1

When you breathe, you inspire. When you don't, you expire.

-- Popular Science

All things share the same breath...
the beast, the tree, the man ...
the air shares its spirit with all the life it supports.

-- Attributed to Chief Seattle (Duwamish), 1884

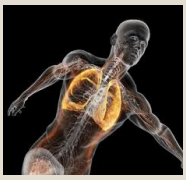
2

INTRO, FUNCTIONS, STRUCTURES

Respiratory System

3

Introduction to the Respiratory System…



- Breath rate is **one of easiest vital signs** to observe.
- Respiration is the process of **extracting oxygen from air and expelling carbon dioxide** and other wastes.
- Our **dependence** on oxygen is extraordinary. After only a few minutes without it, we suffer brain damage and, very shortly, death.
- Blood circulation can only support enhanced health to the extent that blood is well oxygenated and capable of efficiently removing excess CO2.

*** "Normal" breath rate is 12-20 breaths a minute.**

4

4

OXYGEN: Our most immediate need….

- Fresh air contains about 21% oxygen
- Exhaled air contains about 16% oxygen
- There is enough surface area in our lungs that only 5% of our resting energy is needed to supply the whole body with adequate oxygen

5

Functions of the Respiratory System…

- Facilitation of **oxygen and carbon dioxide exchange**
- Olfaction – our primal, deeply evocative **sense of smell**
- Speech – air movement causes **vibration of our vocal cords**
- Homeostasis
  - **Oxygen levels** for all uses (including blood acid/alkaline regulation) are maintained
  - **Movement of blood and lymph** are facilitated
  - **Excess heat is removed** from the body

6

6

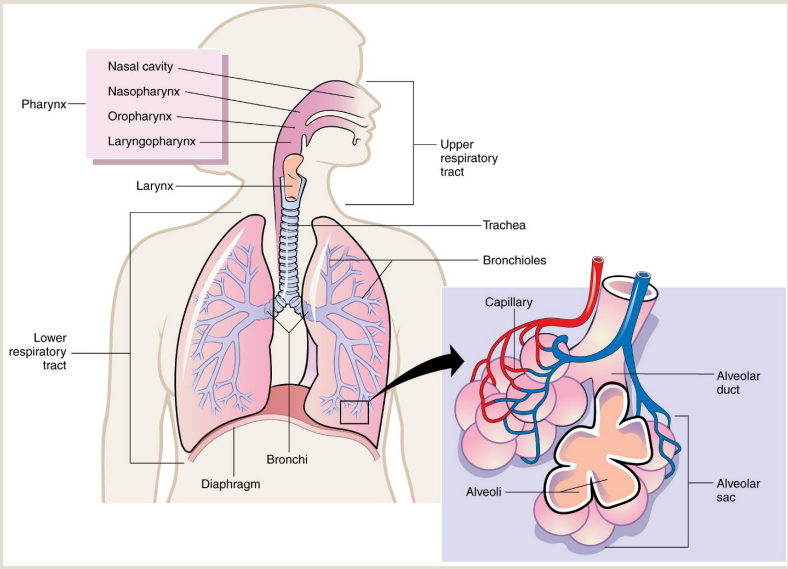
Structures of the Respiratory System…

- Alveoli
- Bronchi
- Bronchioles
- Larynx
- Lungs
- Nasal Cavity
- Nose
- Pharynx
- Respiratory diaphragm
- Trachea

7

7

The Respiratory System



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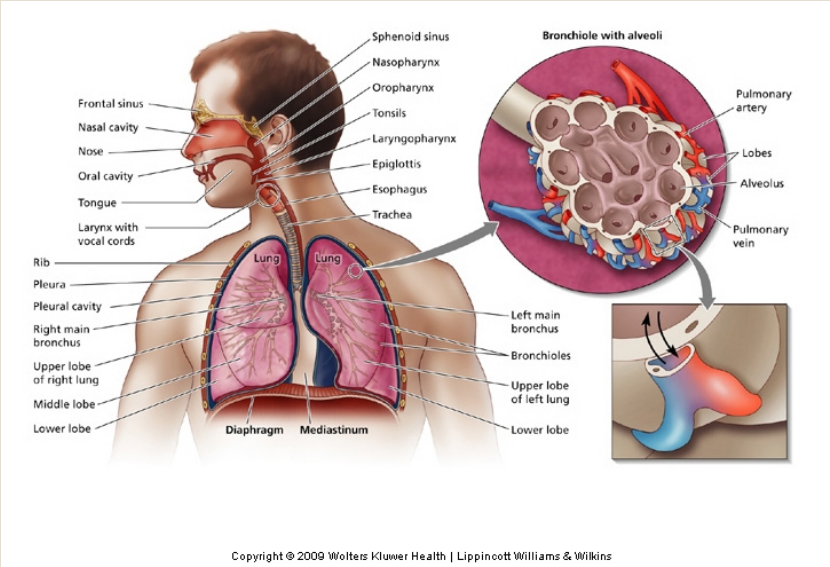
8

Another View of Respiratory System Structures



9

Upper Respiratory Tract…

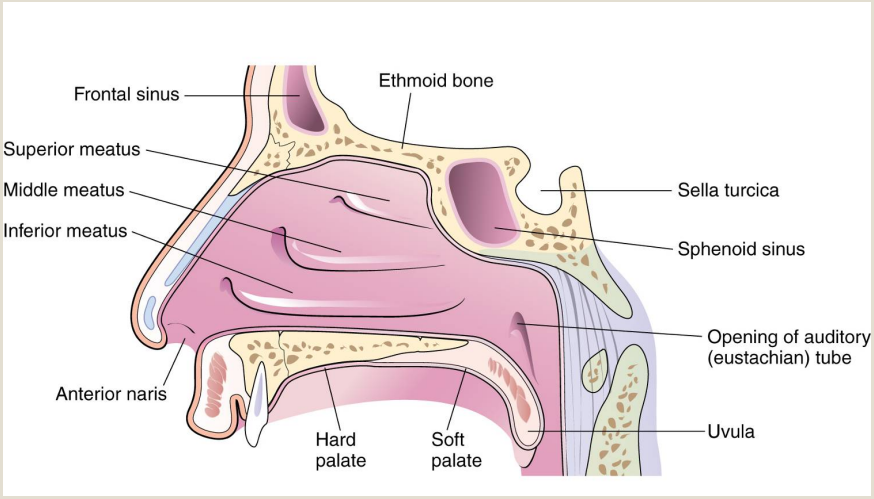
- **Nose**—mostly hyaline and elastic cartilage, but bone in center and bridge
- **Nasal cavity**—just behind nose
  - Cilia—hairlike projections on outer surface of some cells
  - Goblet cells—produce mucus to moisten air
  - Contains openings for the paranasal sinuses

10

10

Upper Respiratory Tract…

Nasal Cavity



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11

Upper Respiratory Tract…

Paranasal Sinuses

***sinus* = L, a recess, cavity, or channel**

- **Four sinus cavities**: air-filled cavities around the nose within the skull.
- Named for the **bones** that they are located close to:
  - Frontal sinus
  - Sphenoidal sinus
  - Ethmoidal sinus
  - Maxillary sinus
- **Connected to one another and to the nasal cavity.** Each sinus has an opening—called the ostium—that connects it to the nasal cavity.

12

12

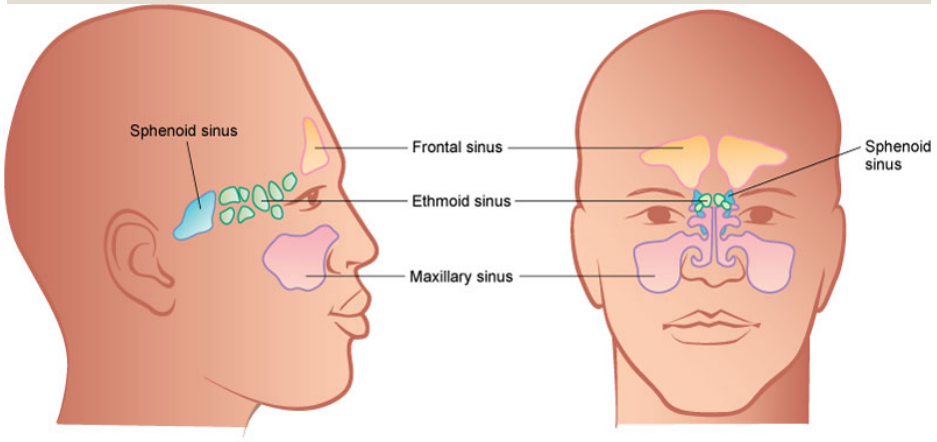


Fig. 28-3. Sinuses.

13

Upper Respiratory Tract…

Pharynx

- Also called the throat
- Muscular tube about 5 in. long
- Shared by the respiratory and digestive tracts

Given what we know about medical terminology, the medical term for sore (inflamed) throat would be…?

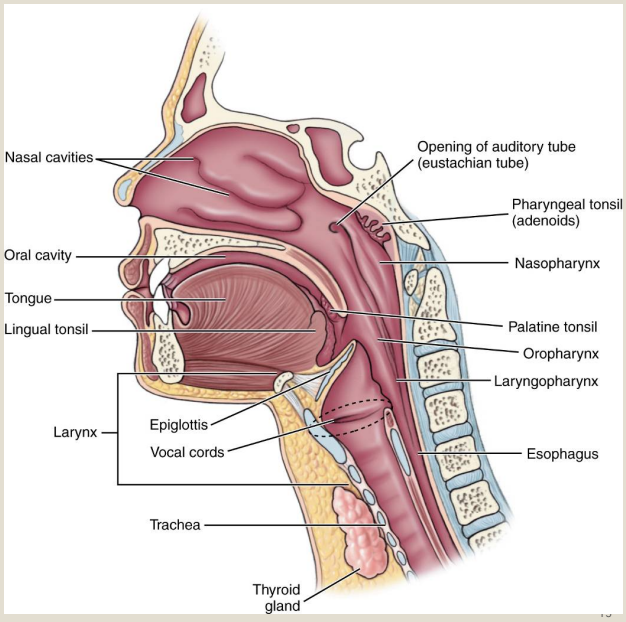
Pharyngitis

14

14

Upper Respiratory Tract…

Pharynx



15

Upper Respiratory Tract…

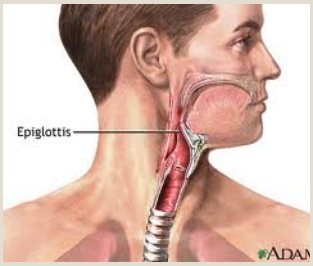
- **Larynx** (voice box)—formed by series of cartilages
  - **Vocal cords**—elastic cords attached to the rigid cartilage of the larynx; the tighter (shorter) the cords are pulled during speech, the higher the sound produced; those of us with naturally shorter cords (smaller adults and children) have higher voices; men generally have larger and longer larynxes than women and, therefore, usually, lower voices
  - **Epiglottis**—closes trachea during swallowing and is the guardian of the airways

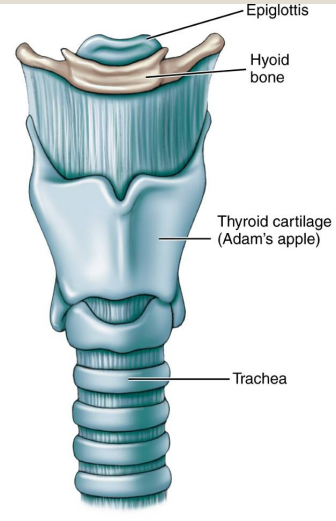
16

16

Upper Respiratory Tract…

Larynx





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17

Upper to Lower Respiratory Tracts…

The upper respiratory tract ends with the larynx: the lower respiratory tract begins with the trachea. Notice the relative position of the trachea (respiratory) and the esophagus (digestive).

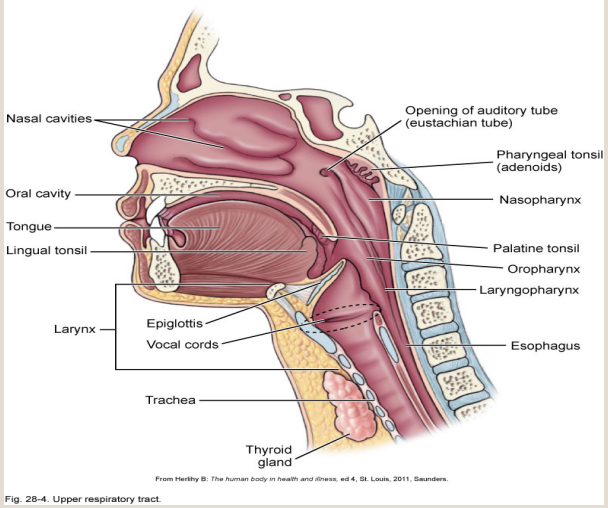

Fig. 28-4. Upper respiratory tract.

18

Lower Respiratory Tract ↓…

- **Trachea** (windpipe)—tube about 5 to 10 inches long leading from larynx to upper chest
- Consists of 16 to 20 C-ring cartilages that both keep the trachea open and allow the esophagus to expand into the trachea when food is swallowed

19

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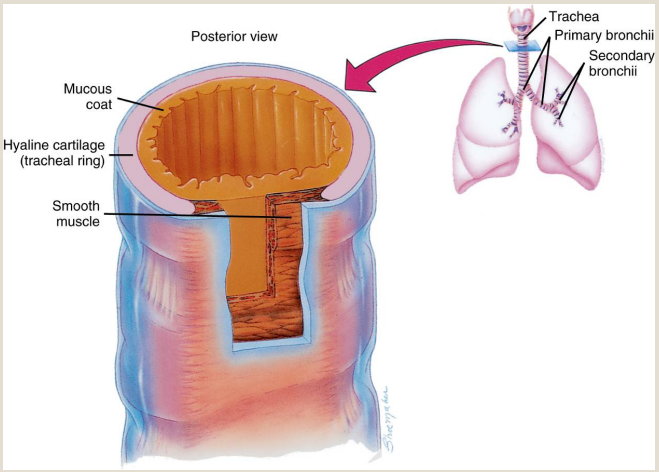
Lower Respiratory Tract ↓…

Trachea ↓



20

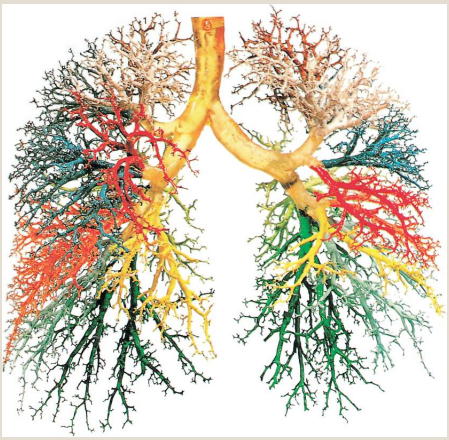
20

Bronchi ↓

Lower Respiratory Tract ↓ …

- Passageways leading from trachea to lungs
  - **Bronchioles**—smaller divisions of bronchi that branch into the lungs

The **right bronchus is wider and has a steeper downward angle** than the left. Because of this, **foreign bodies more often lodge on the right side.**



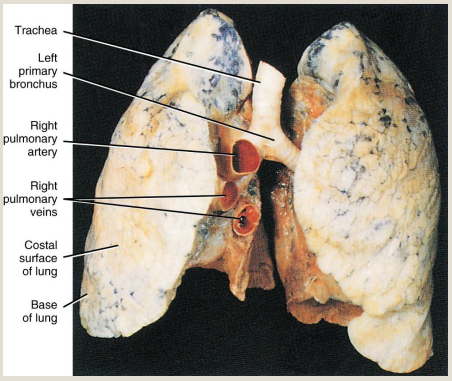
The bronchial tree… our tree of life. 21

21

Lungs ↓

Lower Respiratory Tract ↓ …

- **Lungs**—spongy, elastic organs that fill most of the thoracic cavity and are main organs of respiration
  - External surfaces are covered with **serous membranes**
  - The **pleural membrane** encases both lungs and secretes fluid that reduces friction



Gross anatomy of the lungs: superficial view, lungs of NON-smoker.

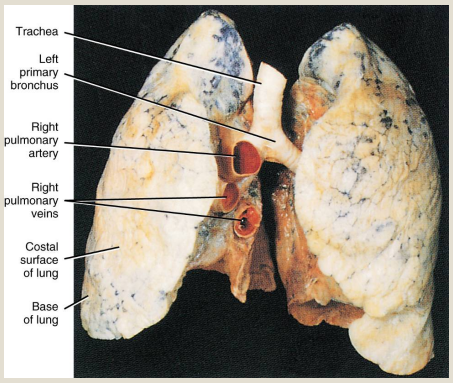
22

22

Lungs ↓

Lower Respiratory Tract ↓ …

- **Lungs** are structured to fight off or survive infection
  - Two (left) or three (right) **lobes**
  - Tubes lined with mucous membranes; cilia move the **mucous blanket** upward for expulsion
  - **Cough reflex** to remove irritants



Gross anatomy of the lungs: superficial view, lungs of NON-smoker.

23

23

Lower Respiratory Tract, cont'd. ↓

- **Alveoli**—tiny, limp-walled sacs attached to alveolar ducts; the sacs are stretched by muscles pulling on thorax walls; they snap back to original shape on exhalation; elasticity is key to health
- **Alveolar sacs**—two or more alveoli that share a common opening
- **Surfactants**—phospholipids that assist in gas exchange in the alveoli and contribute to elasticity of pulmonary tissue

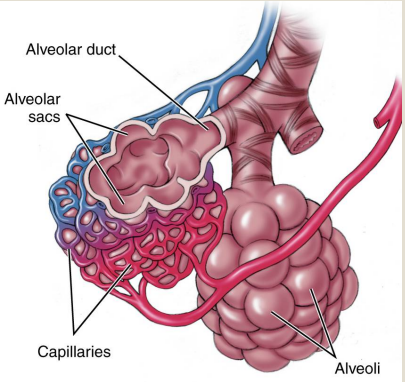
24

24

Lower Respiratory Tract ↓…

Alveoli ↓

Say "*al-**vee**-uh-li*"
or "*al-**vee**-uh-lis*"



Each **alveolus** has its own capillary net for gas exchange.

The first breath is the toughest…

25

25

When lungs fail to develop fully…

- The lungs are the last organs to develop *in utero*, so we often hear about premature infants born without "fully developed lungs."
- The cells that secrete **surfactant** are among the last to develop *in utero*. Without enough surfactant, there is too much friction within the pleural cavity for the lungs to inflate easily.

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Foundation of the Respiratory Tract

- **Respiratory diaphragm**—muscle that forms an airtight seal between the thoracic and abdominal cavities; the main actor in moving air into and out of the body
- The diaphragm also provides additional expulsive power for such activities as sneezing, coughing, vomiting, urination, defecation, and expelling a fetus from the uterus…!

If an individual lives to be age 72, that person will have taken more than 530 million breaths of air.

27

27

Review…

So… what's the order of these structures with regard to passage of air on inhalation?

- Alveoli
- Bronchi
- Larynx
- Nasal Cavity
- Lungs
- Nose
- Pharynx
- Trachea
- Bronchioles

28

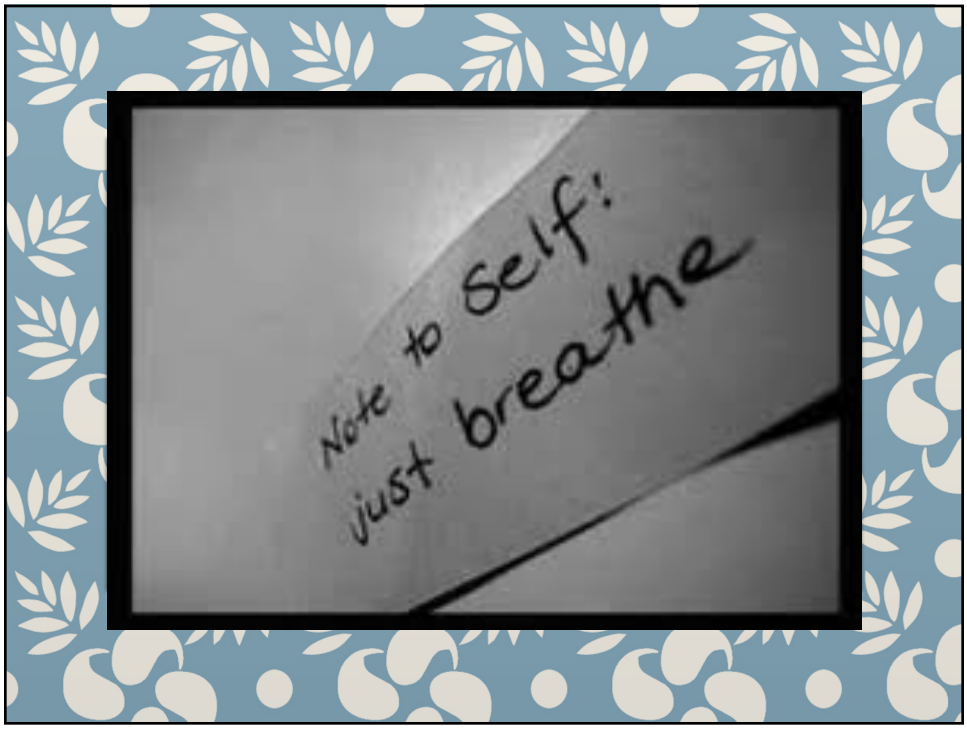
28

Air Conduction Pathway

Nose
↓
Nasal cavity
↓
Pharynx
↓
Larynx
↓
Trachea
↓
Bronchi
↓
Bronchioles
↓
Lung/Alveoli ← → Lung/Alveoli

29

29



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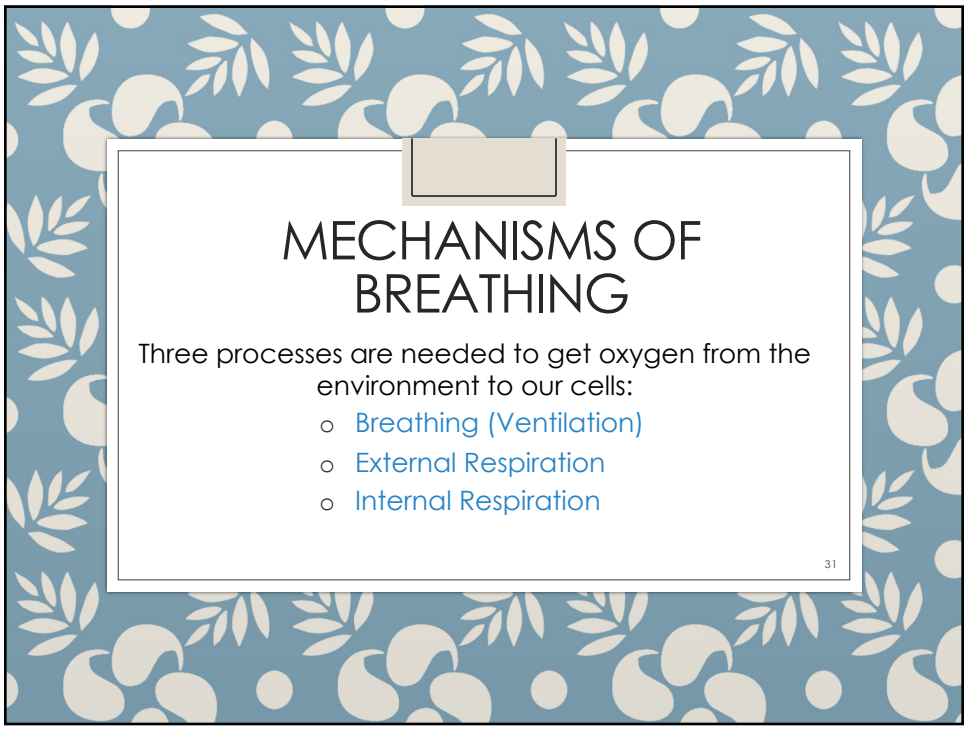

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Breathing

- Also termed **pulmonary ventilation**
- **Muscular contraction and relaxation are required to move air in and out**
- Two phases:
  - **Inspiration or inhalation**
  - **Expiration or exhalation**

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Inspiration

- The **diaphragm** contracts and descends toward the abdominal cavity, lowering the "floor."
- The **external intercostals and serratus posterior** expand the "walls" of the thoracic cavity.
- The **scalenes** lift the "roof."
- As the space of the thoracic cavity is enlarged, **air flows into the depressurized lungs.**

33

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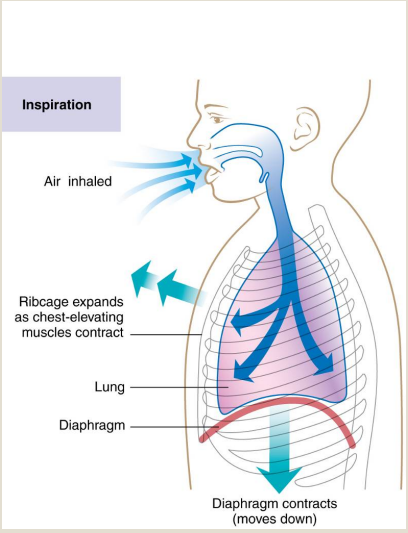
Mechanisms of Breathing



34

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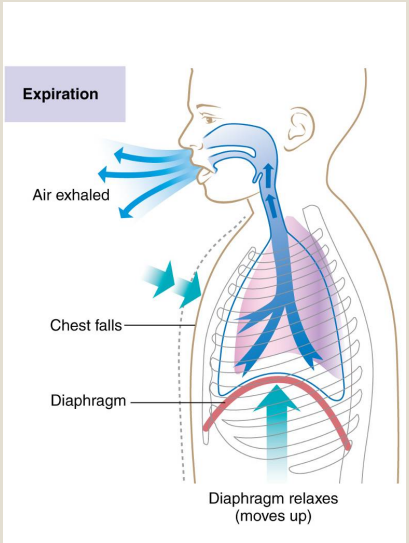
Expiration

- The diaphragm relaxes and ascends; other muscles also relax, and the size of the thoracic cavity decreases, increasing internal pressure.
- This expels air back into the atmosphere.
- We can add force to exhalation by using additional muscular effort.

35

35

Mechanisms of Breathing



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Breathing

- Adults respire about 12 to 20 times per minute
- Children breathe about twice as fast as adults
- An increase or decrease in body temperature increases or decreases respiration rate, respectively

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BREATH AND MASSAGE

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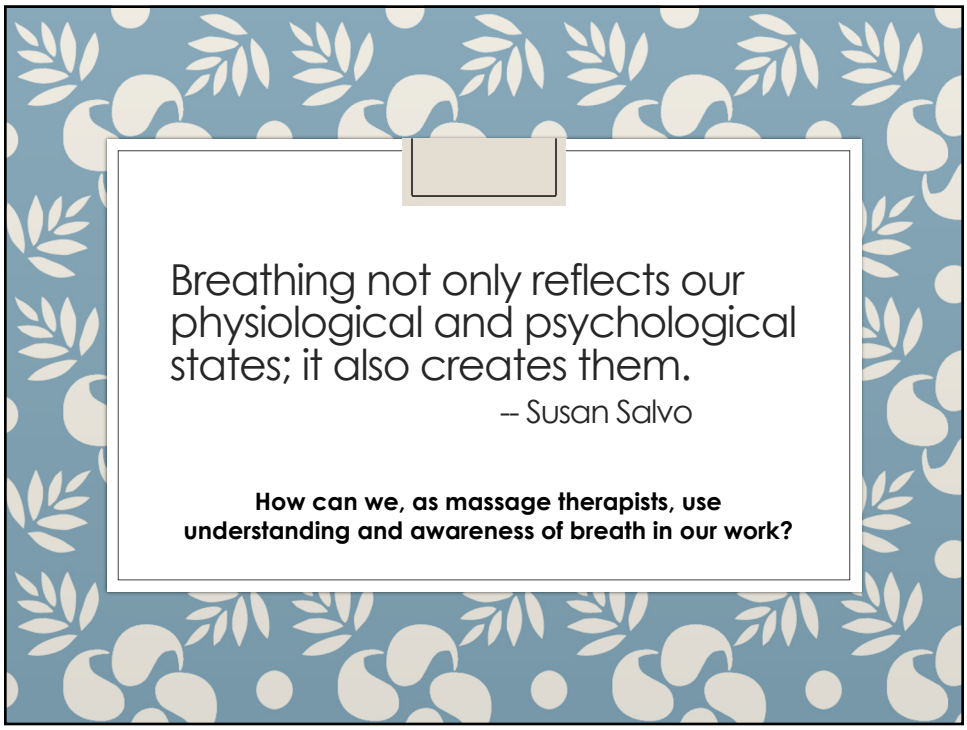

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Breath and Massage…

Normal, not forced, expiration does not require any muscular effort. This is often the best time for the application of direct, sustained pressure on trigger points or points of direct, sustained pressure. Ask your client to exhale as you apply pressure and release pressure during inspiration.

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Breath and Massage…

- Healthy adult breath rhythm in quiet breathing at rest is ~ 2 seconds of inhalation and ~3 seconds for exhalation: that's about 12 respirations per minute.
- Be aware that long, slow breaths **may not be** the most relaxed. Controlled breathing is often no more desirable than shallow, partial breathing.
- Our goal is **to invite the client to relax, to let go of control**, and **to abandon limitation of any sort and bring awareness to the process**. Breath may assume a variety of patterns to support relaxation/healing/optimal balance within the body. Trust the body's wisdom when clients are in relaxed states.

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A FEW MORE TERMS AND CONCEPTS…

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Breathing: some common terms…

- **Vital capacity**: the total amount of air that can forcibly be inspired or expired from lungs in one breath
- **Dyspnea**: labored or difficult breathing
- **Hypoxia**: inadequate oxygen at the cellular level
- **Anoxia**: lack of oxygen, either locally or systemically

Hypoxia can create a condition called "**cyanosis**," characterized by bluish tinges in body color…

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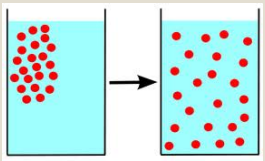
External and Internal Respiration

- Diffusion—tendency of molecules to move from areas of higher concentration to areas of lower concentration



- Two processes
  - External respiration
  - Internal respiration

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External Respiration

- Also called **pulmonary respiration**
- Refers to the **gas exchange in the alveoli** between blood and air
- O2 diffuses from the air through the alveolar wall
  - O2 then binds to hemoglobin to be transported to cells throughout the body
- At the same time, CO2 diffuses from blood into the air contained in the alveoli
  - The air (and CO2) is then exhaled

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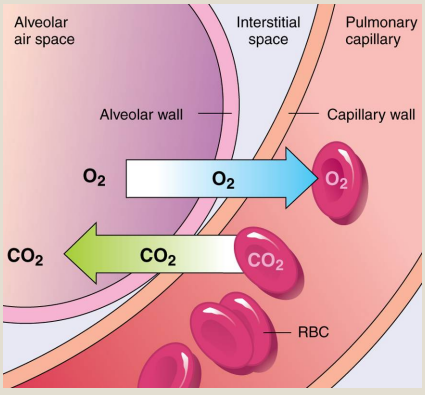
45

External Respiration



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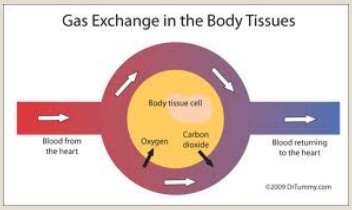
Internal Respiration

- Also called **tissue respiration**
- Refers to the gas exchange between blood and tissues
- O2 diffuses from the blood into the cells
- CO2 diffuses from the cells into the blood



47

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Modified Respiratory Air Movements (:-0 :`-(:-))

- Coughing
- Crying
- Hiccups
- Laughing
- Sighing
- Sneezing
- Snoring
- Sobbing
- Yawning

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Review…

- Gas exchange between air and blood in the alveoli is called…
  - External respiration
- Inadequate oxygen at the cellular level is called…
  - Hypoxia
- For a healthy person, the phase of breathing that requires only relaxation is…
  - Expiration or exhalation
- Some upper respiratory tract structures are…
  - Nasal cavity; sinuses; pharynx; nose; vocal cords; epiglottis; larynx
- The bronchi branch into smaller structures called…
  - Bronchioles
- The wider, steeper bronchus is on the ____.
  - Right
- The _____ lung has three lobes.
  - Right
- Muscles of inhalation include…
  - Diaphragm, serratus posterior, scalenes, external intercostals

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CONDITIONS OF THE RESPIRATORY SYSTEM

50

Respiratory System Conditions

- ***Infectious Respiratory Disorders***
  - Acute bronchitis
  - Common cold
  - Influenza
  - Covid-19
  - Pneumonia
  - Sinusitis
  - Tuberculosis

Why is it important to understand possible respiratory pathologies in your clients?
In the case of asthma, you would want to make sure there are no allergens in your workspace that could trigger an attack. In general, understanding these pathologies will help you give more effective massages and may keep you from doing harm if clients have certain conditions.

- ***Chronic Obstructive Pulmonary Diseases***
  - Chronic bronchitis
  - Emphysema
- ***Other Respiratory Disorders***
  - Cystic fibrosis (in Werner 7th, p. 587)
  - Lung cancer
  - Laryngeal cancer
  - Asthma
  - Apnea (in Werner 7th, pp 246-9)
  - Effects of Smoking (Werner 6th)

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Pathological Conditions of the Respiratory System

- **Obstructive Sleep Apnea**
  - Temporary cessation (usually ≤15 seconds) or absence of breathing; occurs during sleep; airways collapse; treated with Positive Airway Pressure therapy or dental devices to change jaw position
- **Effects of smoking**
  - Cigarette smoking eventually destroys alveoli and reduces gas exchange
  - Also destroys respiratory cilia, leading the body to produce excess mucus
  - Smokers tend to be sick more often because excess mucus breeds bacteria
  - Early teen smokers may never develop completely mature lungs

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Pathological Conditions of the Respiratory System

- **Laryngitis**
  - Inflammation of larynx that results in hoarseness or loss of voice.
  - Caused by respiratory infections or irritants or over- or mis-use.
  - Folds swell so much that they cannot open/close or vibrate properly.
  - Massage is fine unless the laryngitis is caused by an infectious disease… then OK in recovery phase if overall condition permits.
- **Pleurisy or Pleuritis**
  - Inflammation of pleural membranes
  - Stabbing pain during breathing, caused by friction of membranes rubbing against one another
- **Hay Fever (see Allergic Sinusitis, later)**
  - Any allergic reaction of the nasal mucosa
  - Symptoms: sneezing, swelling, mucous discharge, itching and watering of eyes

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Pathological Conditions of the Respiratory System…

Common Cold

- ***Definition***
  - Over 200 viruses that attack upper respiratory system
  - Also called upper respiratory tract infection (URTI)
- ***Demographics***
  - An estimated 1 billion infections each year in the United States
  - Children most at risk: 6–10 colds a year
  - Adults: 2–3/year
  - Elderly: <2/year

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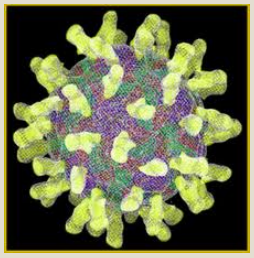
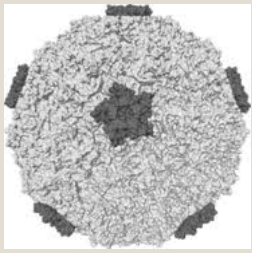
Common Cold, cont'd.



- ***What causes it?***
  - Rhinoviruses (110 subtypes), Coronaviruses, Adenoviruses, Respiratory syncytial viruses
  - Viruses enter nose: good growth medium
  - Access cells in lymphoid tissue of adenoids
  - Incubation is short: 12 hours
  - Immune system attacks infected cells; causes most symptoms
  - Does *being* cold *cause* cold? Maybe



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Common Cold, cont'd.

- ***Signs and Symptoms***
  - Runny nose, sneezing, sore throat, dry coughing, headache, mild fever
  - Less than 2 weeks
- ***Complications***
  - Bacterial infections of ear, larynx, sinuses
  - May go to lungs: bronchitis, pneumonia
    - Especially if lungs are compromised, e.g., chronic obstructive pulmonary disease (COPD)

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Common Cold, cont'd.

- ***Prevention***
  - Virus can be airborne or picked up by hand from contaminated surfaces
  - **Prevent spread by washing hands, disposing of tissues, staying home when sick**
- ***Treatment***
  - No antibiotics!
  - Rest, fluids, humidifier
  - Over-the-counter (OTC) drugs can reduce symptoms, may *increase* communicability
  - Vitamin C, Echinacea, lysine, zinc, licorice root, hydrotherapy
- ***Massage***
  - Safest after symptoms have peaked
  - May be more severe if massage occurs early in infection
  - May exacerbate symptoms for a day or so if massage occurs during healing—get permission!

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Pathological Conditions of the Respiratory System…

Influenza

- ***Definition***
  - Viral infection of respiratory tract: different from viruses that cause colds
- ***Demographics***
  - 5–20% population has flu 1/year
  - Children more at risk than adults
  - For young, elderly, and immunocompromised, can be dangerous
  - 200,000 hospitalizations annually
  - 36K to 50K deaths/year

In the ten months between September 1918 and June 1919, 675,000 Americans died of **influenza and pneumonia.** When compared to the number of Americans killed in combat in World War I, World War II, Korea, and Vietnam combined- 423,000- it becomes apparent that the influenza epidemic of 1918-1919 was far more deadly than the war which it accompanied. For comparison, as of 12-2-20, deaths from **Covid-19** in the US total 279,845. Current projections expect between 470,000 and 654,000 US deaths by mid-March 2021.

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Influenza, cont'd.

- ***What Causes the Flu?***
  - Virus gains access (airborne or via hands)
  - Invade mucus-producing cells in respiratory tract
  - Immune system kills infected cells, making most symptoms
  - Incubation 2–3 days; communicable before symptoms appear
  - Peak of communicability about day 4; continues through recovery
  - Type A: most virulent, associated with epidemics, pandemics
  - Type B, C: stable, less severe
  - Type A infects other animals (birds, pigs, etc); mutates easily
- ***Signs and Symptoms***
  - Looks like a bad cold
    - Respiratory irritation, high fever 3 or more days
    - Muscle, joint pain
  - May last 2 weeks
  - No such thing as stomach flu

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Influenza, cont'd.

- ***Complications***
  - Acute bronchitis, pneumonia
- ***Treatment***
  - NO antibiotics
  - Rest, liquids
  - OTC drugs may control symptoms, don't shorten duration
  - Antiviral medications
    - Amantadine, rimantadine, Tamiflu, Relenza
  - Flu vaccine: made several months ahead to predict active virus; must be updated yearly
- ***Massage***
  - May exacerbate symptoms during recovery: ask permission!
  - Clients may be contagious during recovery
  - Gentle, non-demanding work is generally recommended

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Pathological Conditions of the Respiratory System…

Covid-19

Covid-19 Pathophysiology
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7169933/

- ***What causes it?***
  - Novel coronavirus (SARS-CoV-2)
  - Virus particles enter the body, generally into the upper respiratory tract.
  - The life cycle of the virus with the host (us!)consists of the following 5 steps: attachment, penetration, biosynthesis, maturation and release. Once viruses bind to host receptors (attachment), they enter host cells through endocytosis or membrane fusion (penetration). Once viral contents are released inside the host cells, viral RNA enters the nucleus for replication. Viral mRNA is used to make viral proteins (biosynthesis). Then, new viral particles are made (maturation) and released.

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Covid-19

- ***Signs and Symptoms***
- Symptoms may appear 2-14 days after exposure to the virus. People with these symptoms may have COVID-19:
  - Fever or chills
  - Cough
  - Shortness of breath or difficulty breathing
  - Fatigue
  - Muscle or body aches
  - Headache
  - New loss of taste or smell
  - Sore throat
  - Congestion or runny nose
  - Nausea or vomiting
  - Diarrhea

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Covid-19

- ***Signs and Symptoms, cont'd***
- Look for emergency warning signs for COVID-19. If someone is showing any of these signs, seek emergency medical care immediately:
  - Trouble breathing
  - Persistent pain or pressure in the chest
  - New confusion
  - Inability to wake or stay awake
  - Bluish lips or face

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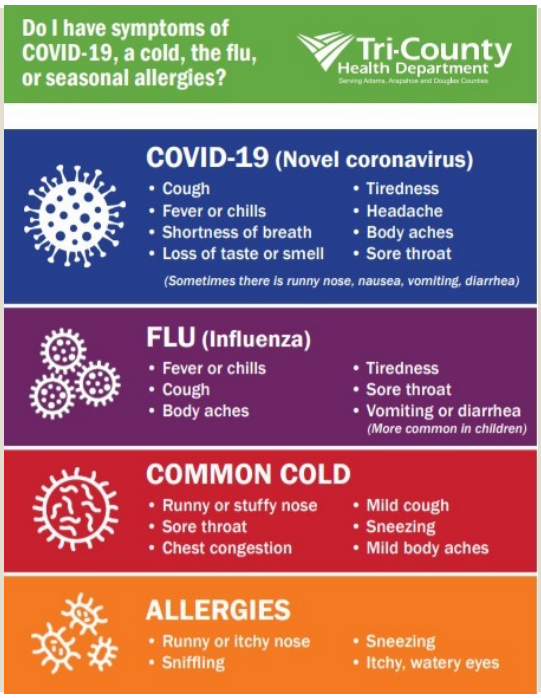
Covid-19

- ***Signs and Symptoms, cont'd.***



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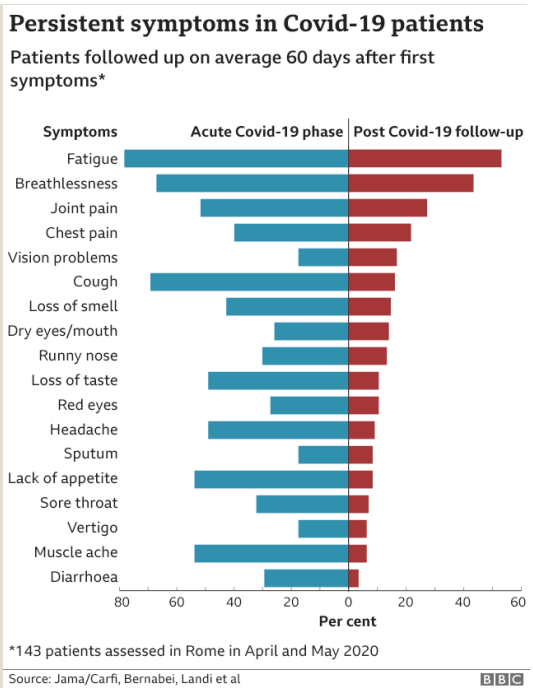
Covid-19

- ***Acute vs. Persistent Symptoms***



65

Covid-19

- ***Complications and Long-Term Effects***
- Our understanding of these is still developing. Complications appear to affect one person in six. The following is a partial summary of what is now recognized:
  - Increased risk of heart failure or other heart problems; acute cardiac injury
  - Lung damage (alveoli) that significantly impairs breathing/O2 & CO2 exchange; acute respiratory failure or Acute Respiratory Distress Syndrome
  - Neurological damage (in 1 in 7 of those infected [10-2020})
  - Pneumonia
  - Acute liver and/or kidney injury
  - Secondary infection
  - Septic shock
  - Disseminated Intravascular Coagulation
  - Blood Clots
  - Multisystem Inflammatory Syndrome in Children
  - Chronic Fatigue

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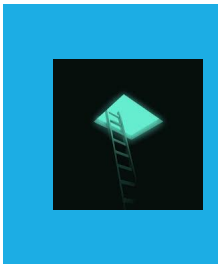

Covid-19

- ***Treatment***
  - *Current treatments include systemic steroids (to suppress immune system over-response) and antibody therapy*
  - *Much of hospitalization treatment is supportive: oxygen, ventilation support, etc.*
- ***Prevention***
  - *Several vaccines appear to be highly effective. Preliminary data suggest that protective effects are relatively long-lasting. Widespread distribution of vaccines in the US will likely not occur until the second half of 2021.*

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Covid-19

- ***Massage?***
- *Because of the highly contagious and potentially serious nature of the disease, every precaution must be taken not to spread the virus and to protect oneself and one's clients from infection.*
- *Emphasis has shifted away from surface (fomite) transmission (at least in the medical and scientific communities); but rigorous surface hygiene protocols are still recommended by massage therapy organizations/standard bearers.* https://www.sfchronicle.com/health/article/Coronavirus-FAQ-How-long-does-it-stay-on-15152021.php

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Covid-19

- ***Massage, cont'd.***
- *Emphasis has shifted toward all measures that may reduce airborne viral transmission.*
  - *Screen clients repeatedly for symptoms or exposure prior to sessions.*
  - *Increase ventilation with fresh air during sessions and facilitate air exchange in session room after session is complete.*
  - *Increase high-quality (HEPA) filtration of air.*
  - *All parties must wear medical-grade masks (not cloth face coverings) at all times during session.*
  - *As much communication as possible must occur prior to the actual session.*
  - *Talking during sessions must be kept to a bare minimum.*
  - *Risks of massage for those with long-term effects have not been fully established.*

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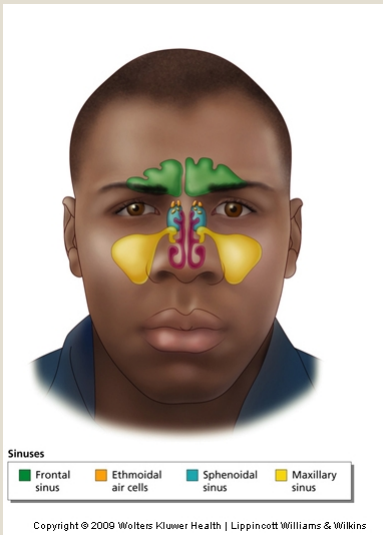
Pathological Conditions of the Respiratory System…

Sinusitis

- ***Definition***
  - Inflammation of mucous membranes in nose, sinuses
  - Can be from infection or allergies
- ***Demographics***
  - 37 million infections/year in the United States
- ***What causes it?***
  - Cilia in sinuses break down in response to infection, pollutants
  - Non-infectious sinusitis: allergic rhinitis: sinuses are inflamed without infection; may increase risk of infection
  - Infectious sinusitis
    - Acute (complication of viral infection, lasts 6–8 weeks)
    - Chronic (less severe, longer-lasting symptoms)



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Sinusitis, cont'd.

Causes, continued…

- Infectious agents
  - Viruses and bacteria: cold, flu, *Streptococcus pneumoniae*, *Haemophilus influenzae*, bacteria freed by dental work
  - Fungi and bacteria: Colonies of fungi may create growth medium for bacteria as well
- Other causes of infectious sinusitis
  - Structural problems: Deviated septum, nasal polyps
  - Environmental irritants: cigarette smoke, indoor and outdoor pollutants, cocaine, other irritants
  - Other conditions: severe cavities, asthma

Signs and Symptoms

- Depends on cause
- Severe headache, worse with bending over
- Local pain, edema
- Fever, chills with acute infection
- Sore throat, coughing (postnasal drip)
- Mucus clear with allergies; streaked or opaque with infection

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Sinusitis, cont'd.

- ***Treatment***
  - Humid air, fluids, saline wash of sinuses
  - Drugs: antibiotics for bacterial infection; short-term decongestants; steroid spray
  - Surgery to correct structural anomalies
- ***Massage***
  - Indicated for allergies if client is comfortable on table (may require some adjustment in position or duration)
  - Circulatory massage is contraindicated for acute, untreated infection
  - Gentle or lymphatic work may be helpful

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Pathological Conditions of the Respiratory System…

Asthma

- ***Definition***
  - Chronic disorder of the bronchioles that interferes with breathing
  - Triggered by irritants, stress
  - Membranes swell and secrete mucous
- ***Demographics***
  - 26 million in United States diagnosed; 7 million children
  - 2 million emergency room visits; 15,000 deaths/year
  - Statistics continue to climb
  - Highest incidence and severity among African Americans

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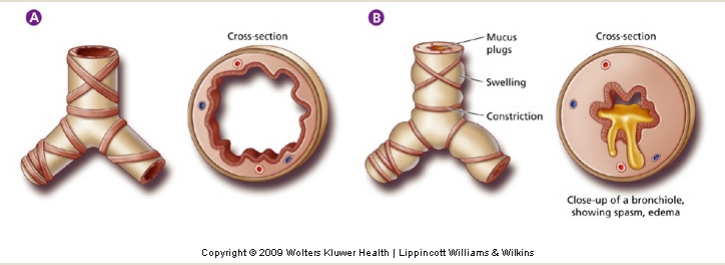
Asthma, cont'd.

- ***How does Asthma occur?***
- Hyperreactive bronchioles
  - Chronic inflammation, waiting for trigger
  - Dilation (sympathetic) followed by constriction (parasympathetic)
  - Membranes swell, secrete excessive mucus
- Breathing, especially exhalation, becomes labored
- Triggers: pet allergens, cockroach waste, cigarette smoke, dust mites, viral infections, breathing cold dry air, exercise, ??

Normal and Asthmatic Bronchioles



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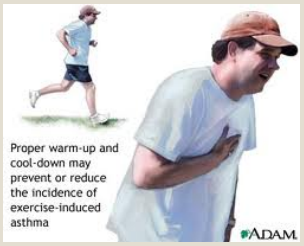
Asthma, cont'd.

- *Mild, intermittent asthma*
  - Episodes < twice/week; little impact on activity
- *Mild, persistent asthma*
  - >Once/week; up to 1/day; impacts activity
- *Moderate, persistent asthma*
  - At least 1/day, plus nighttime episodes 1+/week
- *Severe, persistent asthma*
  - Episodes most days and nights; activity severely limited



- ***Signs and Symptoms***
  - Dyspnea, wheezing, coughing
  - Hardest to expel air
  - Variants include…
    - Exercise induced: with exertion
    - Silent: no transition, just sudden shortness of breath
    - Cough variant: coughing is only symptom
  - During episode: panic symptoms, cyanosis

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Asthma, cont'd.

- ***Treatment***
  - Manage exposure to stimuli
  - Recognize warning signs of attack
  - Short term: beta-agonist inhalers (bronchodilators)
  - Long term: inhaled or oral steroids (anti-inflammatories)
  - Allergy shots
- ***Massage***
  - Contraindicated during episode; otherwise, can be helpful for breathing efficiency
  - Be mindful of potential triggers in massage setting: essential oils, hyperallergenic oil, perfume, etc.
  - Adapt for medication side effects
  - Attend to muscles of breathing to increase efficiency
  - Help to manage anxiety

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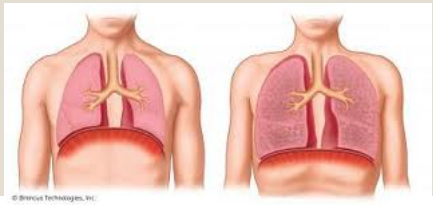
Pathological Conditions of the Respiratory System…

Chronic Bronchitis and Emphysema: COPD

- ***Definition***
  - Chronic Obstructive Pulmonary Diseases. Both are progressive.
  - Chronic Bronchitis: long-term irritation of the bronchi and bronchioles
  - Emphysema: Over-inflated, non-elastic, non-functional alveoli
- ***Demographics***
  - 32 million people in the United States diagnosed with COPD
  - Much more common in those > 65 yrs old
  - Causes include smoking and exposure to pollutants



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Chronic Bronchitis and Emphysema

- Both conditions develop slowly
- Neither condition can be cured, though progression can be slowed sometimes
- Patients are more susceptible to devastating effects with normal colds or flu
- COPD kills about 134,000 Americans a year (third leading cause of death)
- Chronic Bronchitis often precedes Emphysema
- Removal of the causative irritant is the most important step in slowing progression of the diseases

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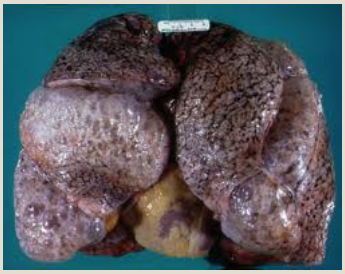
Emphysema Images

Distended and Dysfunctional Alveoli in Emphysema

Appearance of Lung with Emphysema



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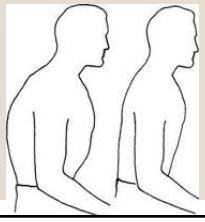
Emphysema

- More effort to breathe, to exhale
- Respiration rate slows → acidosis, high carbon dioxide, spasm of pulmonary arteries
- Right-sided heart failure: can't pump adequate blood through resistant pulmonary circuit
- Respiratory/circulatory collapse

- ***Signs and Symptoms***
  - Can take years to develop
  - Looks like normal symptoms of aging
  - Pain with breathing, shortness of breath, dry cough, wheezing
  - Weight loss (too much energy consumed in breathing)
  - Exhalation takes longer
  - Barrel chest



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Chronic Bronchitis and Emphysema

- ***Massage***
  - Major risks include possibility of cardiovascular problems, difficulty lying flat, and secondary respiratory infection. Adapt with modality choices and positioning.
  - If active infection is present, delay massage until it has resolved.
  - Gentle and sometimes specific massage that addresses the muscles of breathing (intercostals, scalenes, serratus posterior, and diaphragm) can allow patients to feel more energized and less fatigued.

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Respiratory Conditions and Positioning

- **What are the benefits of a semi-reclining position?**
  - *A 30-degree incline promotes sinus drainage for clients who have upper respiratory congestion.*
  - *For clients with emphysema or chronic bronchitis, this position can make breathing less difficult by requiring the lungs to support less weight.*
  - *For clients with lower respiratory congestion (as in cystic fibrosis, for example), postural drainage, with the head lower than the chest, may be beneficial.*

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Lung Cancer

Pathological Conditions of the Respiratory System…

- ***Definition***
  - Growth of malignant cells in the lungs
- ***Demographics***
  - 224,000 new diagnoses/year
  - 160,000 deaths/year
  - Number 1 cause of death by cancer (more deaths than from breast and colorectal and prostate cancers combined)
- ***Causes and Progression***
  - 85–90% related to tobacco exposure
  - Other factors: radon, asbestos, uranium, arsenic, air pollution, other carcinogens
  - Orderly pattern of death and repair in epithelial cells of lungs is disrupted
  - Abnormal cells accumulate in patches
  - Lots of circulatory and lymph vessels allow cells to travel before a significant tumor forms
    - Mediastinal lymph nodes, liver, bone, skin, adrenal glands, brain are frequent sites for metastasis
  - There may be a higher genetic predisposition factor than previously thought

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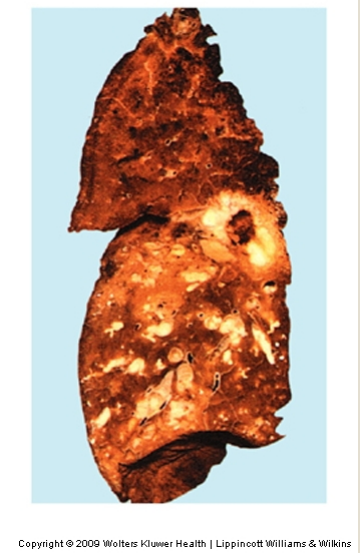
A few images of lung cancer…



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Lung Cancer, cont'd.

- ***Risk Factors***
  - Smoking
  - Exposure to asbestos, coal miners, toxic chemicals
  - 15,000 deaths/year in people who never smoked
    - Exposure to other cigarette smoke, genetic predisposition
- ***Signs and Symptoms***
  - **No early signs**
  - Smoker's cough, bloodstained phlegm, chest pain, wheezing, and possibly shortness of breath
  - Tumor may put pressure on other structures: brachial plexus, vena cava esophagus, larynx, phrenic nerve (supplies the diaphragm)

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Lung Cancer, cont.

- ***Diagnosis***
  - Radiography, CT, MRI
  - Sputum analysis is inconsistent
  - No accurate, noninvasive early detection methods
  - Usually metastasizes before detection
- ***Treatment***
  - Surgery, radiation, chemotherapy
  - Photodynamic therapy may become practical; other biological therapies in development
- ***Massage***
  - Useful to deal with challenges of cancer treatment; respect limitations of client and risks associated with treatment protocols

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Pathological Conditions of the Respiratory System…

Other Conditions to Browse in Werner…

- Pneumonia
- Tubercolusis
- Cystic Fibrosis
- Larnygeal Cancer

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Review…

Match the following…

Runny nose, sore throat, mild fever	Surfactants
Hyperreactive bronchioles	Influenza
High fever for 3 or more days; muscle aches	Sinuses
Non-functional alveoli; difficulty exhaling	OSA
Reduce friction in the lungs	Common Cold
Air-filled cavities in the skull	Asthma
Cessation of breathing during sleep	Emphysema
Semi-reclining position	Chronic Bronchitis

88

Review…

Match the following…

Runny nose, sore throat, mild fever	Common Cold
Hyperreactive bronchioles	Asthma
High fever for 3 or more days; muscle aches	Influenza
Non-functional alveoli; difficulty exhaling	Emphysema
Reduce friction in the lungs	Surfactants
Air-filled cavities in the skull	Sinuses
Cessation of breathing during sleep	OSA
Semi-reclining position	Chronic Bronchitis

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