Respiratory Assessment

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Nurse Practitioner
Anatomy

- Esophagus
- Trachea
- Right upper lobe
- Pleurae
- Right middle lobe
- Left upper lobe
- Lobar bronchus
- Main bronchi
- Right lower lobe
- Pleural space
- Segmental bronchi
- Ribs (cut)
- Left lower lobe
- Diaphragm
Reference Lines

<table>
<thead>
<tr>
<th>Anterior Chest</th>
<th>Posterior Chest</th>
<th>Axilla</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midsternal Line</td>
<td>Vertebral Line</td>
<td>Anterior Axillary Lines</td>
</tr>
<tr>
<td>Anterior Axillary Lines</td>
<td>Midscapular lines</td>
<td>Midaxillary lines</td>
</tr>
<tr>
<td>Midclavicular Lines</td>
<td></td>
<td>Posterior Axillary Lines</td>
</tr>
</tbody>
</table>

**Anatomy Points to Remember**
- Lungs are symmetric
- Lungs are divided into lobes – Right lung = 3 lobes, Left lung = 2 lobes
- Primary muscles of respiration
- Upper airway
- Lower airway
Health History

Chief Presenting Complaint
- Onset
- Duration
- Nature
- Sputum
- Severity
- Associated symptoms
- What makes it worse?
- What improves it?
- Previous treatments
- Past similar experiences

Past health history
- Lung disease or breathing problems such as frequent severe colds, asthma, emphysema, bronchitis, pneumonia, tuberculosis
- Allergies
- Previous chest x-rays
- Medications
- Personal and Social History – tobacco use, alcohol, drugs, home environment, occupational environment, travel

Family history
Physical Examination
# Inspection

<table>
<thead>
<tr>
<th>General</th>
<th>Chest Wall</th>
<th>Oxygenation</th>
<th>Respiratory Effort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Symmetry</td>
<td>Nails</td>
<td>Rate and depth</td>
</tr>
<tr>
<td>Posture</td>
<td>Muscle development</td>
<td>Skin</td>
<td>Breathing pattern</td>
</tr>
<tr>
<td>Breathing effort</td>
<td>Costal angle 90 degrees or less</td>
<td>Lips</td>
<td>Chest Expansion</td>
</tr>
<tr>
<td>Trachea position - midline</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Palpation

Trachea- for position

Thoracic expansion (Excursion)
- Place both thumbs at about 7th rib posteriorly along spinal process
- Extend fingers of both hands outward over the posterior chest wall
- Ask person to take a deep breath and observe for bilateral outward movement of thumbs
- Normal: bilateral, symmetrical expansion
- Abnormal: unilateral or unequal

Vocal (Tactile) Fremitus
- normal: bilateral symmetrical vibrations
- Decreased or absent: obstruction such as bronchitis, emphysema
- Increased: consolidation (compression) of the lung tissue such as pneumonia
How To:
- Place left hand finger in the ICS and right hand finger taps the left hand finger with movement from the right wrist
# Percussion Sounds

<table>
<thead>
<tr>
<th>Sound</th>
<th>Intensity</th>
<th>Pitch</th>
<th>Length</th>
<th>Quality</th>
<th>Example of origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resonance (heard over part air and part solid)</td>
<td>Loud</td>
<td>Low</td>
<td>Long</td>
<td>Hollow</td>
<td>Normal Lung</td>
</tr>
<tr>
<td>Hyper-resonance (heard over mostly air)</td>
<td>Very Loud</td>
<td>Low</td>
<td>Long</td>
<td>Booming</td>
<td>Emphysema</td>
</tr>
<tr>
<td>Tympany (heard over air)</td>
<td>Loud</td>
<td>High</td>
<td>Moderate</td>
<td>Drum Like</td>
<td>Puffed out cheek, gastric bubble</td>
</tr>
<tr>
<td>Dullness (heard over more solid tissue)</td>
<td>Medium</td>
<td>Medium</td>
<td>Moderate</td>
<td>Thud like</td>
<td>Diaphragm, pleural effusion</td>
</tr>
<tr>
<td>Flatness (heard over very dense tissue)</td>
<td>Soft</td>
<td>High</td>
<td>Short</td>
<td>Flat</td>
<td>Muscle, Bone, Thigh</td>
</tr>
</tbody>
</table>
Auscultation
These sounds are high pitched popping noises, which sound very much like packing foam peanuts being crushed between two fingers. These sounds are not cleared by coughing and are heard mostly on the end of inspiration. As maximum pressure is reached with inspiration, the previously closed airways pop open suddenly causing the crackling sound. It is also thought that air being drawn through small passageways with fluid contribute to the phenomenon, as the air is drawn through small fluid filled airways.

http://www.easyauscultation.com/cases-waveform?coursecaseorder=2&courseid=201
Variations dependent on age:

**Neonates**
- Chest is round
- Obligate nose breathers
- Periodic breathing is common
- Breathing is from abdomen and diaphragm

**Signs of compromise:**
- Stridor
- Grunting
- Central cyanosis
- Flaring nares

**Children and Neonates**
- Breath sounds may sound louder and more bronchial as chest walls thinner than adults
- Bronchovesicular sounds may be heard throughout the chest

**Pregnancy**
- Costal angle increases in the third trimester
- Dyspnoea and orthopnoea are common
- Breathing is deeper

**Older Adult**
- Often get decrease in chest expansion
- Bony prominences are marked
- AP diameter often increased with respect to transverse
Bronchiectasis

Pathophysiology

- **Host**
  - Chronic infection
  - Adaptive immunity
  - Chronic sputum
  - Early respiratory infections
  - Previous lung injury

- **Environment**
  - Tobacco smoking
  - Poor hygiene
  - Nasal polyps
  - Chronic cough

- **Pathogen**
  - Resident microbiota
  - Viral infections
  - Fungi
  - Other infections eg. m. catarrhalis
  - Non-viable organisms

- **Dampness**
- **Cold homes**
- **Bacterial load**
- **Access to care**

Airway damage and obstruction causing increasing bronchiectasis

- **Bacterial virulence**
- **Colonization**
- **Host microbe interaction**
- **Response and change with antibiotics**

Airway with bronchiectasis

- Normal airway
- Scared and thickened airway wall
- Mucus

Lungs in cross-section

Airway wall

Muscle
Pneumonia

- Chronic bronchitis
  - Bronchial edema
  - Chronic productive cough
  - Bronchospasm

- Emphysema
  - Destruction of alveolar walls
  - Lung fibrosis
  - Air trapping

- Continual bronchial irritation and inflammation

- Breakdown of elastin in connective tissue of lungs

- 
  - Airway obstruction or air trapping
  - Dyspnea
  - Frequent infections

- Abnormal ventilation-to-perfusion ratio
  - Hypoxemia
  - Hypoventilation

- α1-antitrypsin deficiency

Inflammation of the lung
Signs and symptoms of Chronic Obstructive Pulmonary Disease

<table>
<thead>
<tr>
<th>Feature</th>
<th>Chronic Bronchitis</th>
<th>Emphysema</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cough</td>
<td>Frequent</td>
<td>With exertion</td>
</tr>
<tr>
<td>Sputum</td>
<td>Copious</td>
<td>Scant</td>
</tr>
<tr>
<td>Hematocrit</td>
<td>Elevated</td>
<td>Normal</td>
</tr>
<tr>
<td>PaCO₂</td>
<td>Often elevated</td>
<td>Usually normal</td>
</tr>
<tr>
<td>Radiograph</td>
<td>Increased lung markings</td>
<td>Hyperinflation</td>
</tr>
<tr>
<td>Elastic recoil</td>
<td>Normal</td>
<td>Decreased</td>
</tr>
<tr>
<td>Airway resistance</td>
<td>Increased</td>
<td>Normal to slightly increased</td>
</tr>
<tr>
<td>Cor Pulmonale</td>
<td>Early</td>
<td>Later</td>
</tr>
<tr>
<td></td>
<td>PNEUMONIA</td>
<td>PNEUMOTHORAX</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>HISTORY / INSPECTION</strong></td>
<td>Cough, sputum production, fever.</td>
<td>Dyspnoea, chest pain, Hx of trauma. ↑JVP in tension.</td>
</tr>
<tr>
<td><strong>PALPATION</strong></td>
<td>• ↑Tactile fremitus</td>
<td>• ↓Tactile fremitus</td>
</tr>
<tr>
<td></td>
<td>• ↓ chest expansion - unilateral</td>
<td>• Tracheal deviation if tension (away from affected side)</td>
</tr>
<tr>
<td><strong>PERCUSSION</strong></td>
<td>Dull</td>
<td>Hyper-resonant</td>
</tr>
<tr>
<td><strong>AUSCULTATION</strong></td>
<td>• Bronchial Breathing</td>
<td>• ↓ vesicular breath sounds</td>
</tr>
<tr>
<td></td>
<td>• Added sounds: crackles and wheeze</td>
<td>• Added sounds</td>
</tr>
<tr>
<td></td>
<td>• ↑Vocal resonance (whispering pectoral quay)</td>
<td>• Added sounds</td>
</tr>
<tr>
<td>Obstructive</td>
<td>restrictive</td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>characterized by limitation of airflow due to partial or complete obstruction</td>
<td>characterized by reduced expansion of lung parenchyma accompanied by decreased total lung capacity.</td>
<td></td>
</tr>
<tr>
<td>Eg are emphysema, chronic bronchitis, bronchiectasis, and asthma</td>
<td>Eg are ILD like Fibrosing alveolitis, idiopathic pulmonary fibrosis, interstitial pneumonia, Pneumoconiosis, Sarcoidosis; and chest wall neuromuscular diseases</td>
<td></td>
</tr>
<tr>
<td>total lung capacity normal</td>
<td>decreased</td>
<td></td>
</tr>
<tr>
<td>forced vital capacity (FVC) normal</td>
<td>reduced</td>
<td></td>
</tr>
<tr>
<td>decreased expiratory flow rate, measured as forced expiratory volume at 1 second (FEV₁)</td>
<td>Normal or reduced</td>
<td></td>
</tr>
<tr>
<td>FEV₁/FVC ratio &lt; 0.80</td>
<td>normal</td>
<td></td>
</tr>
<tr>
<td>Pathological process</td>
<td>Chest wall movement (reduced)</td>
<td>Mediastinal displacement</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>-------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Consolidation (i.e. lobar pneumonia)</td>
<td>Affected side</td>
<td>None</td>
</tr>
<tr>
<td>Collapse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major bronchus</td>
<td></td>
<td>Towards lesion</td>
</tr>
<tr>
<td>Peripheral bronchus</td>
<td></td>
<td>Towards lesion</td>
</tr>
<tr>
<td>Fibrosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Localized</td>
<td>Affected side</td>
<td>Towards lesion</td>
</tr>
<tr>
<td>Generalized (e.g. idiopathic lung fibrosis)</td>
<td>Both sides</td>
<td>None</td>
</tr>
<tr>
<td>Pleural effusion (&gt;500 mL)</td>
<td>Affected side</td>
<td>Away from lesion</td>
</tr>
<tr>
<td>Large pneumothorax</td>
<td>Affected side</td>
<td>Away from lesion</td>
</tr>
<tr>
<td>Asthma</td>
<td>Both sides</td>
<td>None</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>Both sides</td>
<td>None</td>
</tr>
</tbody>
</table>