

The Respiratory System

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Reading

The respiratory system is divided into two main components, the upper respiratory system (URS) and the lower respiratory system (LRS). The URS is composed of the nose, nasal cavity, paranasal sinuses and pharynx. The pharynx is further subdivided into the nasopharynx (superior **portion**), oropharynx (middle portion) and the laryngopharynx (inferior portion). The LRS is composed of the larynx, trachea, bronchial tree and lungs. The functions of the respiratory system include: (1) providing a gas exchange surface between the air and the blood, (2) moving air to and from the gas exchange surfaces, (3) participate in the regulation of blood pH, blood volume and blood pressure, (4) sound production, (5) defensive barrier against airborne pathogens, and (6) protection of gas exchange surfaces from environmental changes.

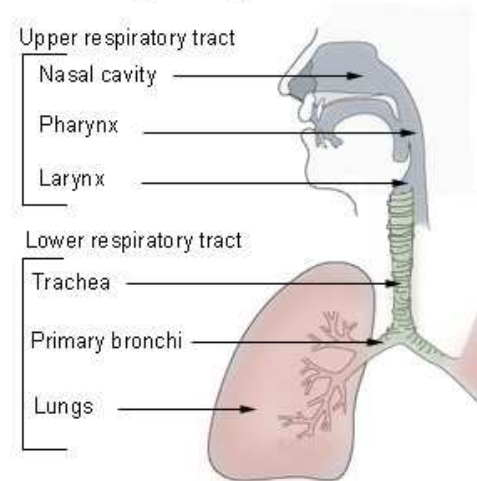
Respiration **refers** to two integrated phases: external respiration and internal respiration. External respiration includes the processes **involved** in the exchange of oxygen and carbon dioxide between the blood and interstitial fluid of the body and the **environment**. While internal respiration **consists of** the **utilization** of oxygen and production of carbon dioxide by the cells of the body. This **latter** process is also called cellular respiration.

It is important not to confuse breathing and respiration. The two terms are not **interchangeable**. Breathing or respiratory **rate** and **depth**, is controlled by the respiratory centers located in the pons and medulla of the brain stem. The respiratory centers are sensitive to the amount of oxygen in the blood, the pH of the blood and the **amount** of carbon dioxide in the blood. However, the respiratory centers are most sensitive to CO₂; for this reason, it is the amount of CO₂ that normally controls breathing. During exercise, as the demand for O₂ increases, the amount of CO₂ produced by cells also increases. The increase CO₂ leads to an increase in the respiratory rate, which not only brings in more O₂, it also **eliminates** the excess CO₂.

External respiration involves the movement of air into and out of the lungs. The process is driven by pressure differences that develop between air pressure in the environment and the pressure deep within the lungs. As the diaphragm contracts during inspiration (inhalation), the volume of the thoracic cavity increases and the pressure within the lungs falls below that of the atmosphere (negative pressure). As a result, air flows down the pressure gradient into the lungs. Once in the lungs, O₂ can diffuse from the alveoli into the blood and CO₂ can diffuse from the blood into the alveoli. After a **brief** equilibrium period, the diaphragm **relaxes**, returns to its original position. In doing so, the volume of the thoracic cavity decreases and the pressure within the lungs increases above atmospheric pressure (positive pressure). Air now flows down its pressure **gradient** out of the lungs. This process is called expiration (exhalation). As mentioned previously, the frequency of diaphragmatic contractions (rate) and **degree** of contraction (depth) are controlled by the respiratory centers in the brain stem.

Internal respiration, sometimes called cellular respiration, is the process whereby the oxygen in the blood is utilized by the cells of the body. When blood reaches a capillary bed, the O₂ in the blood will **diffuse** down its concentration gradient into the cells surrounding the capillary. Ultimately diffusion will carry the O₂ into the mitochondria of the cell where it is utilized in the production of ATP. At the same time, CO₂, a by product of internal respiration, will diffuse from the cells into the blood and be carried to the lungs for elimination.

Conducting Passages



Check Point – Sentence construction

Instructions: Match the first part of the sentence in column A with the second part in column B:

A	B
1. Breathing is controlled by	a. signals the brain that the respiratory rate needs to be increased.
2. Every cell in the body	b. expands the lungs.
3. Oxygen moves from blood	c. must receive a continuous supply of oxygen.
4. This phase is	d. into the cells.
5. Increased carbon dioxide in the blood	e. called inspiration or inhalation.
6. Air from the environment enters and	f. a respiratory center in the brain stem.

Check Point – Vocabulary

Instructions: Match the word in column A with its contextual meaning in column B.

A	B
1. portion	A. a part of something
2. refers	B. disperse
3. involved	C. event per unit time
4. consists of	D. extent
5. utilization	E. is made from
6. latter	F. magnitude
7. interchangeable	G. one can substitute for the other
8. rate	H. quantity
9. depth	I. short period of time
10. amount	J. slope
11. eliminates	K. the second of two things
12. brief	L. to make reference to something
13. relaxes	M. to participate in something
14. gradient	N. to remove
15. degree	O. to stop contracting
16. diffuse	P. to use / to make use of something

Clinical Corner

Asthma: respiratory condition characterized by hypersensitive airways, susceptible to inflammation and bronchospasms.

Atelectasis: a condition in which part of, or an entire lung collapses.

Bronchitis: inflammation of the bronchial tree.

Bronchodilation: relaxation of bronchial smooth muscle in response to a bronchodilator medication.

Bronchoscope: a flexible, tubular instrument (with light) that can be inserted into the trachea of observation or removal of foreign objects.

Bronchospasm: contraction of the smooth muscles that surround the bronchial tree.

Chronic obstructive pulmonary disease (COPD): any of several chronic lung diseases that let to reduced alveolar aeration.

Continuous positive airway pressure (CPAP): respiratory therapy the uses air delivered at super-atmospheric pressures throughout the breathing cycle. The objective is to keep breathing passageways open through increased pressure.

Cough: respiratory reflex used to expel objects or secretions from the respiratory system.

Cystic fibrosis: an inherited disease of the exocrine glands of the lungs and pancreas. Lung secretions become too viscous to me eliminated from the lower respiratory system.

Dyspnea: difficulty breathing.

Emphysema: chronic, progressive disease which producing shortness of breath resulting from progressive destruction of gas exchange surfaces.

Epiglottitis: inflammation of the epiglottis, a serious potentially life threatening condition because of the potential of a spasm that could completely block airflow.

Epistaxis: nose bleed.

Heimlich maneuver: method of applying abdominal pressure in an attempt to force a foreign object from the trachea or larynx.

Expectorate: to cough material up from the respiratory passages and lungs.

Hemoptysis: coughing up of blood.

Hoarse: change in the quality of the voice when someone has a sore throat or laryngitis.

Hypercapnia: above normal CO₂ levels in the blood.

Hypoxia: inadequate oxygenation of the blood.

Laryngitis: inflammation of the larynx.

Laryngotracheobronchitis (Croup): an inflammation common in infants that causes breathing difficulty and causes the child to have hoarse cough.

Nebulization: treatment for respiratory conditions in which the medicine is presented in as a fine mist for inhalation.

Pharyngitis: inflammation of the pharynx (sore throat).
Pleural effusion: an exudate of blood or lymph into the pleural cavity.

Phlegm: thick mucus secreted by the respiratory passages which can be coughed up.

Pneumonia: infection of the lung lobules characterized by accumulation of fluid in alveoli, edema of bronchioles, or brochiolespasm. The result is diminished airflow and gas exchange.

Pneumothorax: an opening in the thoracic wall that allows air into the pleural cavity.

Pulmonary edema: a condition in which pressures in the pulmonary circulation increase to a point that fluids begin to accumulate in the interstitial space around alveoli. The additional fluid decreases gas exchange between the blood and the alveoli.

Pulmonary embolism: blockage of a pulmonary artery by a blood clot.

Purulent: a discharge containing pus.

Respiratory distress syndrome: a condition resulting from inadequate production of surfactant; which results in the collapse of alveoli and reduction of gas exchange.

Rhinitis: inflammation of the mucosa lining the nose and nasopharynx.

Rhonchous:

Sinusitis: inflammation of the mucosa lining the sinuses.

Sputum: mucus mixed with pus expectorated from the respiratory passages.

Stridor: a harsh creaking respiratory sound created by obstructive respiratory conditions.

Surfactant: a substance produced by the lungs to reduce surface tension caused by the thin film of water that covers the alveolar mucosa.

Tachypnea: rapid breathing.

Thoracentesis: removal of a sample of pleural fluid for diagnostic purposes or to relieve fluid build-up.

Tracheostomy: insertion of a tube though an opening cut in the anterior wall of the trachea. The procedure is done to bypass and obstructed larynx.

Tuberculosis: bacterial infection caused by *Mycobacterium tuberculosis*.

Wheeze: high pitched respiratory sound produced when air is forced through narrowed passageways.

Talking with the patient

1. D: Good morning Mesha, I haven't seen you in a long time.
2. P: Hi doctor Amad. For the past year I've had a job working as an alpine tour guide.
3. D: Really. What does that involve?
4. P: Basically, I took small groups of tourist on day hikes in the mountains around Salzburg. I would explain some of the historic towns we pased through and that kind of thing.
5. D: Well, it's nice to have you back. What can I do for you today?
6. P: Since I returned I feel like my asthma is getting worse. While I was working as a tour guide, my asthma really didn't bother me much at all. I only used my inhaler a few times and mainly of extremely cold days. Why do you think it is worse all of the sudden?
7. D: How long have you been back in town?
8. P: Only 4 weeks.
9. D: I can't be sure, but it is probably a combination of the heat, air pollution plus we are having a bad allergy season this summer.
10. P: What can I do?
11. D: Go back to the mountains.
12. P: That job is over; I'll be working here from now on.
13. D: Well let's run through a few things and we'll see what we can do.
14. P: Okay.
15. D: Do you smoke?
16. P: If I'm on fire.
17. D: Very funny – you know what I mean.
18. P: No, I don't smoke – never have.
19. D: How about alcohol, how much do you drink a week.
20. P: Well, I'm not teetotal but I rarely have more than a glass or two of wine in a week.
21. D: Are you taking any prescription medication?
22. P: No.
23. D: Any over-the-counter medications?
24. P: I take a one-a-day vitamin.
25. D: No problem with that. Tell me a little about your new job – where do you work and what do you do?
26. P: I'm working as a customer service representative for IBM. I take phone calls and try to solve delivery issues with the clients.
27. D: Wow, that's quite a change for guiding in the mountains.
28. P: I know – but it pays much, much better.
29. D: Do you think there are any environmental issues at your workplace? Is the air circulated, do you smell any stale smells or chemical smells, do you eyes burn or itch?
30. P: No – the building is new and is climate controlled.
31. D: Well climate controlled should be good for you as long as the air isn't too dry. The filters on the air conditioning system should help in removing allergens and particulate matter from the air.
32. P: That's sounds good.
33. D: Have you had a cold or the flu recently?
34. P: No.
35. D: Have you had any allergic symptoms – runny nose, tearing eyes, sinus congestion or rashes?
36. P: I have had some congestion – especially at night. My nose gets stuffy as soon as I lie down – and I have been waking up with headaches, not bad ones – and they are usually gone in an hour or so.
37. D: Okay, now describe your asthma sytoms to me.
38. P: The main one is shortness of breath. My chest feels tight most of the day and when I walk home in the evenings I really feel like I'm working hard to breathe. There is usually some wheezing and I have to just sit quietly for 30 or 40 minutes before I feel better. I have used up the inhaler you give my last year.
39. Any real exercise or exertion leaves me wheezing and gasping for air.
40. D: When did you first notice these symptoms?
41. P: About two weeks ago.

42. D: Did they start suddenly or did they come on gradually?
43. P: Gradually – over a period of 3 or 4 days.
44. D: Okay – before I forget, I see here that I noted that you have a dog – this that still correct?
45. P: I have my own flat now, the family dog lives with my parents in their flat.
46. D: Have you notice if your symptoms are worse after you have been to their flat?
47. P: No – I don't think so.
48. D: You weren't allergic to dogs when I tested you before, but sometimes things can change. Do you have any pets?
49. P: No.
50. D: Well let's get some spirometry numbers for you and see what's going on in there. Let's see how much you weigh first – so step on the scale.
51. P: Okay.
52. D: Fine, 57 kg – you have lost 2 kg since I saw you last – I guess it was all that walking in the mountains.
53. P: I know – it was pretty hard work – lots of activity everyday.
54. D: Well we'll start with vital capacity – do you still remember how to do this test?
55. P: Yes – I hate it – but I remember how to do it.
56. D: Deep, deep breath and blow, blow, keep going, keep going 5 seconds , 6 seconds – okay done!
57. P: *coughing* Doc you killing me.
58. D: You'll live – I'll give you a couple of minutes to recover then we need to do the FEV₁.
59. P: Okay, I'm ready for the next test.
60. D: Okay – ready, set, go.
61. P: *coughing* Is that it? How does it look?
62. D: Well both numbers are down from your last test results. I want you to take two puffs of this medication, we'll wait 10 minutes and then we need to test again.
63. P: Again?
64. D: Here – two puffs.
65. P: Okay.
66. D: While we wait let me tell you about your results. Your FEV₁ is 55% of the expected value. This suggests that you

are having a moderate problem with air exchange. The number is consistent with your description of your symptoms. If the bronchodilator you just took helps reverse this, then we can be pretty certain that your symptoms are an exacerbation of your asthma condition and not something new.

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67. D: It's time to repeat the tests.
68. P: That medicine was great – I feel like I'm breathing easier.
69. D: Great – let's see if that shows up in the new numbers.
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70. D: Excellent – your new FEV₁ is 79% of the expected value – that's a 40% improvement.
71. P: Super.
72. D: Okay – so let's talk about medication for you. I don't see any lifestyle changes you can make, so we will need to control this through medication.
73. P: Okay.
74. D: I'm going to prescribe Symbicort for you to use twice a day. It's an inhaler. It has a corticosteroid to fight inflammation and a long acting bronchodilator. Even though the bronchodilator is long acting, it is also fast acting, which means you can use it as a rescue medication if you need it.
75. P: Okay.
76. D: But if you are using it as a rescue medication more than twice a week, I want you to call me. While it can be used as rescue medicine, however, that is not its intended use. If it is working right, you shouldn't be having episodes where you feel you need a rescue medication.
77. P: Okay – how long will it take for the medicine to work?
78. D: The bronchodilator part will be effective right away; the steroid part will take several days to a week. I'm going to start you off with a low dose, so it is important that you let me know if the medicine is not effective.
79. P: Okay.
80. D: I also want you to wash you mouth out with water after each dose – don't swallow the water, just spit it out.
81. P: Why?

82. D: It's important that the steroid powder not stay in your mouth. It can lead to a candidiasis.
83. P: Candy-what?
84. D: It's a fungal infection – but it is not likely at this low dose – still, it is best to rinse your mouth after each use.
85. P: Okay.
86. D: Also, asthma can get worse around the time of your period. So pay careful attention to your symptoms as that time approaches.
87. P: Really.
88. D: There seems to be some link between hormonal changes and an increase in symptoms. I'm going to give you a new peak flow spirometer and I want you to check it daily and keep a log. If you see changes as you approach your period I want you to let me know. However, I don't expect there to be any real problem controlling your asthma.
89. P: Are you sure? It was never this bad before.
90. D: As I said, I think a lot of the problem is the heat and the fairly serious air pollution we are having right now. The heat will pass and the high pressure system causing the stagnant air will eventually move on. Once those two things happen, I think you will feel a lot better.
91. P: Okay.
92. D: Here is a detailed brochure on how to use the peak flow spirometer.
93. P: Okay.
94. D: Do remember how to use it?
95. P: Yes.
96. D: Okay – good. Now the Symbicort has 60 days of normal use – so if there are no problems, I want to see you again in 6 weeks.
97. P: Okay.
98. D: Remember; call if you have any problems or if the medication isn't controlling your symptoms.
99. P: Okay, I will. Thanks for everything and I'll see you in two months.
100. D: Okay – bye.

Talking with the Patient

Instructions: Reread the interview and then, working with a partner, try to recreate the interview using some of the question variations below – then switch roles and recreate the interview again using other question variations.

Phrases to remember (note the verb tenses used in the different phrases)

- ⇒ Describe your symptoms to me.
- ⇒ Are you taking any prescription medication? (present perfect continuous)
- ⇒ Have you had a cold or the flu recently?
- ⇒ When did you first notice these symptoms?
- ⇒ Did they (symptoms) start suddenly or did they come on gradually?
- ⇒ Do you still remember how to (do this test)?

Instructions: Review the interview and find line numbers that correspond to the interview elements listed below. In some cases different aspects of the same interview element may be addressed in different parts of the interview – one such case has been done as an example. The questions in the table below are not in the sequence of the interview.

Interview element	Line numbers
Patient greeting.	
Request for information on patients chief complaint	
Request for information on patient's recent health	
Request for information about medications being taken by patient	
Request for information about working environment	25
Request for information about pets	
Couching the patient through a test	
Explaining tests results	
Explaining what additional tests will be done	
Providing the patient printed information on how to use a device	
Explanation on how and when to use a medication	
Explanation on potential side effects of a medication	
Request that the patients keep records of events	
Offering a prognosis	
Arrangements for next appointment	
Concluding the visit	
Explaining the reason for the patient's symptoms	
Prescribing a medication	

Check Point – Comprehension

Instructions: Work with a partner and take turns asking the following questions. When answering, practice giving full answers, not short cryptic answers – don't limit your use of language.

1. What is the patient's chief complaint?
2. How long has the patient had the problem?
3. What was the onset of the current problem?
4. What symptoms does the patient include as part of the description of their CC?
5. What environmental factors does the doctor blame?
6. What tests does the doctor perform on the patient?
7. What did the initial test results show?
8. Why were the repeat test results better than the initial test results?
9. Describe the medication included in the treatment plan.
10. What other elements does the doctor want included in the treatment process?
11. What is the prognosis for the patient?

Asking Questions – Work with a partner to write questions that would generate the listed responses from a patient. Then put the Q and A in what you think is the most logical sequence. Compare your sequence with other groups.

Questions	Responses	Sequence
	I work for IBM as a customer service representative.	
	I've had some sinus congestion and sinus headaches.	
	The symptoms first started about 2 weeks ago.	
	No, I've never smoked.	
	I was a mountain tour guide.	
	It started slowly, over a period of 3 or 4 days.	
	The dog lives at my parents' flat.	
	I take a one-a-day vitamin.	
	The building is climate controlled.	
	I'm not teetotal; I have 2-3 glasses of wine a week.	
	No, I haven't noticed any chemical smells or had tearing eyes.	

Reading

Assessing a patient's respiration includes both **rate** (the normal adult rate is between 12 and 20 breathes per minute) and **character**, which involves **depth of respiration** (the normal adult tidal volume is about 500 ml), as well as any difficulty associated with breathing, sounds and specific respiratory patterns.

Many factors affect the rate and character of respiration: exercise, **emotional reactions**, pain, elevated temperature, **hemorrhage, shock**, and certain drugs. The normal rate of respiration for an adult varies from 14 to 20 per minute. Whenever the body needs increased oxygen, respiration becomes faster. A respiratory rate over 40 is called **hyperpnea**. In an adult it is a significant **deviation** from normal rate and should be reported immediately. Disease, poison, or a dangerous level of certain drugs such as morphine can cause slow, **shallow** respiration. A respiratory rate below 9 is significant and should be reported immediately.

Dyspnea means a person is having difficulty in breathing. If a sitting position relieves dyspnea, the condition is termed **orthopnea**. **Apnea** means absence of respiration. Apnea can also occur as a part of a temporary breathing pattern. **Cheyne-Stokes** respiration alternates between hyperpnea and apnea. The patient experiences 10 to 30 seconds of apnea; then slow and shallow respiration begins, leading up to deep rapid breathing for 10 to 30 seconds, followed by slow, shallow respiration and apnea. Cheyne-Stokes respiration is usually associated with serious, life-threatening conditions.

Check point – work with a partner. Pretend that you need to explain these terms to a patient with little medical knowledge of respiration. One person should explain (in everyday English) the meaning the words in column A; switch roles and have the other person explain the terms in column B.

A	B
apnea	breathing rate
hyperpnea	character of respiration
dyspnea	depth of respiration
orthopnea	emotional reactions
Cheyne-Stokes respiration	hemorrhage
shock	deviation
shallow respirations	life-threatening

Check point – Vocabulary

Instructions: word with a partner to complete the following passage with the words in the box.

antagonist / notorious / inadequate / arrest / exchange / combined / stop / concentration / overdose
hypoventilation / counteract / depressant / cause

In medicine, **hypoventilation** (also known as **respiratory depression**) occurs when ventilation is _____ to perform needed gas _____. It generally causes an increased _____ of carbon dioxide (hypercapnia) and respiratory acidosis. It can be caused by medical conditions, by holding one's breath, or by an _____ of certain drugs.

As a side effect of medicines or recreational drugs, _____ may become potentially life-threatening. Many different CNS _____ drugs such as alcohol, benzodiazepines, barbiturates, gamma-Hydroxybutyric acid (GHB) and opiates can produce respiratory depression; however this is most commonly seen as a _____ of death with opiates or opioids, particularly when they are _____ with sedatives such as alcohol or benzodiazepines. Strong opiates or opioids such as morphine, heroin and fentanyl are _____ for producing this effect; in an overdose, an individual may _____ breathing entirely and go into respiratory _____.

Naloxone is traditionally used to _____ respiratory depression due to opioid overdose. Naloxone is an opioid _____ with binds to opioid receptors and prevents binding of opiates.

Reading

Influenza is a viral infection of the respiratory tract that produces severe discomfort and **debilitation**. Flu should not be **confused** with a **cold**. Influenza produces symptoms that **require** bed rest for several days. There are several types of influenza virus and all have certain characteristics: rapid transmission from person to person, an incubation period of few days, and symptoms that become **severe** in a short time.

Symptoms are generally respiratory in nature but gastrointestinal **involvement** is common with certain types of influenza. Headache and painful respiration are usually the first symptoms. Within the first hours the body temperature **increases** and **remains elevated** for several days. Severe muscle aches, headache, weakness, and chest discomfort **accompany** the fever. **Throat tenderness** and **episodes** of coughing are present in most cases. Symptoms are severe for 3 to 5 days, and then **subside** slowly. Weakness and coughing may persist for 10 days to 2 weeks.

Check point – Vocabulary

Instructions: work with a partner and match the term in column A with its contextual meaning in column B.

A	B
1. debilitation	a. abate / diminish
2. confuse	b. acute / grave / critical
3. cold	c. complement / to go together with something
4. require	d. event / occurrence
5. severe	e. higher than normal
6. involvement	f. need or demand
7. increases	g. pharynx
8. remain	h. rhinovirus or coronavirus infection
9. elevated	i. sensitive / painful
10. accompany	j. to be mistaken for something else
11. throat	k. to be part of / to be included in
12. tenderness	l. to go up
13. episodes	m. to incapacitate
14. subside	n. to stay / to continue being

Check point – Comprehension

Instructions: Work with a partner. Discuss each question in English and decide if the statements are True or False. Circle the letters of the TRUE statements.

- a. Influenza is caused either by virus or bacteria.
- b. The flu is the same thing as a cold.
- c. Fever is not a typical sign of the flu.
- d. Some patients may develop gastrointestinal troubles during influenza.
- e. Influenza is a very infectious disease.
- f. The incubation period for the flu is usually about one month.

Check point – Vocabulary

Instructions: Work with a partner. Draw lines to match the terms in column A with their meanings in column B.

A	B
wheezing	abnormal rapid breathing
hemoptysis	collection of air in the pleural cavity
cyanosis	pertains to inhaling
pleuritic	bluish coloration of the skin
inspiratory	pertains to exhaling
expiratory	related to inflammation of the pleura
pneumothorax	bloody sputum
dyspnea	difficulty in breathing
tachypnea	whistling sound heard during abnormal breathing

Reading

Instructions: Work in pairs. One student reads about **bronchitis**, while the other reads about **pleurisy**, then tell each other about the information you have read. As you talk about your article – try to use the words seen in bold print or synonyms for these words. Don't read your article to your partner – present it in your own words.

Bronchitis: Inflammation of the bronchi may follow influenza. Bronchitis is characterized by a **persistent** cough that is initially **dry**, and then gradually becomes **loose** with production of yellowish or greenish sputum. Treatment **depends** on the cause but involves removing or avoiding any irritants (stopping smoking, avoiding dust, etc.). The patient should be **advised** to drink more fluid and get additional rest. It is best to allow the patient to **cough up** secretions. However, if **coughing paroxysms** become **intolerable** and/or **unproductive**, a cough medicine should be prescribed.

Pleurisy: Pleurisy is the inflammation of the pleura (the membrane covering the lungs and lining chest cavity). Pleurisy is usually caused by a lung infection, such as pneumonia or a viral infection of the pleura. **Rarer** causes include pulmonary embolism, lung cancer, and rheumatoid arthritis. Pleurisy causes **sharp** chest pains during respiration. These pains can sometimes travel to the tip of the shoulder on the involved side. The pain, which is worse during **inhalation**, is caused by the two inflamed membranes **rubbing** against each other. Treatment is directed **towards** the **underlying cause** and can be **supplemented** with analgesic drugs (painkillers) to make the patient more comfortable.

Check point – Vocabulary

Instructions: word with a partner. Draw a line between the medical term in column A and its meaning in column B.

A	B
epistaxis	chronic respiratory disease characterized by sudden attacks of coughing, wheezing, and shortness of breath
asthma	blockage of blood flow through a pulmonary artery by a blood clot
anthracosis	infection of the nose, larynx, and bronchi
pulmonary embolism	fluid accumulation in bronchioles and alveoli
pulmonary edema	coal dust deposits in the lungs due to breathing in smoke or cal dust
upper respiratory infection (URI)	nosebleed

Reading

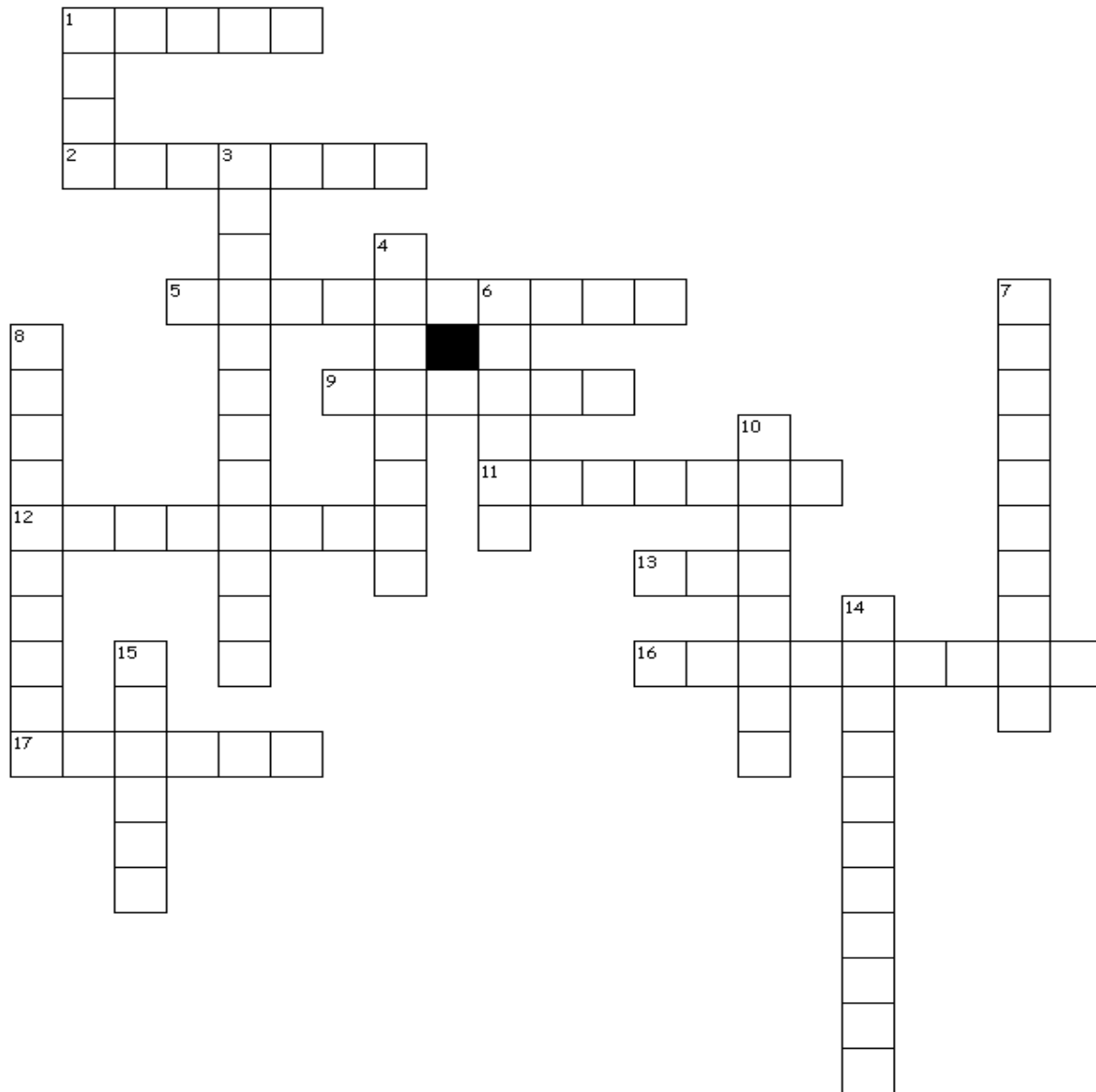
A pleural effusion is an accumulation of fluid between the layers of the pleura. Pleural effusion may be caused by pneumonia, tuberculosis, heart failure, cancer, pulmonary embolism, or mesothelioma (a tumor of the pleura). The effusion may affect one or both sides of the chest. Pleural effusion causes **compression** of the **underlying** lung, leading to breathing difficulty. Diagnosis is confirmed by chest X-ray. To determine the cause of the effusion, some of the fluid may be **aspirated** (removed with a needle and syringe) and examined. A biopsy (removal of a tissue sample for microscopic analysis) of the pleura may also be necessary.

Check point – Phrases

Instructions: word with a partner. Draw a line between words in column A and column B to make two word phrases. You have encountered these phrases in the previous readings.

A	B
pleural	cancer
chest	sputum
breathing	paroxysm
pulmonary	difficulty
nose	embolism
analgesic	arthritis
inflamed	cause
underlying	membranes
rheumatoid	drugs
coughing	bleed
greenish	X-ray
lung	effusion

Cross Word Puzzle



Across	Down
1. a respiratory reflex to expel secretions from the respiratory system	1. a common name for a Rhinovirus infection
2. difficult breathing	3. air in the pleural cavity.
5. substance produced by the lungs to reduce the surface tension of water	4. an episode of coughing
9. quality of a person's voice who has some degree of inflammation of the larynx	6. common name for the pharynx
11. part of the respiratory system where gas exchange takes place	7. to cough up blood in the sputum
12. blue coloration of the skin due to lack of oxygen.	8. inflammation of the bronchial tree
13. common name of influenza	10. inflammation of the pleural membranes
16. nose bleed	14. a collapsed lung
17. a respiratory reflex to expel material from the nose	15. a high pitched sound made when there is a breathing obstruction.

Check point – Vocabulary builder

Instructions: find the word that doesn't belong in the group.

Odd One Out			
Nose	Pharynx	Trachea	Larynx
Persistent	Unrelenting	Constant	Sudden
Deep	Shallow	Heavy	Hard
Elevated	Increased	Depressed	Raised
Accumulate	Build up	Collect	Disperse
Involve	Include	Dismiss	Contain
Rapid	Gradually	Slowly	Progressively
Utilized	Removed	Consumed	Used
Temporary	Chronic	Prolonged	Lengthy
Common	Rare	Typical	Widespread
Obvious	Frank	Overt	Subtle
Bubbly	Foamy	Frothy	Flat
Lung	Tummy	Windpipe	Adam's apple

Self Test

Instructions: Put the terms in the blanks that correspond to the numbers on the figure.

Respiratory Anatomy		
1. _____	⇒ Esophagus	
2. _____	⇒ Laryngopharynx	
3. _____	⇒ Nasal cavity	
4. _____	⇒ Nasopharynx	
5. _____	⇒ Oral cavity	
6. _____	⇒ Oropharynx	
7. _____	⇒ Trachea	

Check point – Talking about the respiratory system

Instructions: work with a partner. Find the words in column B that best complete the sentences in column A. Place the letters of the words in the blanks.

A	B
1. The patient was complaining about a running _____ and a _____ head.	a. aids
2. He was coughing so hard that he broke a _____.	b. attending
3. The premature baby was having difficulty breathing because its lungs weren't _____ enough to be producing _____ yet.	c. bacterial
4. Pneumonia can make the patient feel very short of _____.	d. breathe
5. Pertussis (the "P" in the DPT vaccine) causes a high _____ cough followed by a force inhalation that gives the disease its common name of _____ cough.	e. cases
6. Normally TB is _____ only after close, _____ contact with an infectious individual.	f. discovered
7. People with _____ often have difficulty with a _____ type of fungal pneumonia called Pneumocystis pneumonia which is caused by <i>Pneumocystis carinii</i> .	g. frank
8. Bacteria cause between 5% and 10% of the _____ of sore throat, the rest are mainly viral.	h. immune
9. Strep throat is an infectious _____ infection that is more common in children than in adults.	i. infectious
10. In children, strep throat often _____ with a sore throat, fever, sometime tummy pain, and a red _____ (usually worse under the arms and in skin creases).	j. mature
11. Over use of nasal sprays can lead to _____ blood in nasal secretions when the patient blows their nose.	k. nose
12. In 1976 a new respiratory illness was _____ in a group of patients who had become ill while _____ a legionnaire's convention in Philadelphia. The disease was caused by a bacterium in the <i>Legionellaceae</i> family and became known as Legionellosis.	l. pitched
13. People with colds are most _____ during the first three days of their colds.	m. presents
14. Most cold symptoms are caused by the body's _____ response to the presence of the cold virus infecting the cells of the nasal mucosa or the mucosa over the pharyngeal _____.	n. prolonged
	o. rare
	p. rash
	q. rib
	r. stuffy
	s. surfactant
	t. tonsil
	u. transmitted
	v. whooping

Talking with the Patient

Instructions: Work with a partner. One person should play the role of the doctor while the other plays the role of the patient. The doctor should practice asking clear, concise questions to get information about the outlined items. Once finished, switch roles and repeat. The patient needs to provide realistic information – the patient can pretend to have one of the following: (1) asthma, (2) bronchitis, or (3) pneumonia.

- 1) Introductions
 - a) Give your name and get the patient's name, address, age, etc.
 - b) Ask an "open-ended" question about the patient's CC.
 - i) What problem brought you in today?
 - ii) How can I help you today?
- 2) History of CC.
 - a) Cough
 - i) Onset
 - ii) Severity
 - iii) Duration
 - iv) Productive / Non-productive
 - v) Character (sound quality)
 - vi) Timing (is the cough better or worse at any particular time of day)
 - b) Sputum
 - i) Volume
 - ii) Color (purulent)
 - (1) Green / yellow
 - (2) Rusty
 - (3) Pink frothy
 - (4) Blood stained
 - c) Dyspnea
 - i) Grading scale
 - (1) Not dyspneic (does not exclude respiratory illness)
 - (2) Dyspneic after moderate exertion (climbing steps)
 - (3) Dyspneic after slight exertion (walking)
 - (4) Dyspneic at rest
 - d) Chest pain
 - i) Pleuritic pain (localized, worse on coughing)
 - ii) Thoracic wall pain (ribs, cartilage, muscles)
 - iii) Chest tightness
 - (1) Asthma

- (2) Cardiac problems
- e) Wheeze (expiratory wheeze / common in asthma)
- f) Hemoptysis
 - i) Quantity
 - ii) Nature
 - (1) Fresh (red) or old (dark)
 - (2) Frank or mixed with respiratory secretions
- 3) Past medical history
 - a) Asthma
 - b) Bronchitis
 - c) TB
 - d) Tonsillitis
 - e) Pneumonia
 - f) Strep. throat
 - g) Surgical procedures associated with the respiratory system
- 4) Drug history (drug and dosage)
 - a) OTC drugs
 - b) Prescription drugs
 - i) Inhalers
 - c) Drug allergies
- 5) Family history
 - a) TB
 - b) Asthma
- 6) Lifestyle history
 - a) Smoking
 - i) Quantify
 - b) Drinking
 - i) Quantify
 - c) Diet
 - i) Specify
 - d) Occupation
 - i) Any connection to CC

Self Test

1. The adult respiratory rate is between:
 - a. 60 – 100
 - b. 10 – 12
 - c. 12 – 20
 - d. 30 – 40
2. Hypoxia is:
 - a. Too much oxygen in the blood
 - b. Too little oxygen in the blood
 - c. Too much carbon dioxide in the blood
 - d. Too little carbon dioxide in the blood
3. Naloxone is a drug that can be used to:
 - a. Increase respiratory rates
 - b. Treat Strep throat
 - c. Counteract the effects of morphine
 - d. Cause Bronchodilation
4. The larynx is part of the:
 - a. Upper respiratory tract
 - b. Lower respiratory tract
5. Rhinoviruses and Coronaviruses cause:
 - a. Influenza
 - b. TB
 - c. Common colds
 - d. Strep throat
6. The “P” in the DPT vaccine stands for:
 - a. Pertussis
 - b. Pneumonia
 - c. Pneumothorax
 - d. Pharynx
7. Hypercapnia is:
 - a. Too much CO₂ in the blood
 - b. Too little CO₂ in the air
 - c. Too much CO₂ in the air
 - d. Too little CO₂ in the blood
8. Cheyne-Stokes breathing refers to:
 - a. A respiratory sound
 - b. A respiratory breathing pattern
 - c. A respiratory condition associated with TB
 - d. A treatment method for cystic fibrosis
9. The most common cause of pleurisy is lung cancer.
 - a. True
 - b. False
10. Bronchitis is a condition that frequently follows an influenza infection.
 - a. True
 - b. False

Suggested Mini-Lectures

The mini-lectures listed below can be used as topics for instructors to add additional information to this unit or the topics can be assigned to students for classroom presentations.

- ⇒ Further discussion of the anatomical relationship between the lungs and thoracic cavity.
- ⇒ Further discussion of surfactant
- ⇒ Further discussion of respiratory volumes
 - Tidal volume (TV)
 - Vital capacity (VC)
 - Inspiratory reserve volume (IRV)
 - Expiratory reserve volume (ERV)
 - Residual volume (RV)
 - Total lung capacity (TLC)
- ⇒ Discussion of anatomic dead space
- ⇒ Discussion of gas exchange between alveoli and blood
 - Partial pressures of gases
- ⇒ Discussion of the O₂ – Hb dissociation curve
- ⇒ Discussion of CO₂ transport in the blood
- ⇒ Control of respiration