

Respiratory Diagnostic Procedures Anatomy and Physiology

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Bell Work

- Complete “cost of smoking” exercise.
- We will go over this together!
- (Don’t worry)!
- Define:
- Tracheostomy
- Tracheotomy

State Standard

- 42) Review case studies that involve persons with respiratory disorders, diseases, or syndromes.

Citing

information from the review, explain the expected

anatomy involved and what abnormality is present; and

outline normal and abnormal physiology, pathophysiology, preventive measures, and diagnostic

procedures for identification of the disease/disorder.

Objectives

- Students will identify correct respiratory rate and how to measure respirations.
- Students will identify common breath sounds and respiratory conditions that they correlate with.
- Students will explore different diagnostic procedures related to the respiratory system.
- Students will perform respiratory assessments on a partner.

Respiratory Frequency

- Inspiration and expiration combined is counted as one respiratory movement.
- Respiratory Depth: can be shallow or deep
- Respiratory Rate: normal 14-20 breaths per minute.
- Discussion: With a partner discuss if breathing is a voluntary or involuntary process.

Changes in Rate

- Respiratory rate fluctuates depending on the circumstances of the body.
- Rate is dependent on....activity, increased body temperature, gender, age, emotions, and position.
- Discussion: What happens to the respiratory rate in the following situations and why?....
 - Climbing a flight of stairs
 - Heat exhaustion
 - Crying
 - Sleeping
 - Hyperthermia

Normal Respiratory Rates

- Women tend to have a higher rate of 16-20 breaths per minute
- Newborn 40-60 breaths per minute
- 5 years- 24-26 breaths per minute
- Asleep 12-14 breaths per minute

Breath Sounds

- Assessed using a stethoscope
- Classified as either normal or abnormal
- Due to vibration in the walls of the respiratory system
- Presence of abnormal breath sounds is used to diagnose respiratory disorders or diseases.

Discussion

- With a partner discuss....
- When examining a patient a doctor

or nurse will listen to breath sounds, what other sounds will they also be listening to at the same time to reach a full diagnosis?

Why?

Normal Breath Sounds

- **Tracheal Sounds**- hear over the trachea
– harsh and sound like air is being blown through a pipe.
- **Bronchial sounds** -present over the large airways in the anterior chest near the second and third intercostal spaces
– hollow-sounding and not as harsh as tracheal breath sounds.
- **Broncho-vesicular sounds**-heard in the posterior chest between the scapulae.
– softer than bronchial sounds, but have a tubular quality.

Normal Breath Sounds Audio

- <http://www.practicalclinicalskills.com/breath-sounds-reference-guide>

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Abnormal Breath Sounds

Wheeze or rhonchi continuous expiratory or inspiratory whistling/sibilant, musical Caused by narrowing of airways, such as in asthma, COPD, foreign body Crackles discontinuous inspiratory cracking/clicking/rattling pneumonia, edema, tuberculosis, Stridor continuous either, mostly inspiratory whistling/musical epiglottitis, foreign body, laryngeal edema, croup

Abnormal Breath sounds audio

- <http://www.practicalclinicalskills.com/breath-sounds-reference-guide>

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Bronchoscopy

- **Bronchoscopy** surgical technique for visualizing the inside of the airways for diagnostic and therapeutic purposes.
- An instrument (**bronchoscope**) is inserted into the airways, usually through the nose or mouth, or occasionally through a tracheostomy.
- Practitioner examines the patient's airways for abnormalities such as foreign bodies, bleeding, tumors, or inflammation.
- Specimens may be taken from inside the lungs.
- <https://www.youtube.com/watch?v=KqZc1JqArco&t=328s>
- 12 minutes

Activity

- With a partner complete Station 4 Lung sounds and Respiratory Rate under respiratory lab activities.
- Listen to lung sound **THROUGH YOUR PARTNERS SHIRT NOT UNDER IT.**
- Follow the directions, you will be provided with a stethoscope.
- Complete the station 4 analysis questions individually.

Mechanics of Breathing

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Bell Work-(copy in your notes)

- **Pulse Oximetry (Pulse Ox)** - Tests the percentage of oxygen in the blood. 95% or more is a normal level, and any less would indicate a lack of perfusion (oxygen circulating around the blood).
- • **Arterial Blood Gas (ABG) Levels** - A blood sample is taken and the amounts of oxygen and carbon dioxide found in the blood are measured.
- • **Chest X-ray** – Used to visualize any masses, congestion, or infection that has accumulated in the lungs or thoracic cavity.
- • **Pulmonary Function Tests (PFTs)** - Tests the lung capacity, volume, speed of airflow, and the overall functioning of the lungs.
- • **Spirometry** – Part of a PFT that specifically assesses lung capacity and volume.

State Standards

- 43) Define Boyle's Law and the relationship of ventilation, external respiration, internal respiration, and the overall process of gas exchange in the lungs and tissue. Correlate the neural and chemical factors in the control of inspiration and expiration. Identify normal and abnormal lung sounds, explaining the structures responsible for the sounds.

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Objectives

- Students will describe the mechanics of breathing.
- Students will describe common respiratory movements.
- Students will analyze the chemical and neural factors that control breathing.
- Students will explore the respiratory process through a lung volume lab

Mechanics of Breathing

- Pulmonary Ventilation

(breathing)

- Due to changes in pressure in the thoracic cavity
- Normal pressure within the cavity is always negative or less than atmospheric pressure to keep the lungs expanded
- Discussion: Applying what you know about homeostasis, what body systems work in conjunction with the respiratory system to create the act of pulmonary ventilation and O₂ exchange?

Boyle's Law

- In physics, Boyle's Law is used to describe the relationship between volume and pressure.
- When the volume of a container a substance is housed in decreases the pressure increases.
- When the volume of a container increases, the pressure decreases.
- This mechanism gives us the ability to draw O₂ into our lungs.
- <https://www.youtube.com/watch?v=q6-oyxnkZC0>

Discussion

With a partner discuss...

Applying what you learned about Boyle's law, if a patient is suffering from a condition that causes the lungs to become stiff and not inflate fully, what will this theoretically do to the air pressure in the lungs?

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Inspiration and Expiration

- Due to intercostal muscles and the diaphragm changing the pressure within the thoracic cavity.

- Video

- <https://www.youtube.com/watch?v=lr5d>

[DmTASos](#)

Thoracic Volume and Inspiration

Thoracic Volume and Expiration

Respiratory movements

- Coughing- a deep breath is taken followed by a forceful exhalation from the mouth
- Hiccoughs- caused by a spasm of the diaphragm due to irritation to the diaphragm
- Sneezing- air is forced through the nose and upper respiratory tract

Discussion

- With a partner discuss...
- What is the purpose of coughing and sneezing? Are they a side effect of the infection or disease or are they a defense mechanism?

Control of Breathing

- Breathing is controlled by both neural and chemical factors
- Neural-located in the medulla oblongata in the brain. Increase in CO₂ or decrease in O₂ stimulates the brain to change the respiratory rate.
- Chemical- dependent on the level of carbon dioxide in the blood, increased CO₂ in the lungs increases respiratory rate. Receptors in the aorta and the carotid arteries test for O₂ levels, if low increase respiration.

Discussion

- With a partner discuss...
- Larry is a 40 year old male who has recently joined a gym. He hires a personal trainer to help him achieve his weight loss goals. His personal trainer puts in on a treadmill and has him run 1 mile.
- Explain what is happening with Larry's neural and chemical control centers in relation to breathing.
- What is going to happen to his respiratory rate and why?

Lung Capacity and Volume

- Lung capacity- amount of air your lungs can hold.
- Calculated by a spirometer-measures the flow of air during inspiration and expiration.
- These readings can be compared to normal readings for a persons age, weight, height, and sex.
- Discussion: Applying what you know about lung disorders, what will readings from a spirometer tell a health care professional?

Lung Capacity and Volume

Spirographic Record for a Male

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Lung Volume Activity

- Go to the class website and choose the tab called Lung Volume Activity.
- You will be given the materials to use.
- Work with a partner and record your answers.
- Follow the directions given.

Individual Activity

- Choose the link on the class website called *Hopkins Pulmonary Function Test*.
- Answer the following questions:
 - Describe restrictive and obstructive diseases.
 - What are the two ways to measure PFT?
 - Explain why someone might need a PFT?
 - What are some risks for having a PFT?
 - Make sure all of the PFT measurements are defined in your notes.
- Also, record the table for the average volume for men and women.
- Research the possible differences in height, weight, age, and ethnicity.

Additional Activities

In your small groups complete station 2 spirometry located under respiratory lab activities. You will be provided with a lung volume bag, a rubber band, a mouth piece, and alcohol wipes.

Follow the directions in the lab activity. Make sure to wipe the mouth piece with the alcohol between each person. Everyone should complete the activity and calculate their results.

Individually complete the Station 2 Analysis questions