**Case 7**

<table>
<thead>
<tr>
<th>Clinical Information:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age: 72</td>
<td>Gender: Female</td>
</tr>
<tr>
<td>Height(in): 68</td>
<td>Weight(lb): 205</td>
</tr>
<tr>
<td><strong>SpO2</strong>: 94 %</td>
<td>90 %</td>
</tr>
<tr>
<td>SO2BEF</td>
<td>40 pk/yr X-smoker</td>
</tr>
</tbody>
</table>

### Spirometry

<table>
<thead>
<tr>
<th></th>
<th>Ref</th>
<th>Pre</th>
<th>% Ref</th>
<th>Post</th>
<th>% Ref</th>
<th>% Chg</th>
</tr>
</thead>
<tbody>
<tr>
<td>FVC</td>
<td>Liters</td>
<td>3.24</td>
<td>(2.2 - 4.2)</td>
<td>2.20</td>
<td>68</td>
<td>2.45</td>
</tr>
<tr>
<td>FEV1</td>
<td>Liters</td>
<td>2.32</td>
<td>(1.5 - 3.2)</td>
<td>1.57</td>
<td>68</td>
<td>1.69</td>
</tr>
<tr>
<td>FEV1/FVC %</td>
<td>71</td>
<td></td>
<td>71</td>
<td></td>
<td>69</td>
<td></td>
</tr>
<tr>
<td>FEF25-75%</td>
<td>L/sec</td>
<td>2.47</td>
<td>(1.1 - 3.8)</td>
<td>1.05</td>
<td>82</td>
<td>0.99</td>
</tr>
<tr>
<td>FEF50%</td>
<td>L/sec</td>
<td>2.85</td>
<td>(1.5 - 4.2)</td>
<td>1.35</td>
<td>47</td>
<td>1.26</td>
</tr>
<tr>
<td>FEF75%</td>
<td>L/sec</td>
<td>0.66</td>
<td>(0.2 - 1.1)</td>
<td>0.42</td>
<td>64</td>
<td>0.37</td>
</tr>
<tr>
<td>PEF</td>
<td>L/sec</td>
<td>5.92</td>
<td>(3.1 - 8.8)</td>
<td>4.97</td>
<td>84</td>
<td>5.86</td>
</tr>
<tr>
<td>FIF50%</td>
<td>L/sec</td>
<td>2.77</td>
<td></td>
<td>3.79</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Lung Volumes

<table>
<thead>
<tr>
<th></th>
<th>Ref</th>
<th>Pre</th>
<th>% Ref</th>
<th>Post</th>
<th>% Ref</th>
<th>% Chg</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLC</td>
<td>Liters</td>
<td>5.60</td>
<td>(4.8 - 6.4)</td>
<td>5.54</td>
<td>99</td>
<td></td>
</tr>
<tr>
<td>VC</td>
<td>Liters</td>
<td>3.24</td>
<td>(2.2 - 4.2)</td>
<td>2.38</td>
<td>73</td>
<td></td>
</tr>
<tr>
<td>FRC N2</td>
<td>Liters</td>
<td>2.86</td>
<td>(1.9 - 3.8)</td>
<td>3.42</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td>ERV</td>
<td>Liters</td>
<td>1.11</td>
<td>(0.9 - 1.3)</td>
<td>0.26</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>RV</td>
<td>Liters</td>
<td>2.28</td>
<td>(1.6 - 3.0)</td>
<td>3.16</td>
<td>139</td>
<td></td>
</tr>
<tr>
<td>RV/TLC</td>
<td>%</td>
<td>41</td>
<td>(29.1 - 52.5)</td>
<td>57</td>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>

### Diffusing Capacity

<table>
<thead>
<tr>
<th></th>
<th>Ref</th>
<th>Pre</th>
<th>% Ref</th>
<th>Post</th>
<th>% Ref</th>
<th>% Chg</th>
</tr>
</thead>
<tbody>
<tr>
<td>DLCO</td>
<td>mL/mmHg/min</td>
<td>24.1</td>
<td>(18.1 - 30.1)</td>
<td>14.5</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>DLCO/VA</td>
<td>mL/mmHg/min/L</td>
<td>3.62</td>
<td>(1.8 - 5.5)</td>
<td>3.25</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>VA</td>
<td>Liters</td>
<td>4.45</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Comment:**

- **Respiratory Function**
  - **Spirometry:**
    - FVC = 3.24 L (80% predicted)
    - FEV1 = 2.32 L (77% predicted)
    - FEV1/FVC = 71%
    - PEF = 5.92 L/sec (84% predicted)
    - FIF50% = 2.77 L/sec
- **Lung Volumes:**
  - TLC = 5.60 L (88% predicted)
  - VC = 3.24 L (73% predicted)
  - FRC N2 = 2.86 L (83% predicted)
  - ERV = 1.11 L (23% predicted)
  - RV = 2.28 L (139% predicted)
  - RV/TLC = 41%
- **Diffusing Capacity:**
  - DLCO = 24.1 mL/mmHg/min (60% predicted)
  - DLCO/VA = 3.62 mL/mmHg/min/L (90% predicted)
  - VA = 4.45 L

**Observations:**

- **Oxygen:**
  - **SpO2:** 94%
  - **SO2BEF:** 40 pk/yr X-smoker

- **Flow-Volume Curve:**
  - Flow = 0 L/sec
  - Volume = 0 L

- **Conclusion:**
  - **Oxygen:**
    - **SpO2:** 94%
    - **SO2BEF:** 40 pk/yr X-smoker
  - **Spirometry:**
    - Moderate obstructive defect
    - Improved post B.
    - FEV1 = 2.32 L
    - FEF25-75% = 2.47 L/sec
    - FEF50% = 2.85 L/sec
    - FEF75% = 0.66 L/sec
    - PEF = 5.92 L/sec
  - **Lung Volumes:**
    - TLC = 5.60 L
    - VC = 3.24 L
    - FRC N2 = 2.86 L
    - ERV = 1.11 L
    - RV = 2.28 L
    - RV/TLC = 41%
  - **Diffusing Capacity:**
    - DLCO = 24.1 mL/mmHg/min
    - DLCO/VA = 3.62 mL/mmHg/min/L
    - VA = 4.45 L

---

Revised May 2020