Timely Medical Topics (OLLI catalog number 1365)

Richard Wendel MD, MBA Moderator

Spring OLLI virtual course

Wednesdays from 11am-12pm starting April 29th

Course syllabus

1. April 29: The Eyes
2. May 6: The Ears and Semicircular Canals
3. May 13: The Human Immune System
4. May 20: Genetics and the Cell
5. May 27: The Skin
6. June 3: Palliative Pain Management
7. June 10: Interpretation of Blood Chemistries and other testing results
8. June 17: Changes in Medicine in the past 65 years

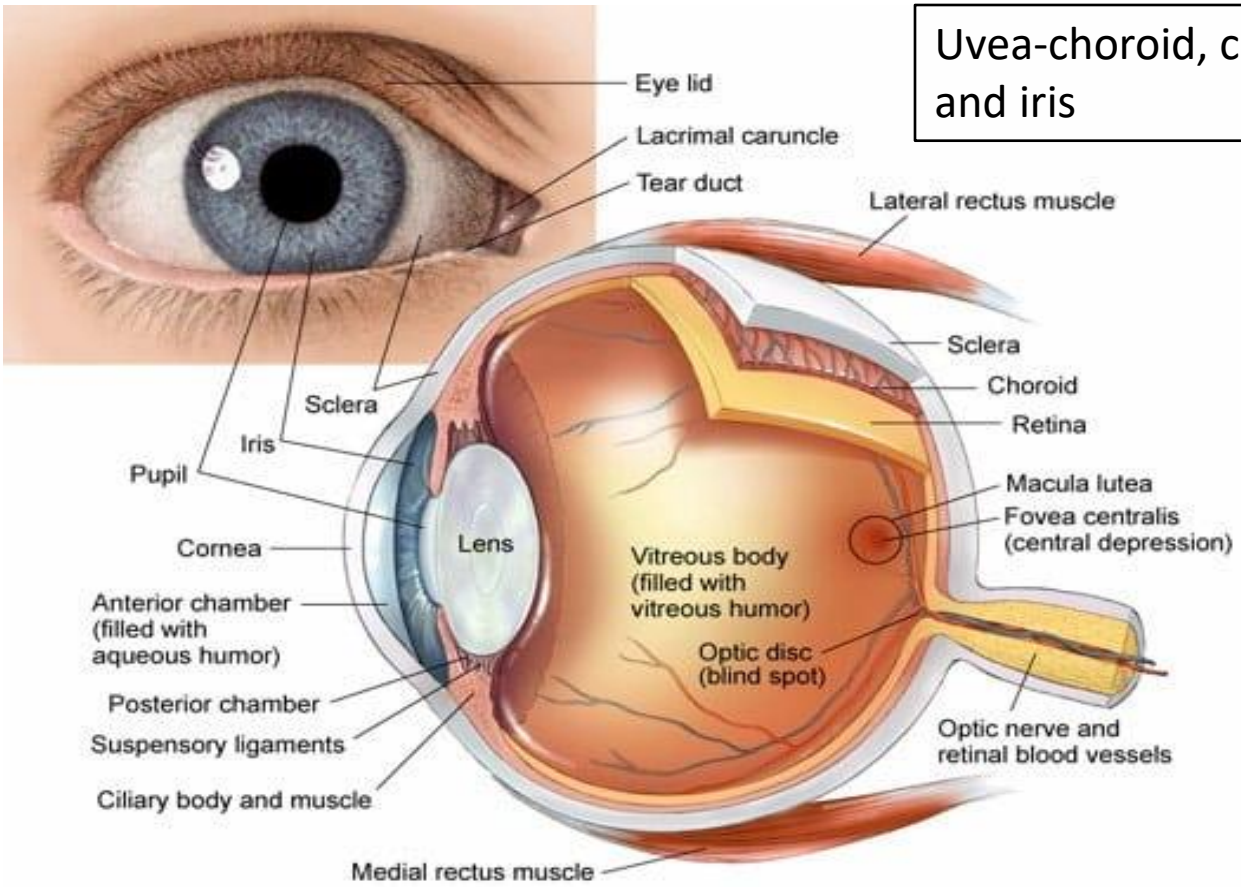
There are approximately 200 PowerPoint slides that I will be using in this course. The file is too large to be emailed. If you want a file containing all the slides, I will be sending the file via the Internet through the OLLI office, but the surest way for you to have a complete set is to send me a thumb or flash drive through the mail at my home and I will copy the file and send it back.

My home address is:

Richard Wendel
6722 Hammerstone Way
Cincinnati, Ohio 45227

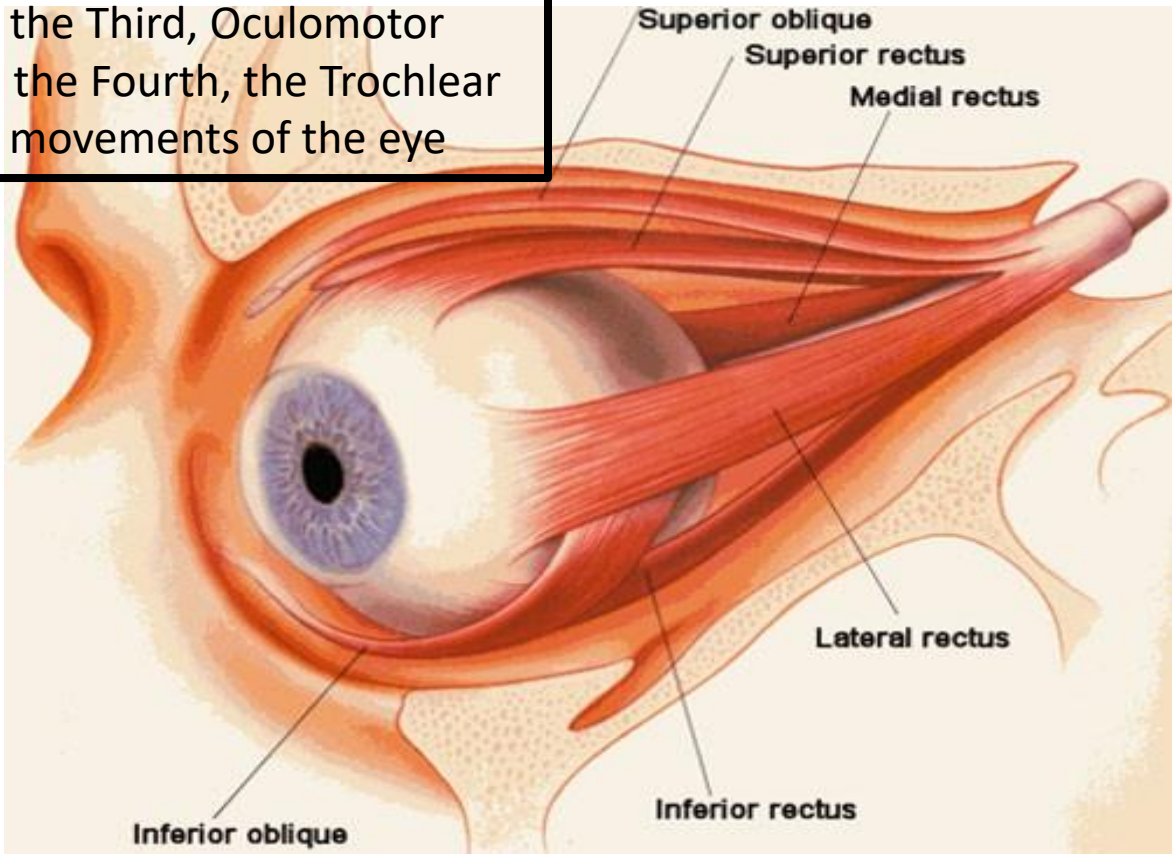
Vision/The Eye

Uvea-choroid, ciliary body and iris



Right Eye (viewed from above)

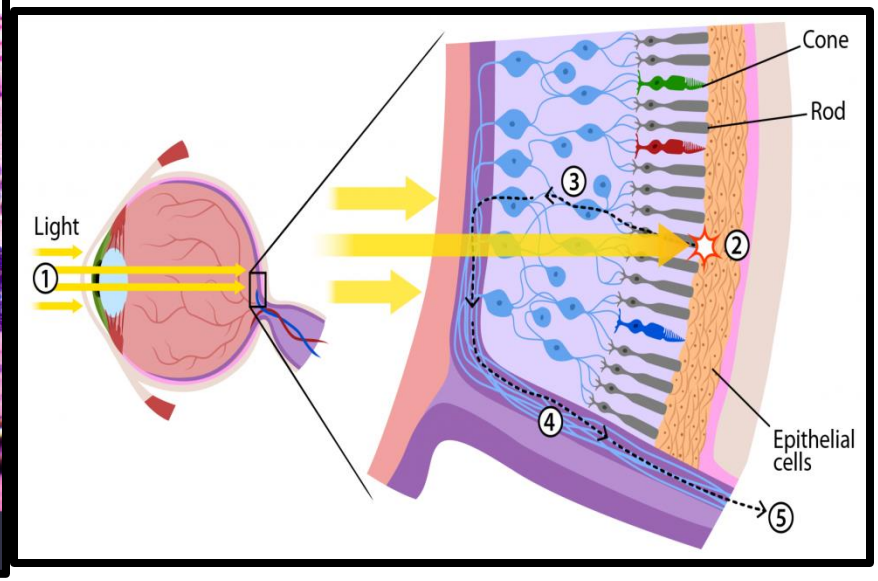
The Sixth Cranial nerve, the Abducens, the Third, Oculomotor nerve, and the Fourth, the Trochlear supply the movements of the eye



Rods are responsible for vision at low light levels (scotopic vision). They do not mediate color vision, and have a low spatial acuity (night vision)
Cones are active at higher light levels (photopic vision), are capable of color vision and are responsible for high spatial acuity. The central fovea is populated exclusively by **cones**.

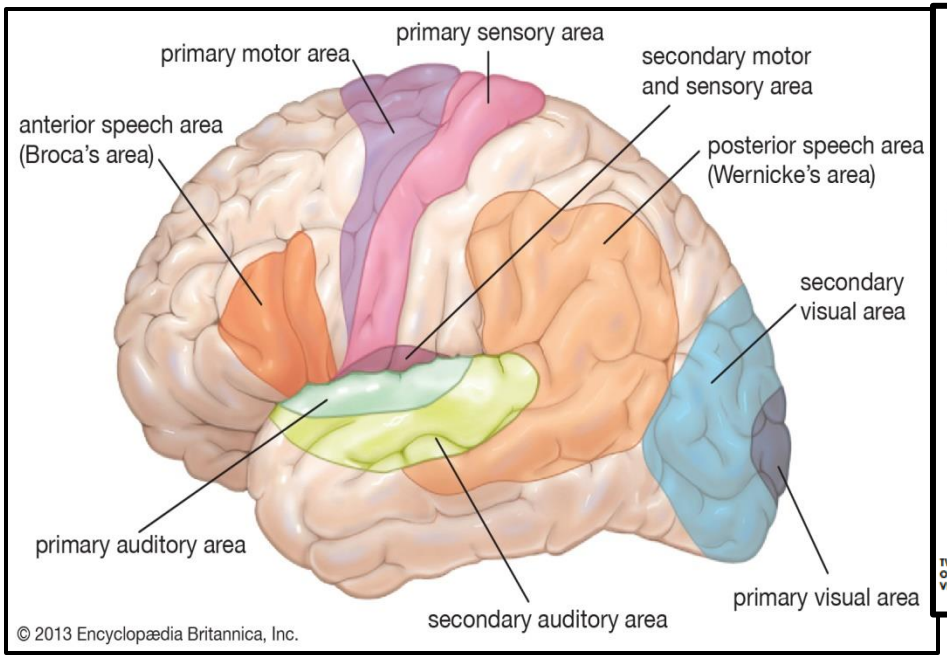
The Retina

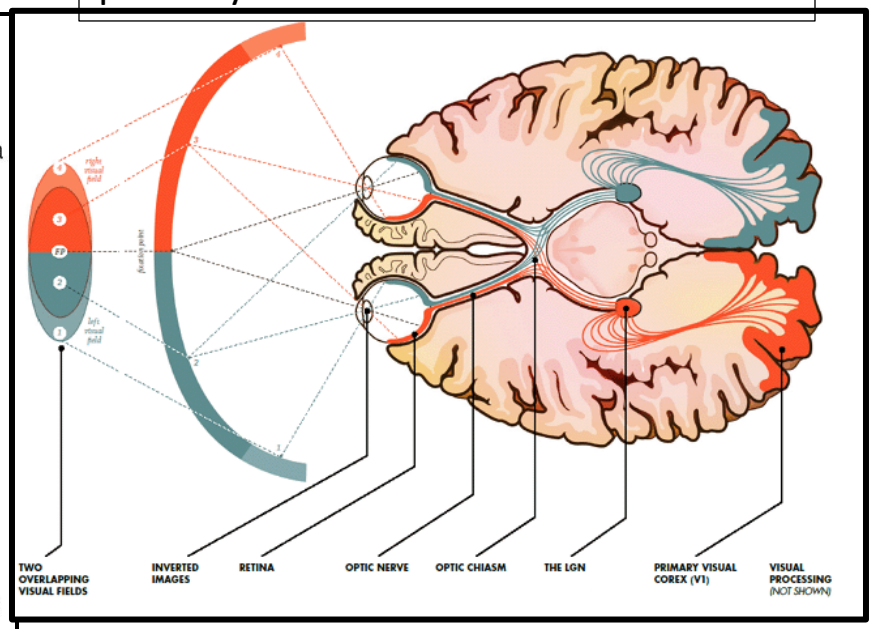

alamy stock photo
E7067J
www.alamy.com


Light
1
2
3
4
5
Cone
Rod
Epithelial cells

Primary Pathway of sight in the brain.

The **lateral geniculate nucleus** is a relay center in the thalamus for the visual pathway. .





Diseases of the Eye

- **Age-Related Macular Degeneration (wet and dry)**.
- **Cataract**.
- **Diabetic Retinopathy**.
- **Glaucoma**.
- **Amblyopia/strabismus: lazy eye** is an imbalance in the muscles, common and can result in loss of vision in weak eye. Good treatment.

Macular Degeneration

- Leading cause of severe, permanent vision loss in people over age 60. It happens when the small central portion of your retina, called the **macula**, wears down.

Wet vs. Dry Macular Degeneration

- **Dry:** People with this may have yellow deposits, called Drusen bodies, blind spots in the center of your vision. As that gets worse, you might lose central vision.
- **Wet: Blood** vessels grow from underneath your macula blind spots in the center of your vision. As that gets worse, you might lose central vision.

Symptoms:

- Worse or less clear vision. Your vision might be blurry, and it may be hard to read fine print or drive.
- Dark, blurry areas in the center of your vision
- Rarely, worse or different color perception

Treatments: Reserved for those 10-15 percent of patient with wet MD.

- **Anti-angiogenic drugs.** Your doctor injects these medications into your eye. They stop new blood vessels from forming and block the leaking from the abnormal vessels that cause wet macular degeneration.
- **Laser therapy.** Your doctor may suggest a treatment with high-energy laser light that can sometimes destroy actively growing abnormal blood vessels.
- **Photodynamic laser therapy.** It's a two-step treatment that uses a light-sensitive drug to damage your abnormal blood vessels.
- Conservative: supplement formula that has vitamins C and E, beta-carotene, zinc, and copper.

Coping with Macular Degeneration

- **Ask your eye doctor to check your eyeglass prescription.** If you wear contacts or glasses, be sure your prescription is up to date. If new glasses don't help, ask for a referral to a low vision specialist.
- **Use magnifiers.** A variety of magnifying devices can help you with reading and other close-up work, such as sewing. Such devices include hand-held magnifying lenses or magnifying lenses you wear like glasses.
- You may also use a closed-circuit television system that uses a video camera to magnify reading material and project it on a video screen.
- **Change your computer display and add audio systems.** Adjust the font size in your computer's settings. And adjust your monitor to show more contrast. You may also add speech-output systems or other technologies to your computer.
- **Use electronic reading aids and voice interface.** Try large-print books, tablet computers and audio books. Some tablet and smartphone apps are designed to help people with low vision. And many of these devices now come with a voice recognition feature.
- **Select special appliances made for low vision.** Some clocks, radios, telephones and other appliances have extra-large numbers. You may find it easier to watch a television with a larger high-definition screen, or you may want to sit closer to the screen.
- **Use brighter lights in your home.** Better lighting helps with reading and other daily activities, and it may also reduce the risk of falling.
- **Consider your transportation options.** If you drive, check with your doctor to see if it's safe to continue doing so. Be extra cautious in certain situations, such as driving at night, in heavy traffic or in bad weather. Use public transportation or ask a friend or family member to help, especially with night driving. Make arrangements to use local van or shuttle services, volunteer driving networks, or rideshares.
- **Get support.** Having macular degeneration can be difficult, and you may need to make changes in your life. You may go through many emotions as you adjust. Consider talking to a counselor or joining a support group. Spend time with supportive family members and friends.

Cataracts; that ubiquitous condition that makes ophthalmologists wealthy

Age related and by the age of 75 the number rises to half the U.S Population. A hereditary predisposition with risk factors of diabetes, HPT, obesity and smoking.

Symptoms:

- Blurred vision
- Double vision
- Seeing halos
- Changes in night vision and depth perception
- Sensitivity to sunline causing your vision to decrease
- Difficulty distinguishing colors
- Difficulty reading

Treatment of cataracts

- Cataract surgery is outpatient microsurgery with topical anesthesia. The surgery only takes a few moments and for most, no stitches are required, and recovery is swift with only eye drops for a two weeks and restricted activity for 10-14 days. The lens implants block ultraviolet light.
- After cataract surgery, most need reading classes unless they choose a presbyopia-correcting IOLs or different focal length lenses in each eye (one correcting for close and one for distant vision).

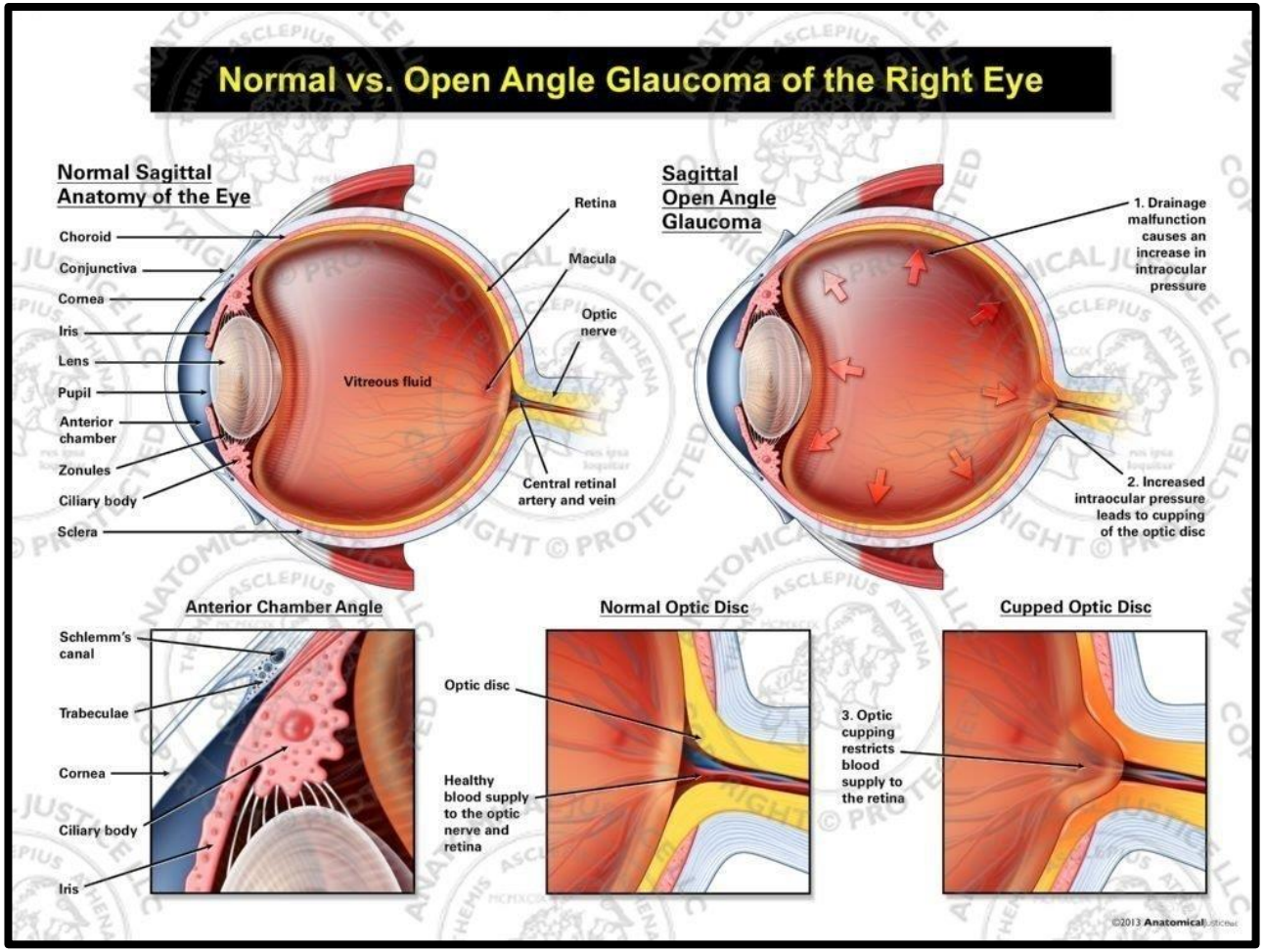
Everyone needs glasses: accept your fate. Reading glass power is measured in units called diopters. The lowest strength is usually 1.00 diopters. Glasses go up in strength by factors of . 25 (1.50, 1.75, 2.00). The strongest glasses are 4.00 diopters.

- A nearsighted/myoptic person sees near objects clearly, while objects in the distance are blurred.
- A farsighted/hyperoptic person sees faraway objects clearly, while objects that are near are blurred.
- Most everyone suffers from presbyopia or farsightedness due to aging

Glaucoma; open angle, closed-angle and acute glaucoma (true emergency)

- Age >60 and family history are risk factors and high intraocular pressure can cause damage to the optic nerve that is irreversible and can go unrecognized or silent and this fact encourages patients to see their ophthalmologist or optometrist on a regular basis.
- Treatment; a wide range of eye drops, and number of types of surgery (trabeculectomy, laser, tubes)

The Anatomic cause of glaucoma and effect: (normal intraocular pressure is 12 to 22 mm Hg)



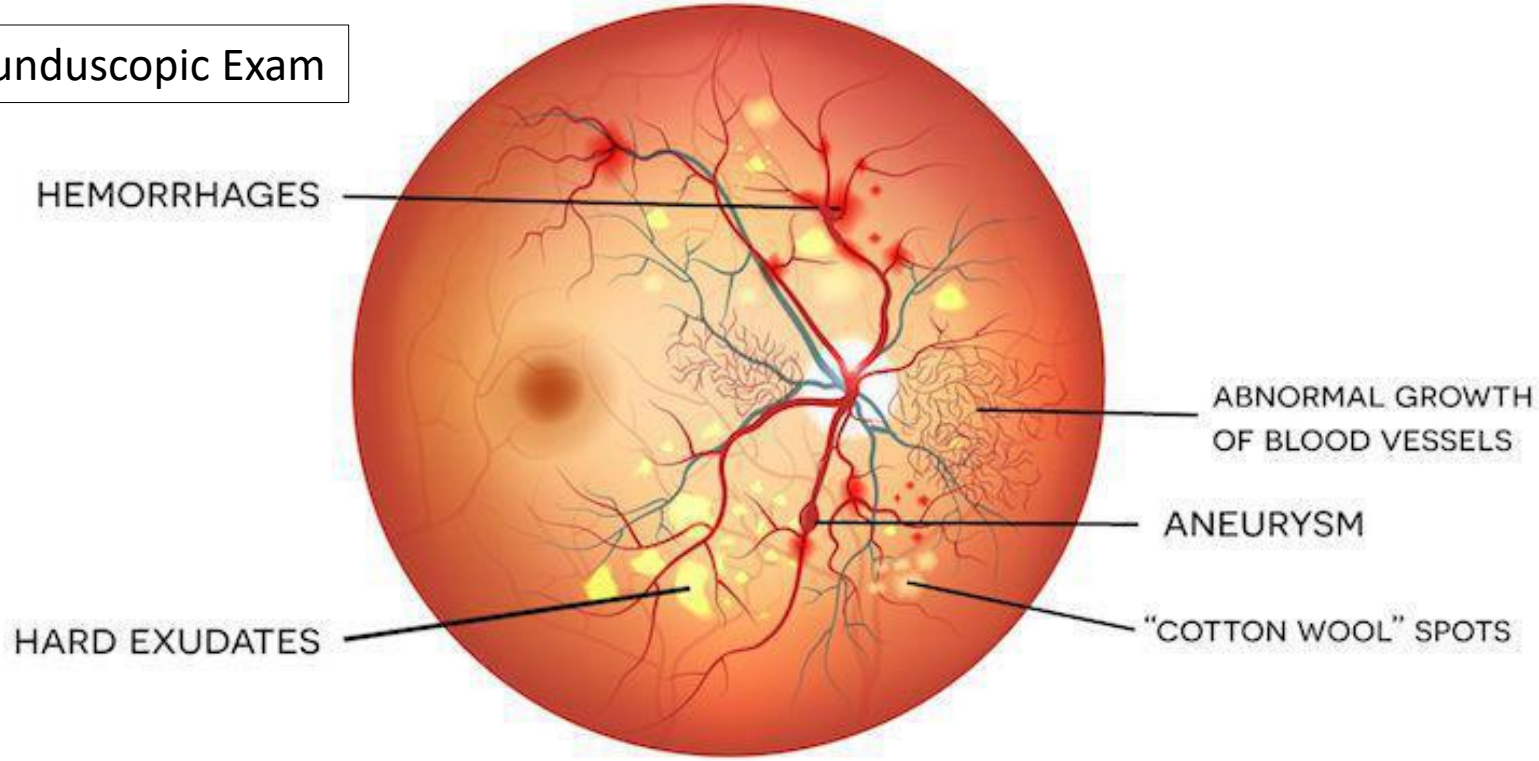
Retinal detachment describes an emergency situation (rapid onset) in which a thin layer of tissue (the **retina**) at the back of the eye pulls away from the layer of blood vessels that provides it with oxygen and nutrients. **Retinal detachment** is often accompanied by flashes and floaters in your vision, blurred vision, gradually reduced side (peripheral) vision and a curtain-like shadow over your visual field

Predisposing causes; aging, family history, extreme myopia, previous eye surgery or trauma, traction due to scar tissue and exudates.

Treatment: Many complex interventions; early use of laser, freezing and injecting a bubble of air. Repair is very successful in the majority of patients especially if it is caught early.

Diabetic Retinopathy is caused by damage to the blood vessels in the retina (Diabetics have an increased incidence of cataracts and glaucoma)

Funduscopic Exam



Nystagmus and Scotomata

What Causes Nystagmus?

It may be a sign of another eye problem or medical condition. Nystagmus is caused by many different things, including:

- Hereditary
- Cataracts or strabismus
- Strokes, MS, or Meniere's disease
- Head injuries
- Inner ear problems and some medications

Scintillating scotomas (flashing lights) as an aura for migraine, and scotomas can occur in a wide range of neurologic disorders.

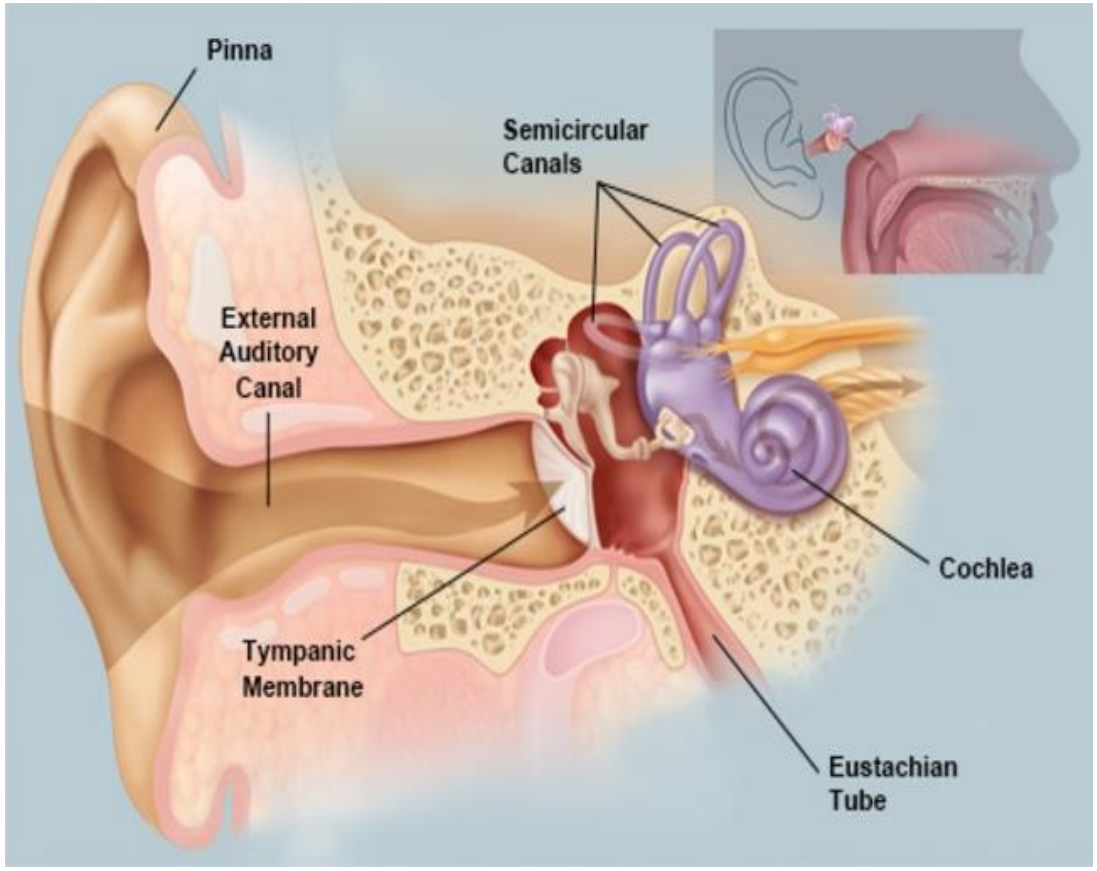
Tests for sight

- Routine exam; eye movements, pupils round and regular and react to light and accommodation, nystagmus
- A refraction assessment determines if you have vision problems such as nearsightedness or farsightedness, astigmatism (evenly) , or presbyopia. Twenty/twenty vision normal (the first 20 is you are standing 20 feet away from the eye chart)
- **Tonometry**: A standard eye test that is done to determine the fluid pressure inside the eye. **normal** pressure **range** is 12 to 22 mm Hg
- Visual fields
- Funduscopic examination

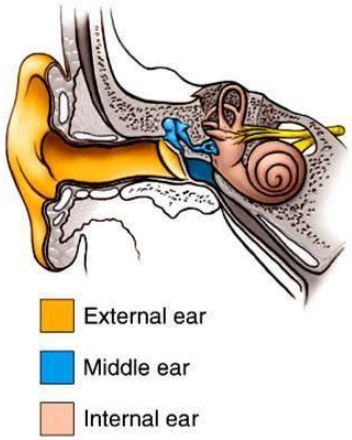
Hints for protecting your vision

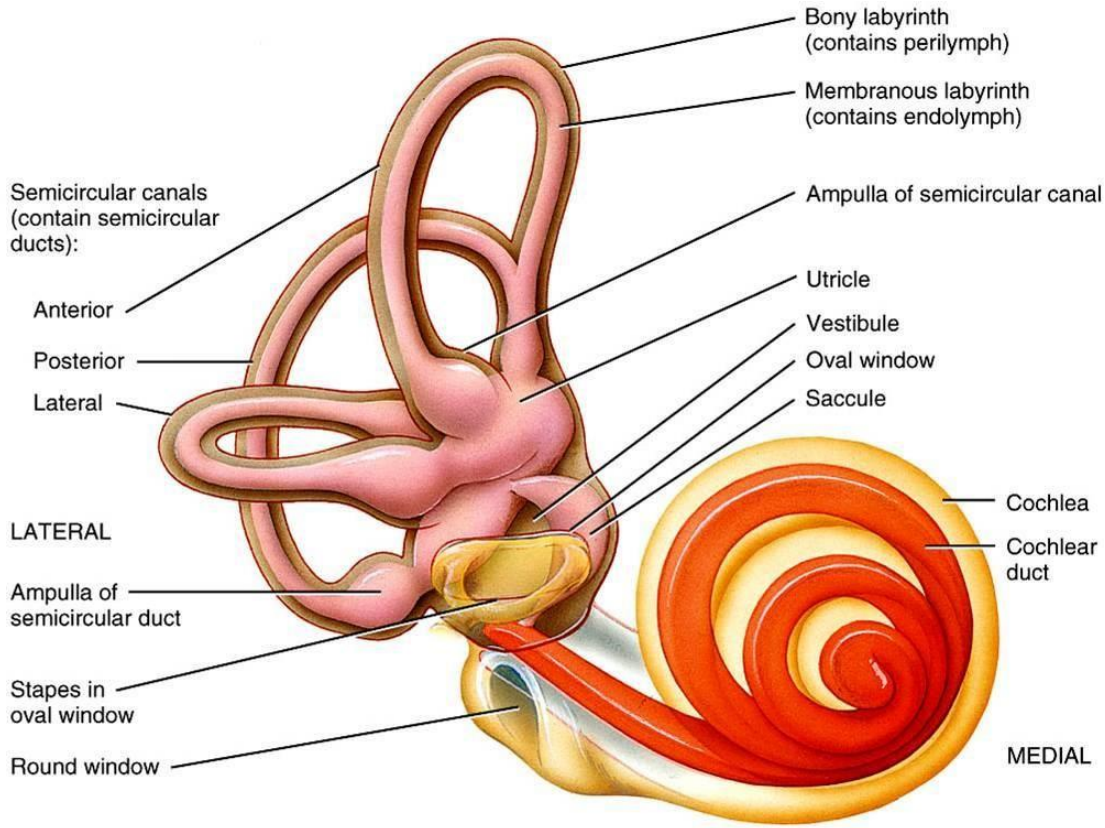
- Carrots, which contain vitamin A, are good for the eyes. But fresh fruits and dark green leafy vegetables, which contain more antioxidant vitamins such as C and E, are even better for eye health.
- The American Academy of Ophthalmology recommends oversized or wraparound sunglasses. They should be labeled 99 percent or 100 percent UV **protection**, or "UV400." These lenses are effective in absorbing UV-A and UV-B radiation. Additional they should screen out 75% to 90% of visible light and ideally have lenses that are gray for proper color recognition

The External, Middle and Internal Ear



The Internal Ear





(a) Components of the right internal ear

Cochlea the spiral cavity of the inner ear containing the organ of Corti, which produces nerve impulses in response to sound vibrations.

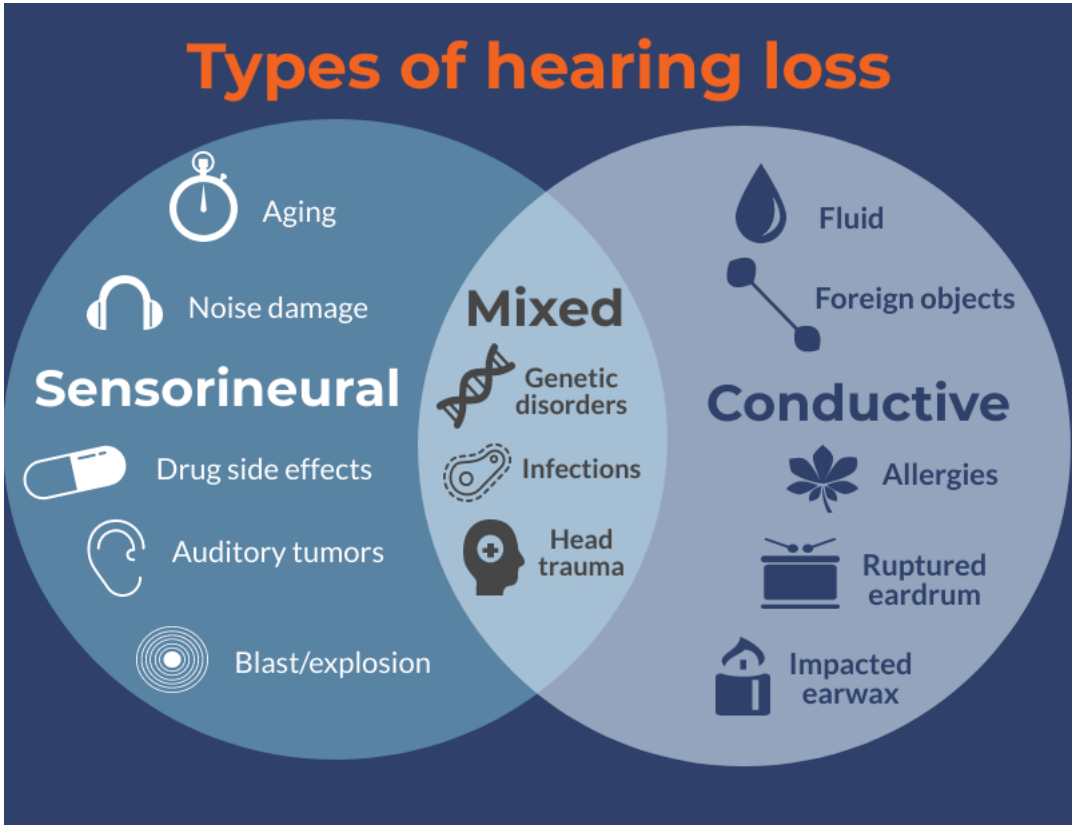
Ear infections: Otitis Media

- Most common illness in infants and young children (aside from a cold)
- Ear pain, especially when lying down, tugging or pulling at an ear, trouble sleeping crying more than usual, fussiness
- Many can get better without antibiotics
- Call doctor if fever lasts more than two (amoxicillin most commonly prescribed)
- In chronic otitis, occasionally tubes can be inserted or adenoidectomy performed. Tonsillectomy no longer common except for Obstructive Sleep Apnea in children or adults
- For pain relief, over-the-counter acetaminophen (Tylenol®) or ibuprofen (Advil®, Motrin®
- Never give aspirin to children. Aspirin can cause a life-threatening condition called Reye's Synrdrome

The **vestibulocochlear nerve** (**auditory vestibular nerve**), known as the eighth cranial nerve transmits sound and equilibrium (balance) information

- **There are four types of hearing loss:**
- Auditory Processing Disorders.
- Conductive.
- Sensorineural.
- Mixed.

Types of hearing loss



Quantification of hearing loss

Every increase of 10 dB on the decibel scale is equal to a 10-fold increase in sound pressure level (SPL).

Short list of common sounds and how they measure up:

- Normal conversation – 60 dB
- Heavy city traffic – 85 dB
- Lawn mower – 90 dB
- MP3 player at maximum volume – 105 dB
- Sirens – 120 dB
- Concerts – 120 dB
- Sporting events – 105 to 130 dB (depending upon the stadium)
- Firearms – 150 dB

Sound measuring: NIOSH has released a free smartphone sound measurement app for iOS devices

The NIOSH Sound Level Meter (SLM) app combines the best features of professional sound levels meters and noise dosimeters into a simple, easy-to-use package. The app was developed to help workers make informed decisions about their noise environment and promote better hearing health and prevention efforts.

Damage can occur either from acute or chronic levels of intense sound.

85 decibels over 8 hours are considered hazardous

100 decibels for more than 15 minutes per day is considered hazardous

110 decibels for shorter periods is harmful.

The message is that when in doubt about high exposure to loud sound; wear ear protection. (cutting the lawn, vacuuming, using work shop tools etc.)

The aging ear

- **Presbycusis** (a type of hearing loss known as sensorineural) is the loss of hearing that gradually occurs in most individuals as they grow older. About 30-35 percent of adults age 65 and older have a hearing loss. It is estimated that 40-50 percent of people 75 and older have a hearing loss.
- **At** low frequencies, between **250 and 1,000** Hz, the **loss** of **hearing** is almost identical among men and women. In these frequencies the average **hearing loss** increases from 22-25 dB among those aged between 60 and 64 ------to 38-48 dB in the highest age group. At age 60 the hearing loss at 4,000 Hz among men is almost 20 dB greater than the hearing loss among women of the same age.

Tests for Hearing Loss

- Physical exam; otoscope
- Tuning fork to differentiate between bone and air conduction.
- Audiometry

Audiometer Testing

- There are a few tests involved in audiometry. A pure tone test measures the quietest sound you can hear at different pitches. It involves using an audiometer, which is a machine that plays sounds via headphones. Your audiologist or an assistant will play a variety of sounds, such as tones and speech, at different intervals into one ear at a time, to determine your range of hearing. The audiologist will give you instructions for each sound. Most likely, they'll ask you to raise your hand when a sound becomes audible.

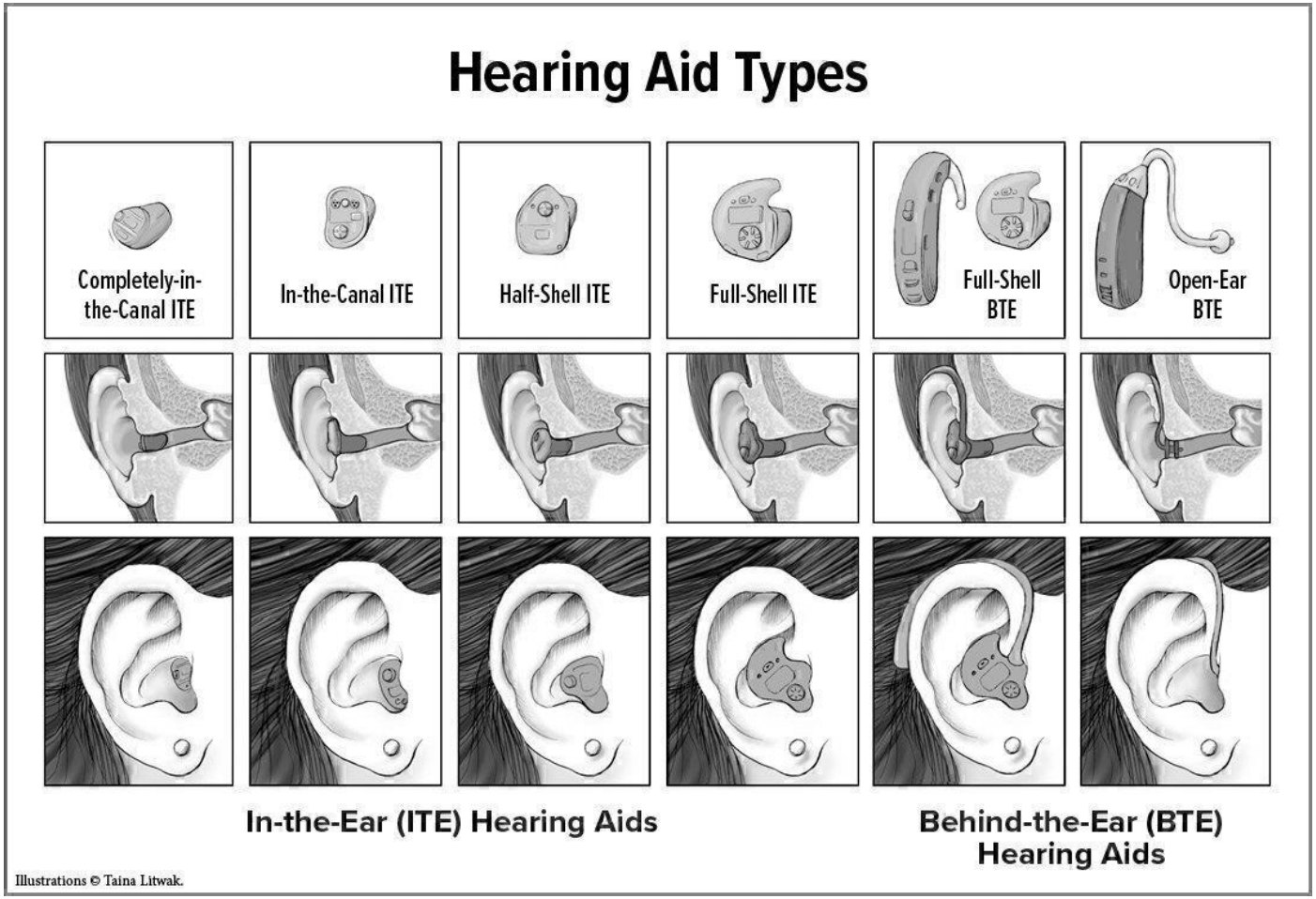
Before you buy a hearing aid:

Get a checkup. See your doctor to rule out correctable causes of hearing loss, such as earwax or an infection. And have your hearing tested by a hearing specialist (audiologist).
Seek a referral to a reputable audiologist. If you don't know a good audiologist, ask your doctor for a referral. An audiologist will assess your hearing, help you choose the most appropriate hearing aid and adjust the device to meet your needs. If you have hearing loss in both ears, you will get best results with two hearing aids.
Ask about a trial period. You can usually get a hearing aid with a trial period. It may take you a while to get used to the device and decide if it's right for you. Have the dispenser put in writing the cost of a trial, whether this amount is credited toward the final cost of the hearing aid and how much is refundable if you return the hearing aid during the trial period.
Think about future needs. Ask whether the hearing aid you've chosen is capable of increased power so that it will still be useful if your hearing loss gets worse. Hearing aids do not function indefinitely, but they should last about five years.
Check for a warranty. Make sure the hearing aid includes a warranty that covers parts and labor for a specified period. Some dispensers may include office visits or professional services in the warranty.
Beware of misleading claims. Hearing aids can't restore normal hearing or eliminate all background noise. Beware of advertisements or dispensers who claim otherwise.
Plan for the expense. The cost of hearing aids varies widely — from about $1,500 to more than a few thousand dollars each. Professional fees, remote controls, hearing aid accessories and other hearing aid options may cost extra. Talk to your audiologist about your needs and expectations.

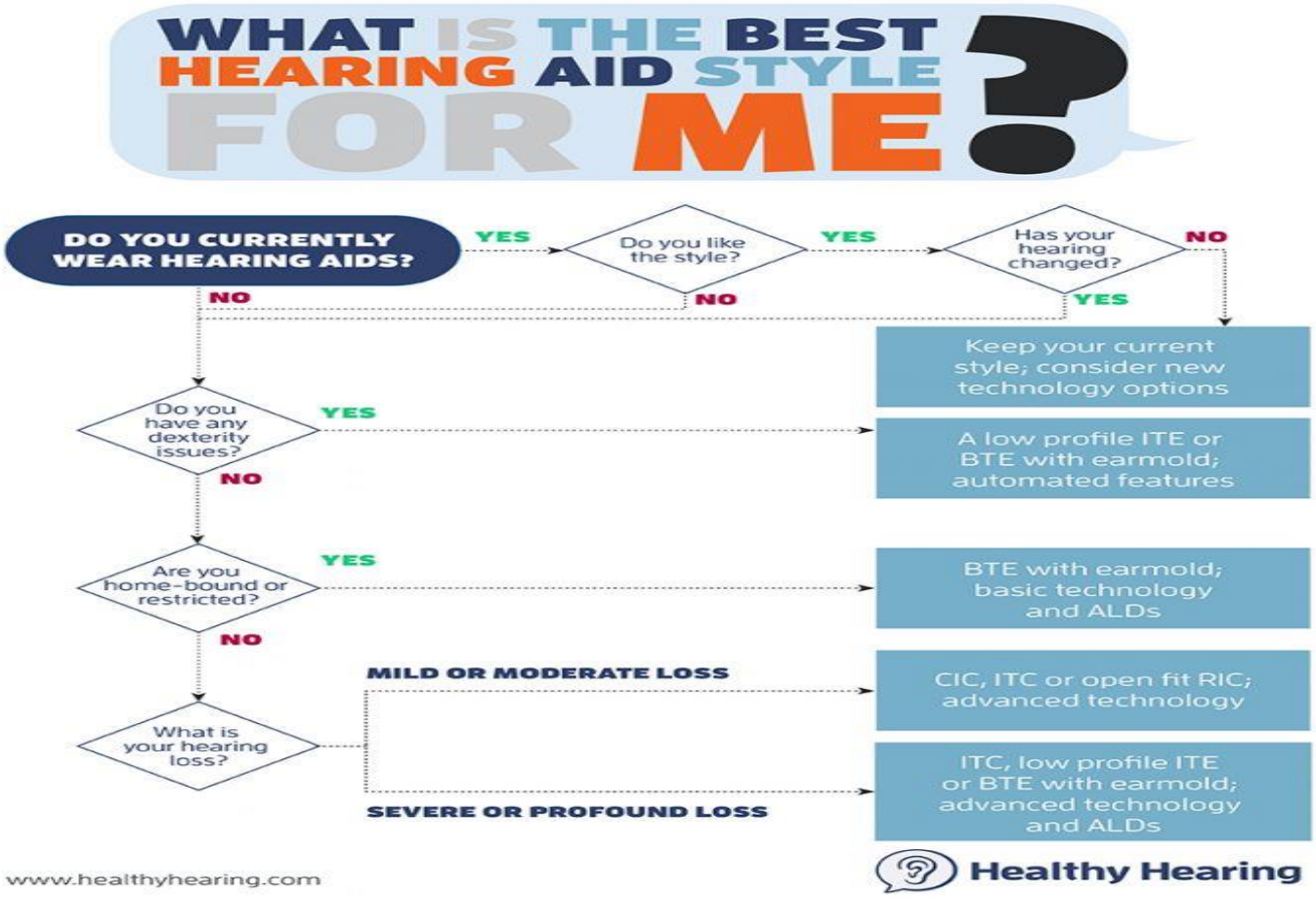
Types of Hearing Aids

- In-the-ear (ITE) hearing aids (custom fit)
- *half-shell* designs that fill half the bowl of the outer ear to *full-shell* designs that fill almost the entire outer ear bowl, directional microphones and manual controls
- Invisible in the canal (IIC) small, requires manual dexterity, invisible, with string to retrieve
  Completely in the canal (CIC) larger, longer battery life,
- Behind-the-ear (BTE) hearing aids (does not occlude entire canal) Receiver in the ear (RITE), rechargeable battery option , telecoil option that allows you to shut out unwanted background noise, and applies to all degrees of hearing loss, including profound hearing loss

Types of Hearing Aids



Things to Consider



More on Hearing Aids

- **Analog and digital** hearing aids (digital clarify sound)
- ***Directional microphone (*** signal-to-noise ratio (SNR) Hearing aids using standard (omnidirectional) microphones, while effective at increasing audibility for speech and other sounds, are largely ineffective in improving inadequate SNR.
- ***T-coil (Telephone switch)*** allows you to switch from the normal microphone setting to a "T-coil" setting in order to hear better on the telephone. The voice of the speaker, who can be some distance away, is amplified significantly more than any background noise
- ***Direct audio input*** **FM Systems** One part is a microphone that the speaker wears. The microphone sends a signal to a receiver. You wear the receiver on your ears or in your hearing aids.
- ***Feedback suppression:*** the **feedback** cancellation filter adapts on the **hearing-aid** input signal, and signal cancellation and coloration artifacts can occur for a narrowband input. This helps suppress squeals when a hearing aid gets too close to the phone or has a loose-fitting ear mold.

Cost

- The **average** cost of a **hearing aid** is $1,000 to $4,000.
- The average price of a single hearing aid is $2,300, according to a 2015 report from the President's Council of Advisors on Science and Technology. And most people need two. (Six global manufacturers control 90 percent of the market.)

According to the website Exposing Hearing Aids, a provider information portal that also connects patients with providers, a typical hearing aid pricing model breaks down as follows:

Total patient price: $4,600

Manufacturer costs (materials and research): $1,400

Retailer costs (operating costs, salaries, marketing, continuing education): $2,236

Service costs for the life of the hearing aids (adjustments, cleaning, repairs, batteries): $574

Potential pretax profit: $350

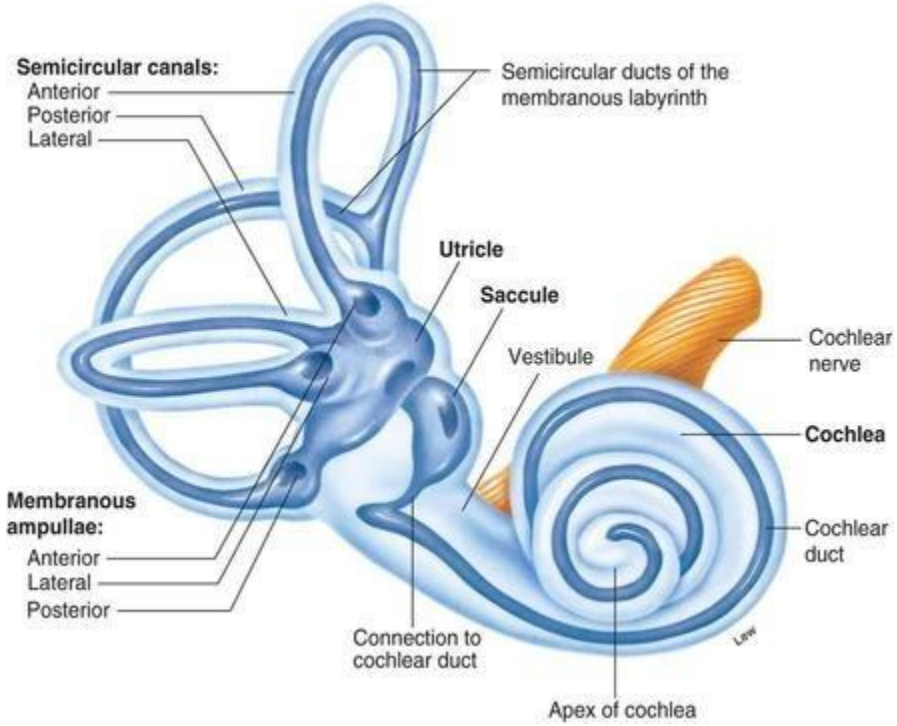
Cochlear Implants

- **What is a cochlear implant?**
- Cochlear implants are complex medical devices that work differently than hearing aids. Rather than amplifying sound—which helps a person with residual hearing ability—a cochlear implant provides the sense of sound by stimulating the auditory nerve directly.

Adult candidates are generally eligible for an implant if they:

- Have severe or profound hearing loss in both ears.
- Get little or no benefit from hearing aids.
- Have no medical problems that could put them at risk during surgery.
- Have a strong desire to be part of the hearing world and communicate through listening, speaking and speechreading.

The Semicircular Canals



Semicircular Canals

- Your **semicircular canals** are three tiny, fluid-filled tubes in your inner ear that help you keep your balance. When your head moves around, the liquid inside the **semicircular canals** sloshes around and moves the tiny hairs that line each **canal** sending signals to the brain about balance.

Other factors in balance

- Proprioception is the sense though which we perceive the position and movement of our body, including our sense of equilibrium and balance.
  Conscious proprioception is relayed mostly by the dorsal column and in part by the spinocervical tract. Finally, the organ of perception for position sense is the sensory cortex of the brain.

- The cerebellum receives information from the sensory systems, the spinal cord, and other parts of the brain and then regulates motor movements
  The cerebellum coordinates voluntary movements such as posture, balance, coordination, and speech, resulting in smooth and balanced muscular activity.

Vertigo (the sensation that the room is spinning)

- **BPPV.** These initials stand for benign paroxysmal positional vertigo. BPPV occurs when tiny calciumparticles (canaliths) clump up in canals of the inner ear. Usually disappears with time. Canalith repositioning procedures can move these particles to a part of your ear where they won't cause dizziness.
- **Meniere's disease:** inner ear disorder thought to be caused by a buildup of fluid and changing pressure in the ear causing tinnitus, hearing loss and vertigo. The episodes can last anywhere from 20 minutes to four or more hours
- **Vestibular neuritis or labyrinthitis.** This is an inner ear problem usually related to infection (usually viral). Most resolve with time..

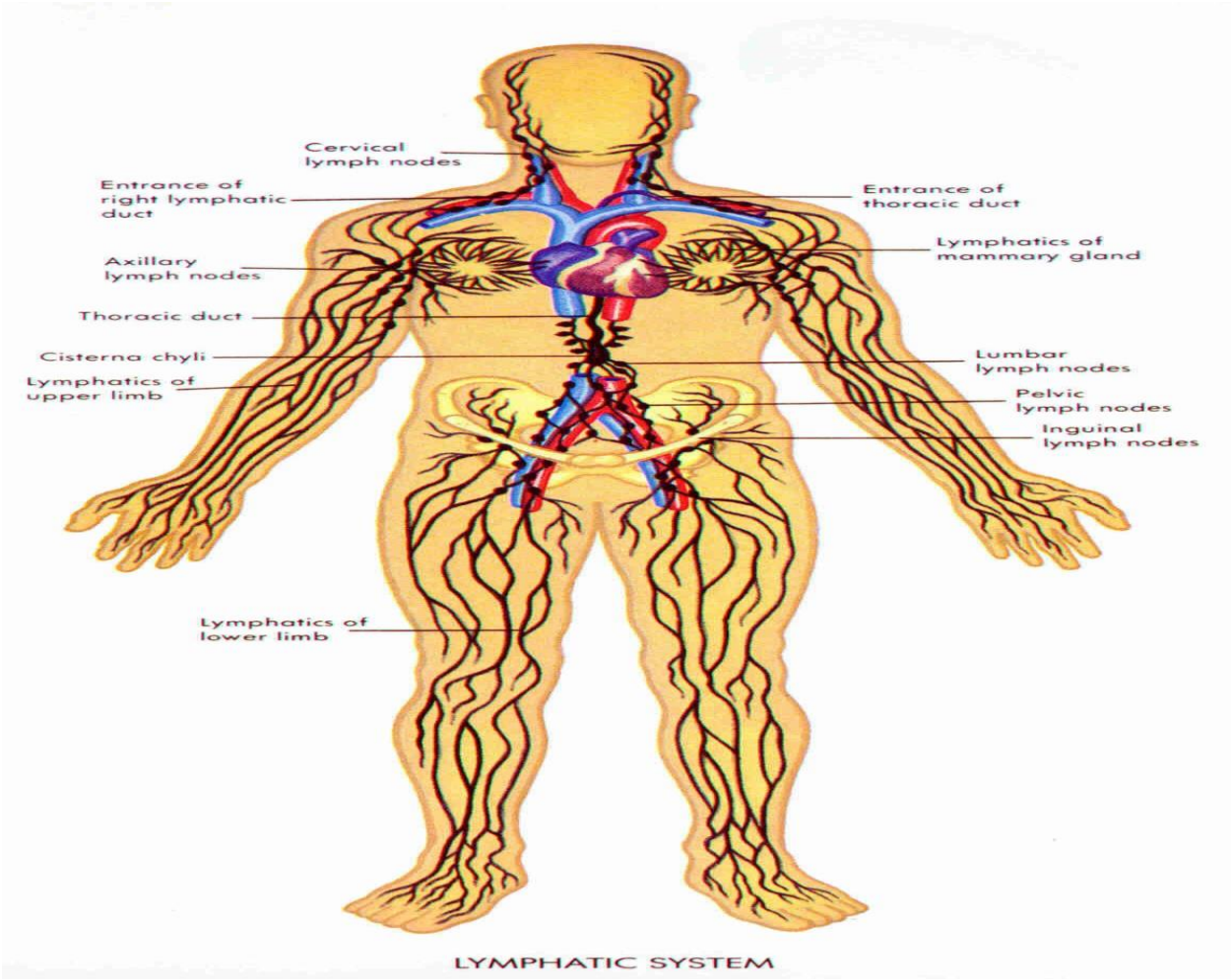
Tinnitus

- **Tinnitus** is the perception of noise or ringing in the ears. It is a common complaint that affects about 15 to 20 percent of people. **Tinnitus** isn't a condition itself — it's a symptom of an underlying condition, such as age-related hearing loss, ear injury or a circulatory system disorder.
- Although bothersome, tinnitus usually isn't a sign of something serious and in most instances the cause is never found.

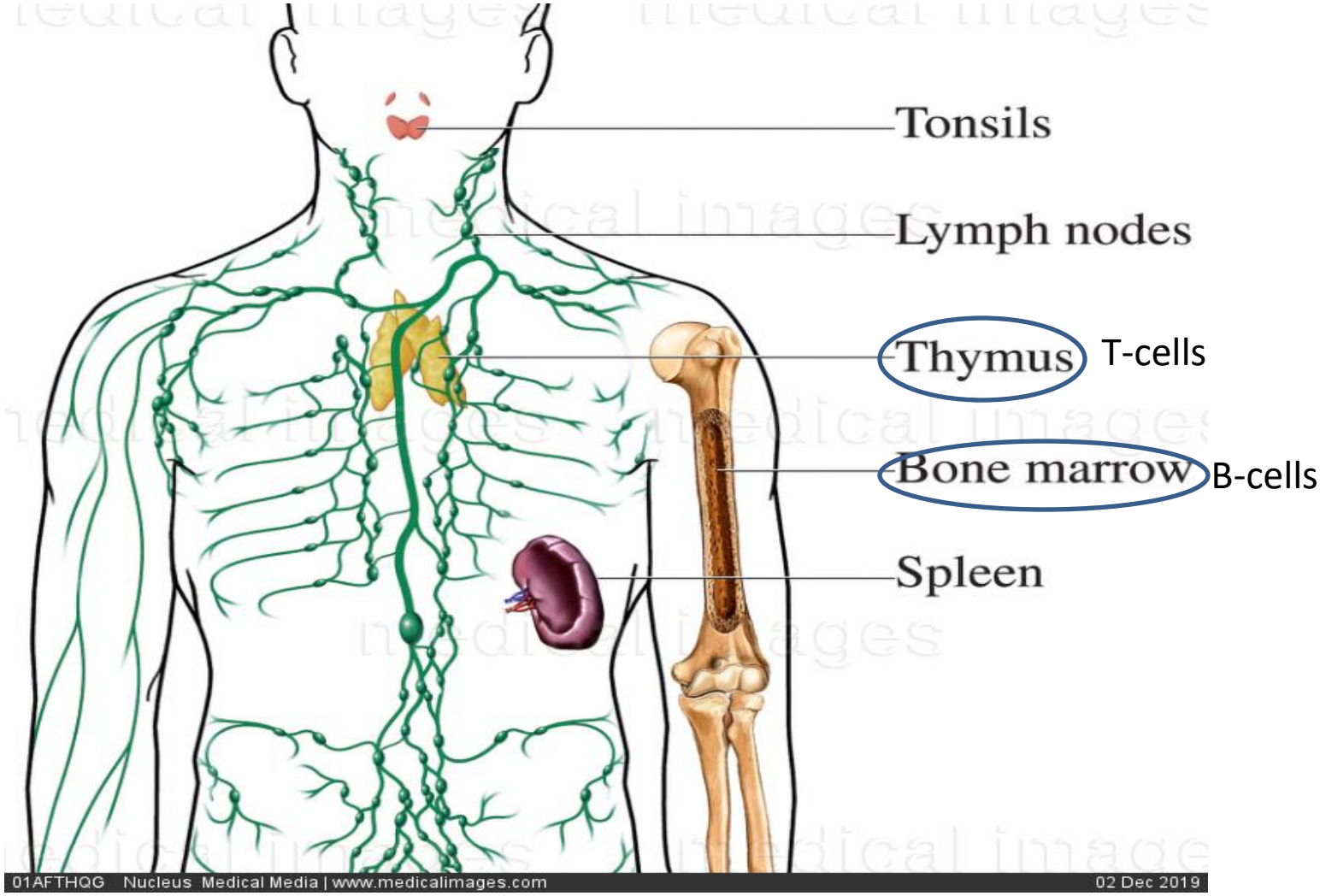
Balance problems and Falls: multiplicity of causes

- Often cause hip fracture that may be a terminal event. In usual care, the reported 1-year mortality after sustaining a hip fracture has been estimated to be 14% to 58%. Major cause of in-hospital accidents with prolonged hospital stays.
- Make your home safer and avoid doing things that are risky; do not go out on the roof.
- Use canes, walkers, wheel chairs, attendants
- Practice transfers
- Physical and occupational therapy: strength and balance training
- Treat osteoporosis and other underlying conditions.

Lymphatic and Hematopoietic Systems related to the Immune Response



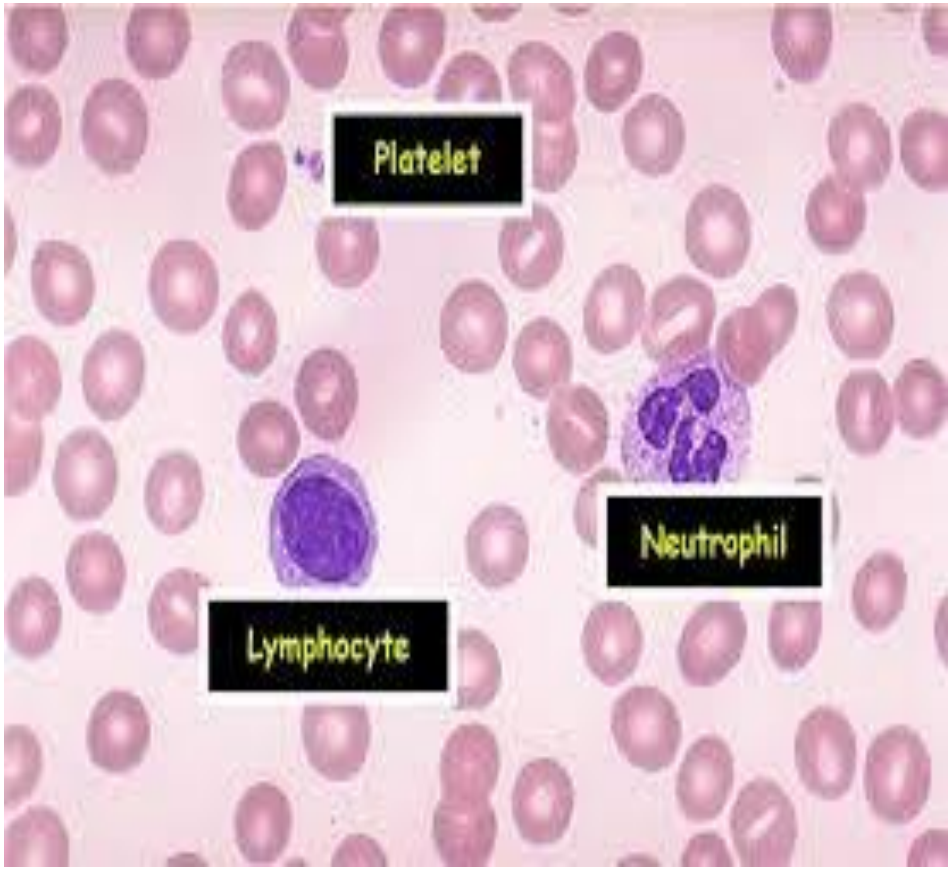
Lymphatic System/lymphoid tissue



Antigens are molecules capable of stimulating an immune response. Each antigen has distinct surface features, or epitopes, resulting in specific responses.

Antibodies (immunoglobulins) are Y-shaped proteins produced by B cells of the immune system in response to exposure to antigens. Each antibody contains a paratope which recognizes a specific epitope on an antigen, acting like a lock and key binding mechanism. This binding helps to eliminate antigens from the body, either by direct neutralization or by 'tagging' for other arms of the immune system.

Peripheral Blood Smear: Neutrophils or polys or polymorphic nuclear leukocytes from the bone marrow circulate in the blood stream and are a major players in the body's defense against bacterial infections.



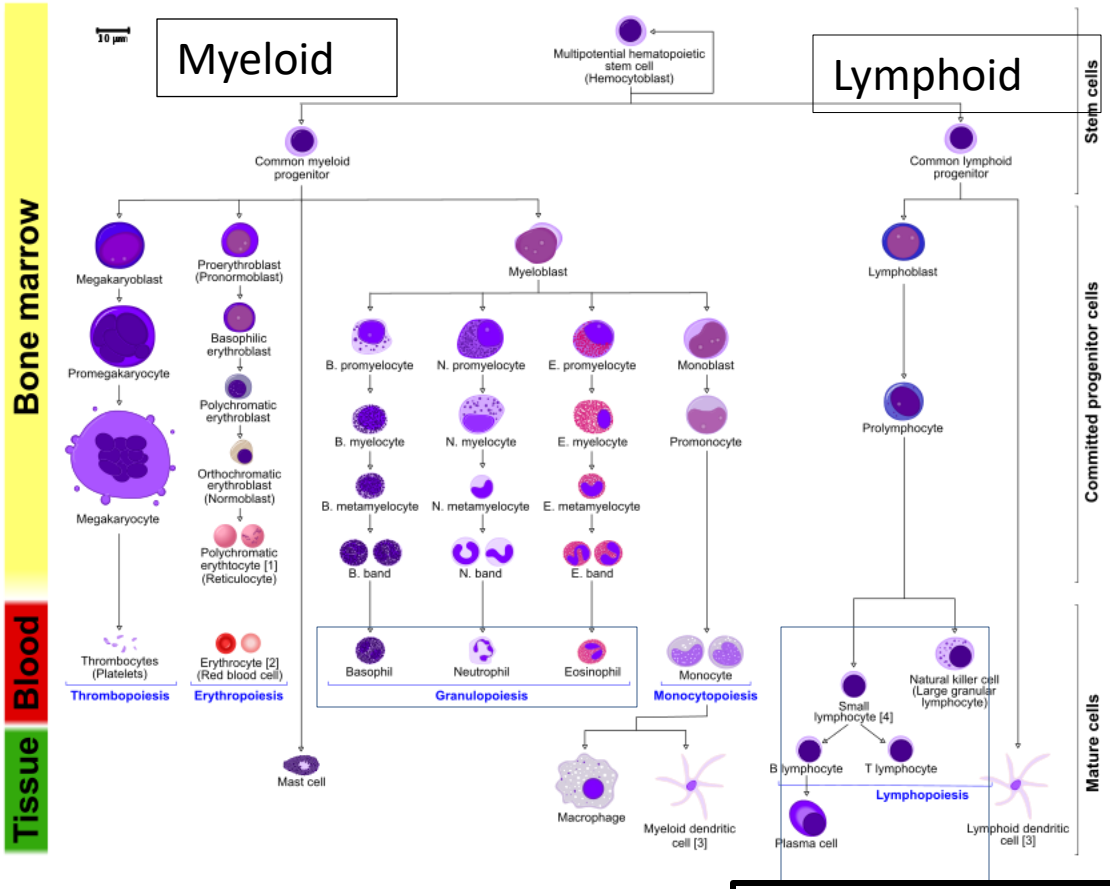
CBC and Differential Blood Cell Count

Neutrophils Relative	**37.0** %	*bacterial infections*
Lymphocytes Relative	**53.0** %	*immune system, leukemia*
Monocytes Relative	**7.0** %	*immune system, globulins, mature into macrophages*
Eosinophils Relative	**2.0** %	*Allergic reactions, parasitic diseases*
Basophils Relative	**1.0** %	*inflammation*
Neutrophils Absolute	**3.3** 10*3/uL	*1.5 - 7.8 10*3/uL*
Lymphocytes Absolute	**4.7** 10*3/uL	*0.8 - 3.9 10*3/uL*
Monocytes Absolute	**0.6** 10*3/uL	*0.2 - 0.9 10*3/uL*
Eosinophils Absolute	**0.2** 10*3/uL	*0.0 - 0.5 10*3/uL*
Basophils Absolute	**0.1** 10*3/uL	*0.0 - 0.2 10*3/uL*

The immune response to antigens and injury

- Cytokines are secreted by immune cells and act as signaling proteins. They include Interferons (some20 or so), Interleukins (30 or more), Growth factor, Tumor Necrosis factor.
- Prostaglandins (response to injury) and leukotrienes (response to allergy) are involved in numerous homeostatic biological functions and inflammation.

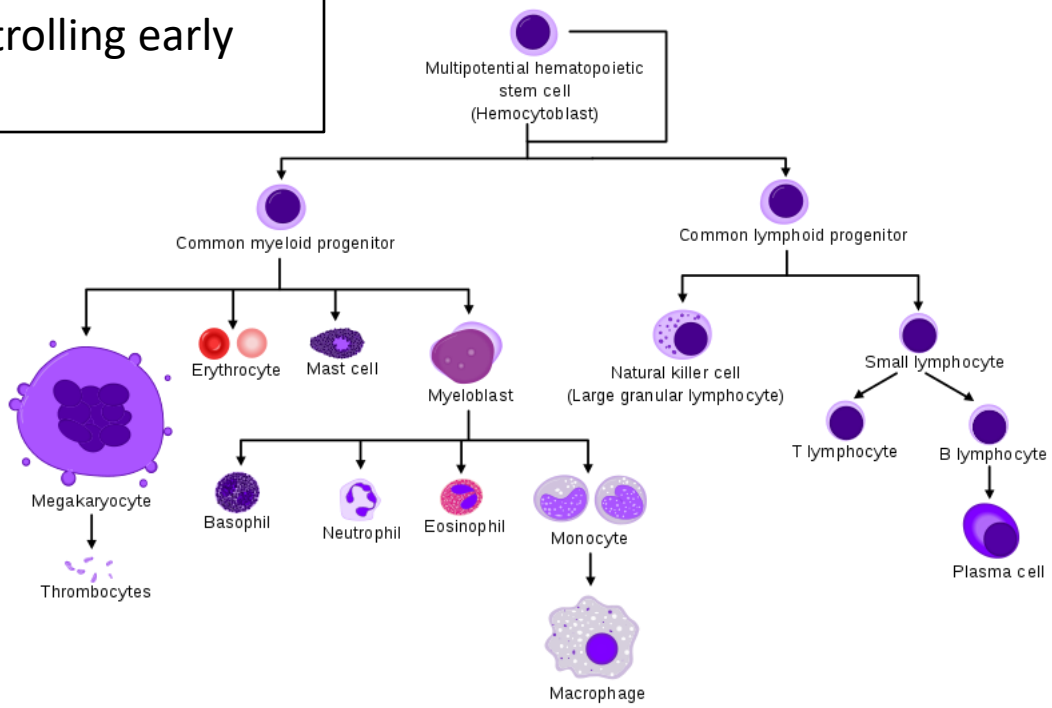
Blood Cell Formation



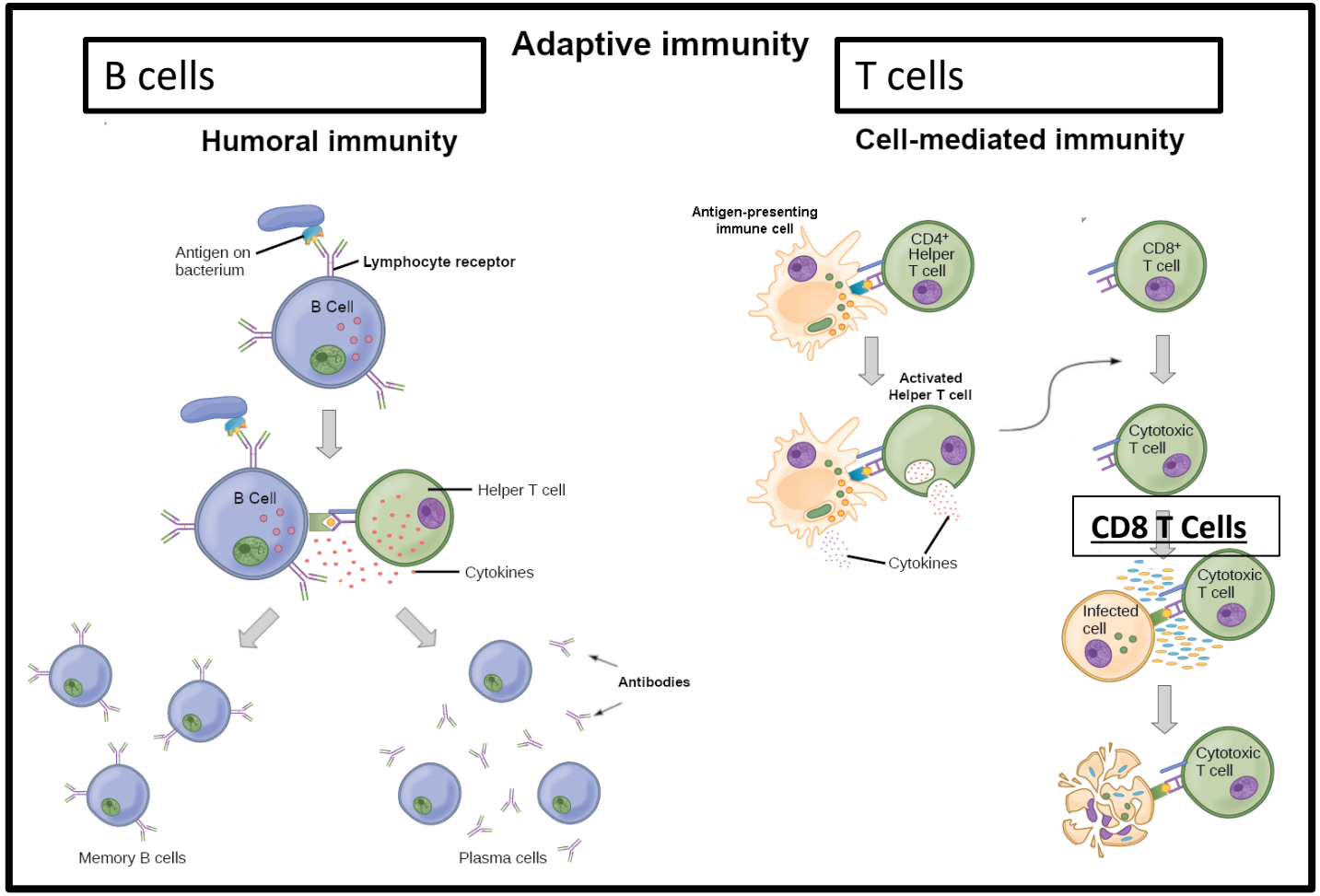
Plasma cell produce immunoglobulins

Another Diagram of Immune Cells

NK cells are best known for killing virally infected cells, and detecting and controlling early signs of cancer.



The Immune System; Lymphoid System



Cytotoxic T Cells (CD8 T Cells)

Cytotoxic T cells kill their target cells, primarily by releasing cytotoxic granules into the cell to be killed. These cells recognize their specific antigen (such as fragments of viruses) when presented by **MHC (Hyman leukocyte antigens (HLA) Class I)** molecules that are present on the surface of all nucleated cells.

MHC Class I molecules interact with a protein called CD8 on the cytotoxic T cells, which helps to identify this cell type. **Cytotoxic** T cells require several signals from other cells to be activated, such as from dendritic cells and T helper cells.

Their main function is to kill virally infected cells, but they also kill cells with intracellular bacteria or tumorous cells.

T-Helper Cells (Th) (CD4 T Cells)

T helper cells have a wider range of effector functions than CD8 T cells and can differentiate into many different subtypes, such as **Th1, Th2, Th17** and regulatory T cells.

They become activated when they are presented with peptide antigens by MHC Class II molecules, which are expressed on the surface of APCs. **MHC Class II** molecules interact with a protein called CD4 on the T helper cells, which helps to identify this cell type.

The roles of a CD4 T cell may include activating other immune cells, releasing **cytokines,** and helping B cells to produce antibodies. They help to shape, activate and regulate the adaptive immune response.

Memory T Cells

Following an infection, antigen-specific, long-lived memory T cells are formed. **Memory T cells** are important because they can quickly expand to large numbers of effector T cells upon re-exposure to the antigen and have a low threshold for activation.

They provide the immune system with memory against previously encountered antigens. Memory T cells may either be CD4+ or CD8+.

Immunoglobulins

- **Immunoglobulins**, also known as antibodies, are glycoprotein molecules produced mainly by plasma cells and initiate the immune response by specifically recognizing and binding to particular antigens, such as bacteria or viruses, and aiding in their destruction.
- Antibodies (immunoglobulins) are produced by B cells of the immune system in response to exposure to antigens. Each antibody contains a paratope which recognizes a specific epitope on an antigen, acting like a lock and key binding mechanism.

Classes of Immunoglobulins

The five major antibody classes are:

- **Immunoglobulin G (IgG)**, 80%, is found in all body fluids and protects against bacterial and viral infections.
- **Immunoglobulin M (IgM)**, is the first antibody to be released by B cells during primary response
- Immunoglobulin D (IgD, important in B cell activation
- **Immunoglobulin A (IgA)**, which is found in high concentrations in the mucous membranes, particularly those lining the respiratory passages and gastrointestinal tract, and prevent attachment of pathogens to epithelial surfaces.
- **Immunoglobulin E (IgE)**, found on mast cells and basophils and triggers release of histamine which is associated mainly with allergic reactions (when the immune system overreacts to environmental antigens such as pollen or pet dander). It is found in the lungs, skin, and mucous membranes.

Complement

- The complement system of which there are nine major components, are circulating proteins that function to help protect an organism from pathogens.
- The serum complement system is a series of dissolved proteins that protect against a variety of pathogens. Briefly, the classical pathway is activated by antibody that has bound to the surface of an invading cell. The membrane-bound antibody activates the first complement component, which activates eight additional complement proteins. The ultimate result is the formation of what is known as the membrane attack complex, a series of proteins that forms a pore in the membrane, resulting in the lysis of target cells.

Immunizations

These recommendations must be read with the footnotes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars in Figure 1. To determine minimum intervals between doses, see the catch-up schedule (Figure 2). School entry and adolescent vaccine age groups are in bold.

Vaccines	Birth	1 mo	2 mos	4 mos	6 mos	9 mos	12 mos	15 mos	18 mos	19–23 mos	2-3 yrs	4-6 yrs	7-10 yrs	11-12 yrs	13–15 yrs	16–18 yrs
Hepatitis B[1] (HepB)	1st dose	2nd dose			3rd dose											
Rotavirus[2] (RV) RV1 (2-dose series); RV5 (3-dose series)			1st dose	2nd dose	See footnote 2											
Diphtheria, tetanus, & acellular pertussis[3] (DTaP: <7 yrs)			1st dose	2nd dose	3rd dose			4th dose				5th dose				
Tetanus, diphtheria, & acellular pertussis[4] (Tdap: ≥7 yrs)														(Tdap)		
Haemophilus influenzae type b[5] (Hib)			1st dose	2nd dose	See footnote 5		3rd or 4th dose, See footnote 5									
Pneumococcal conjugate[6] (PCV13)			1st dose	2nd dose	3rd dose		4th dose									
Pneumococcal polysaccharide[6] (PPSV23)																
Inactivated Poliovirus[7] (IPV) (<18 yrs)			1st dose	2nd dose	3rd dose							4th dose				
Influenza[8] (IIV; LAIV) 2 doses for some: See footnote 8					Annual vaccination (IIV only)						Annual vaccination (IIV or LAIV)					
Measles, mumps, rubella[9] (MMR)							1st dose					2nd dose				
Varicella[10] (VAR)							1st dose					2nd dose				
Hepatitis A[11] (HepA)							2-dose series, See footnote 11									
Human papillomavirus[12] (HPV2: females only; HPV4: males and females)														(3-dose series)		
Meningococcal[13] (Hib-MenCY ≥ 6 weeks; MenACWY-D ≥9 mos; MenACWY-CRM ≥ 2 mos)			See footnote 13											1st dose		Booster

Range of recommended ages for all children

Range of recommended ages for catch-up immunization

Range of recommended ages for certain high-risk groups

Range of recommended ages during which catch-up is encouraged and for certain high-risk groups

Not routinely recommended

This schedule includes recommendations in effect as of January 1, 2014. Any dose not administered at the recommended age should be administered at a subsequent visit, when indicated and feasible. The use of a combination vaccine generally is preferred over separate injections of its equivalent component vaccines. Vaccination providers should consult the relevant Advisory Committee on Immunization Practices (ACIP) statement for detailed recommendations, available online at http://www.cdc.gov/vaccines/hcp/acip-recs/index.html. Clinically significant adverse events that follow vaccination should be reported to the Vaccine Adverse Event Reporting System (VAERS) online (http://www.vaers.hhs.gov) or by telephone (800-822-7967).Suspected cases of vaccine-preventable diseases should be reported to the state or local health department. Additional information, including precautions and contraindications for vaccination, is available from CDC online (http://www.cdc.gov/vaccines) or by telephone (800-CDC-INFO [800-232-4636]).

This schedule is approved by the Advisory Committee on Immunization Practices (http//www.cdc.gov/vaccines/acip), the American Academy of Pediatrics (http://www.aap.org), the American Academy of Family Physicians (http://www.aafp.org), and the American College of Obstetricians and Gynecologists (http://www.acog.org).

NOTE: The above recommendations must be read along with the footnotes of this schedule.

Adult Immunizations

Almost 1 out of every 3 people in the US will develop shingles in their lifetime

- Shingles vaccine, which protects against shingles and the complications from the disease (recommended for healthy adults 50 years and older) Two Shots/Expensive!
- Pneumococcal polysaccharide vaccine (PPSV23), which protects against serious pneumococcal disease, including meningitis and bloodstream infections (recommended for all adults 65 years or older, and for adults younger than 65 years who have certain health conditions)

Leukemias and Lymphomas

- Acute Lymphocytic Leukemia (ALL)
- Acute Myeloid Leukemia (AML)
- Chronic Lymphocytic Leukemia (CLL)
- Chronic Myeloid Leukemia (CML) translocation of chromosome 9 &22 (Philadelphia chromosome) diagnosed with Karyotype, FISH, and PCR. New Rx. With tyrosine kinase inhibitors, good outcomes
- Chronic Myelomonocytic Leukemia (CMML)
- Polycythemia Vera-too many RBCS; JAK2 pathway, Dx. PCR and increase EPO. Thrombosis main issue. Phlebotomy, and Hydroxyurea.
- Essential thrombocytosis: JAK2, CALR and MPL mutations, too may platelets, usually asymptomatic
- Myelofibrosis; nasty disease, burned out bone marrow, allogenic stem cell transplant with 18 month survival or less.
- Multiple Myeloma

Autoimmune Diseases

- Rheumatoid Arthritis
- Psoriasis
- Multiple Sclerosis
- Crohn's Disease
- Ulcerative Colitis
- Type I diabetes/juvenile
- Addison's Disease
- Graves Disease
- Scleroderma (system sclerosis-limited and diffuse-vascular injury) Raynaud's Phenomena-mycophenolate, cyclopsphanide, prednisone. ANA +
- Lupus Erythematosus
- Pernicious Anemia
- Polyarthritis Nodosa
- Myasthenia Gravis

SLE-SYSTEMIC LUPUS ERYTHEMATOSIS

- Rare (140/100,000) but more common in minorities and young women (9 females to 1 male)with a strong genetic predisposition. Related to deposition of C3 and C5 complement as an autoimmune disease.
- Treatment with Hydroxychloroquine, Steroids and Cyclophosphamide and now Rituximab.
- Symptoms; butterfly rash, Reynaud's phenomena, alopecia and depression
- Delay in diagnosis due to wide range of symptoms than mimic other disorders.

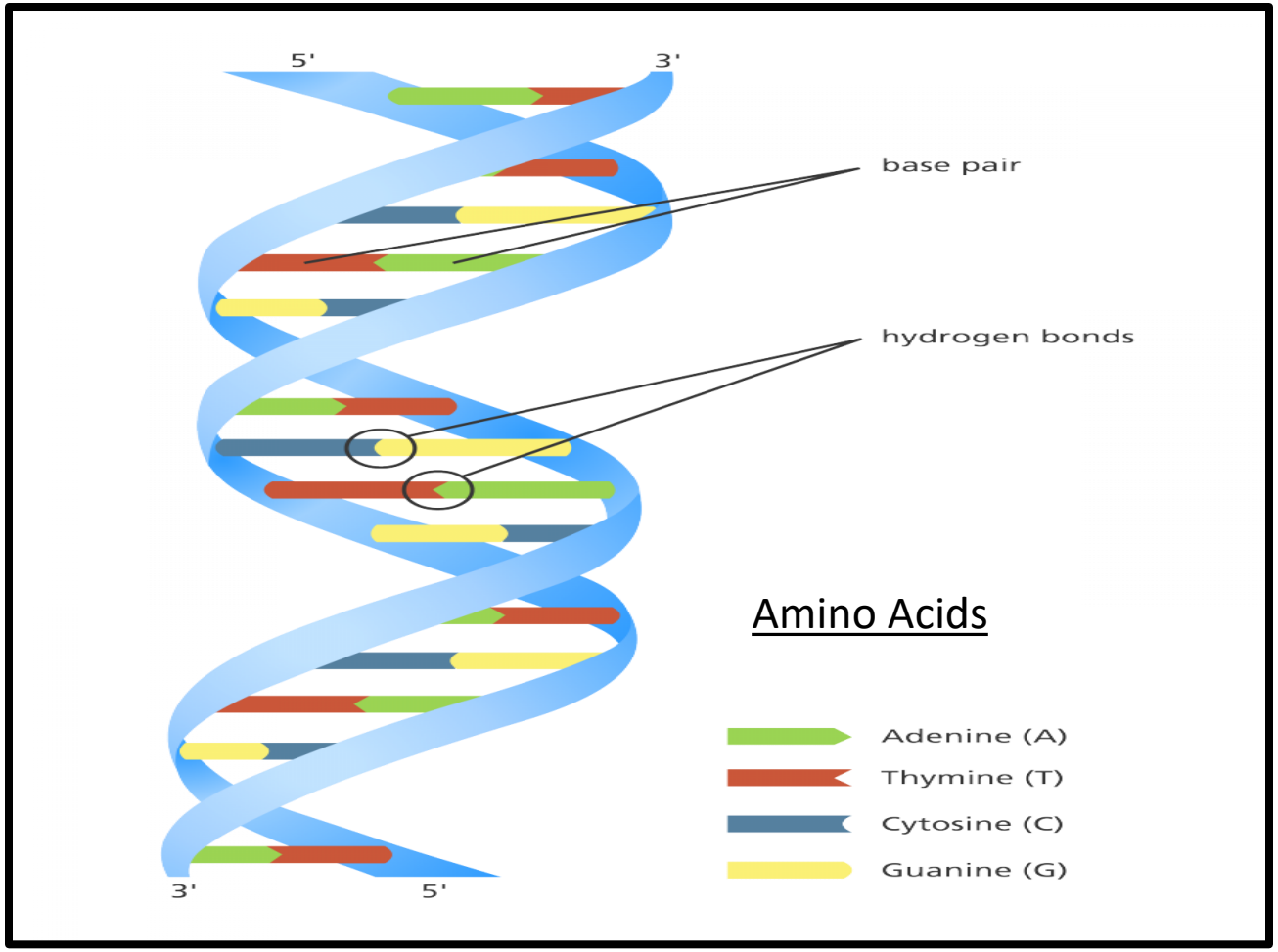
Aids; HIV

- A retro virus that infects CD4-T cells causing a decline in their numbers. Less than 200 is critical level.
- 1.1 million infected in US and no longer considered fatal but a chronic disease with no complete cure and need for lifelong medication.
- Screening of high risk individuals (after 45 days from inoculation this detects 99% of cases).
- When treatment leads to no detectable virus, there is no chance of transmission.
- Three classes of new drugs for treatment; mainstay Truvada and Descovy (15,000/yr). Problems with compliance.
- These drugs may be taken to prevent infection in high risk individuals.

Tests

- Antinuclear antibody (ANA)
- Rheumatoid factor
- CBC
- C-reactive protein (CRP)
- Erythrocyte sedimentation rate (ESR)
- Urinalysis
- Complement (part of immune system)

Genetics and Cellular Anatomy



What is a chromosome?

- **Chromosomes** are the things that make organisms what they are. They carry all of the information used to help a cell grow, thrive, and reproduce. **Chromosomes** are made up of DNA. Segments of DNA in specific patterns are called genes. ... You will find the **chromosomes** and genetic material in the nucleus of a cell and mitochondria.
  A **chromosome** contains hundreds to thousands of **genes**.

Genes and Chromosomes

Definitions

This image shows a pair of homologous chromosomes.
Name and annotate the labeled features.

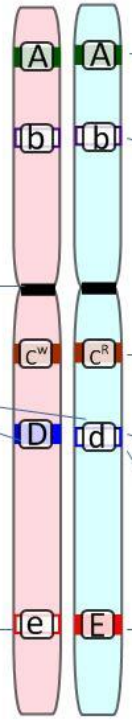
Genotype
*The **combination of alleles** of a gene carried by an organism*

Phenotype
*The **expression of alleles** of a gene carried by an organism*

Centromere
Joins chromatids in cell division

Alleles
***Different versions** of a gene*
Dominant alleles = capital letter
Recessive alleles = lower-case letter

Carrier
*Heterozygous carrier of a **recessive disease-causing** allele*



Homozygous dominant
Having two copies of the same dominant allele

Homozygous recessive
Having two copies of the same recessive allele. Recessive alleles are only expressed when homozygous.

Codominant
Pairs of alleles which are both expressed when present.

Heterozygous
Having two different alleles. The dominant allele is expressed.

Gene loci
Specific positions of genes on a chromosome

Difference between DNA & RNA

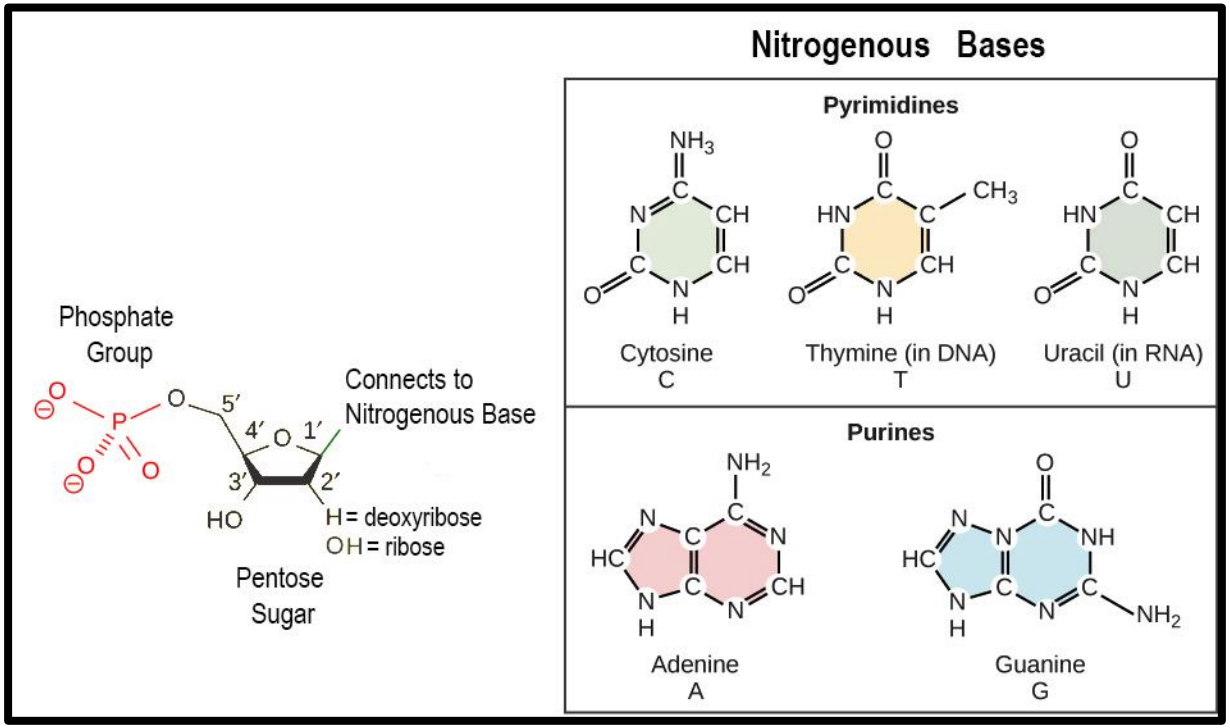
- **DNA** is a long polymer with deoxyribose (a sugar) and phosphate backbone. Having **four** different nitrogenous bases: adenine, guanine, cytosine and thymine.
- **RNA** is a polymer with a ribose (a sugar) and phosphate backbone. **Four** different nitrogenous bases: adenine, guanine, cytosine, and uracil.

Differences between DNA & RNA: Thymine is the pyrimidine base of the DNA, whereas Uracil is the pyrimidine base of the RNA. The occurrence of thymine and uracil is a crucial difference as thymine is only found in DNA and uracil is only found in RNA. Methyl group is absent in uracil whereas present in thymine at the C-5 position.

What is the chemistry of cytosine, adenine, thymine and guanine made

- As a nitrogenous base, **cytosine** is full of nitrogen atoms (it has three). It also has one ring of carbon, which makes it a pyrimidine. A purine, on the other hand, has two rings of carbon. There are two pyrimidines, **cytosine** and thymine, and two purines, adenine and guanine, in DNA.

Basic structure of DNA



What is an amino acid?

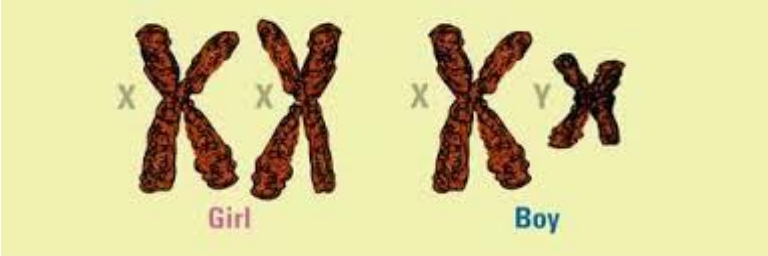
- An amino acid is an organic molecule that is made up of a basic **amino group** ($-NH_2$), an acidic **carboxyl group** ($-COOH$), and an organic R group (or side chain) that is unique to each amino acid. The term amino acid is short for α-amino [alpha-amino] carboxylic acid

Amino acids

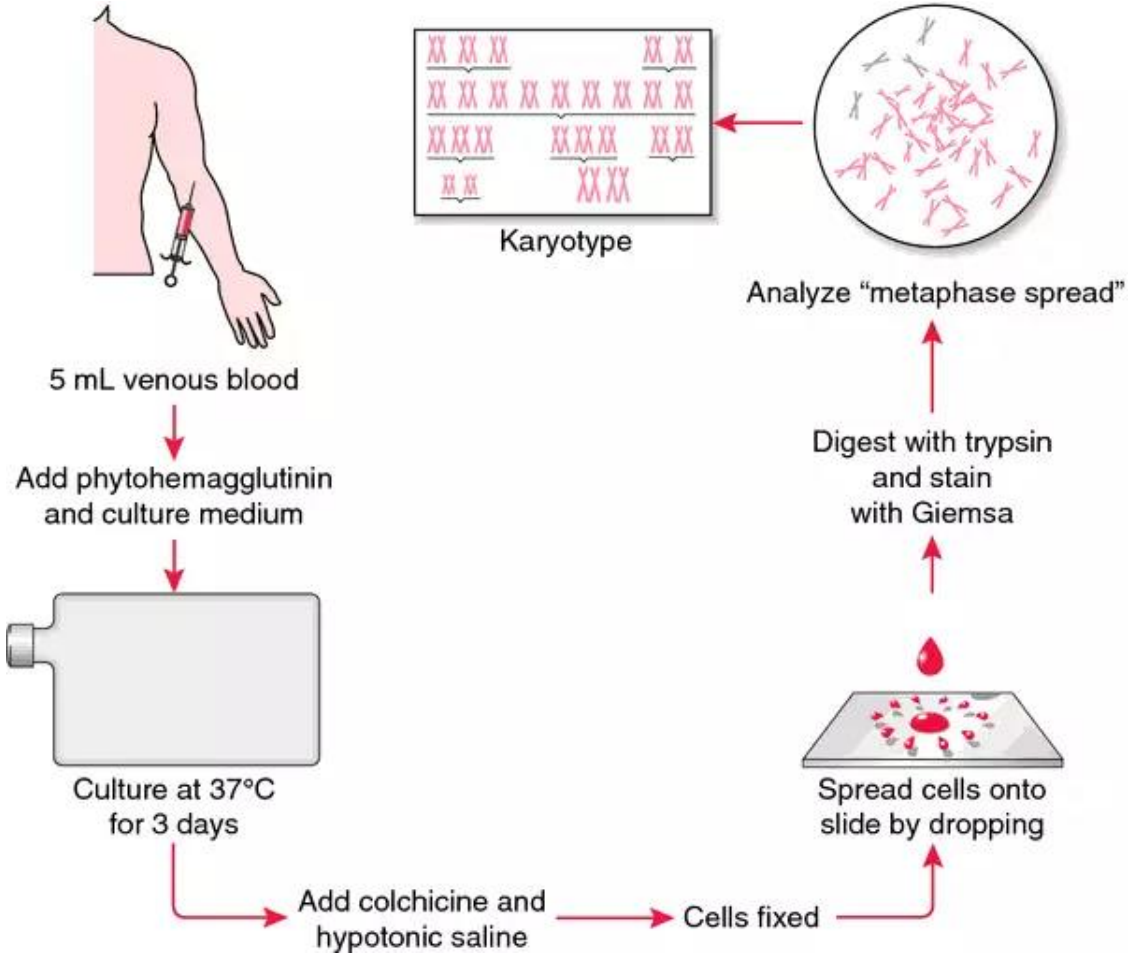
- ESSENTIAL AMINO ACIDS
- Essential amino acids cannot be made by the body. As a result, they must come from food.
- The 9 essential amino acids are: histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine.
- Nonessential amino acids include: alanine, arginine, asparagine, aspartic acid, cysteine, glutamic acid, glutamine, glycine, proline, serine, and tyrosine.

General Knowledge

- In **humans**, each cell normally contains 23 pairs of **chromosomes**, for a total of 46. Twenty-two of these pairs, called autosomes, look the same in both males and females. The 23rd pair, the sex **chromosomes**, differ between males and females.

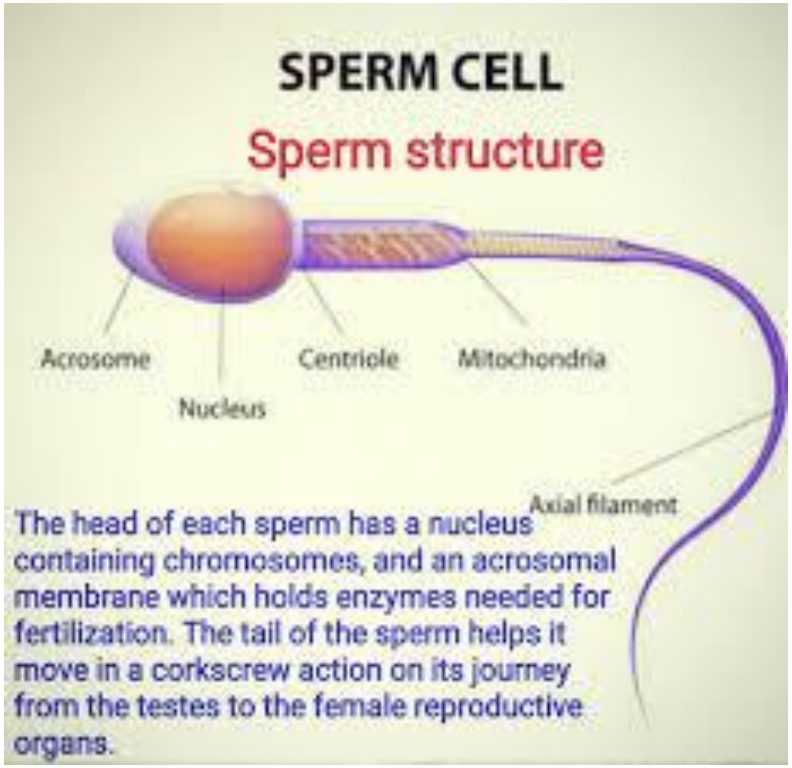


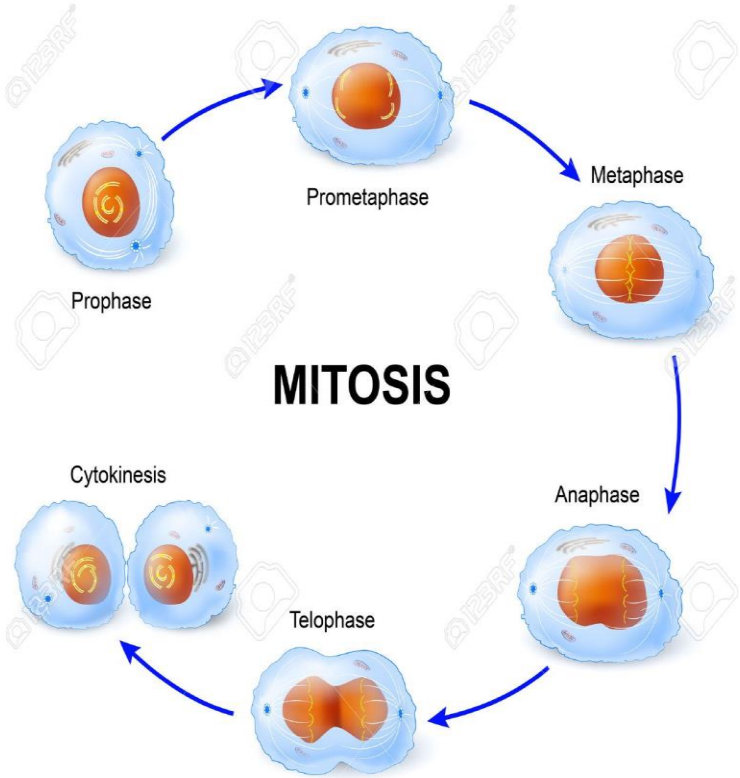
Karyotyping



Difference between Meiosis and Mitosis

- Sperm and ova; they fuse to form a zygote





In mature organs cell division is infrequent

When Should Someone have a Genetic test?

- ***At birth? Pregnancy?***
- ***When they come down with a disease/cancer for precision medical care?***
- ***Wait for genetics to advance more?***

Arguments to get it in the newborn period

- 1. Uncover repairable genetic defects (CRISPR-cas9 or gene replacement therapy.
- 2. Predict predisposition for various illnesses
- 3. Genetic profile for eugenics/descendants.
- Social, emotional and societal consquences

Common Genetic Disorders that relate to an identifiable gene

- Cystic Fibrosis
- Hemophilia
- Huntington's Chorea
- Neurofibromatosis
- Thalassemia
- Tourette syndrome
- Von Willenbrands
- Sickle Cell
- Down's

Designer Babies and Curative Technique for genetic disorders?

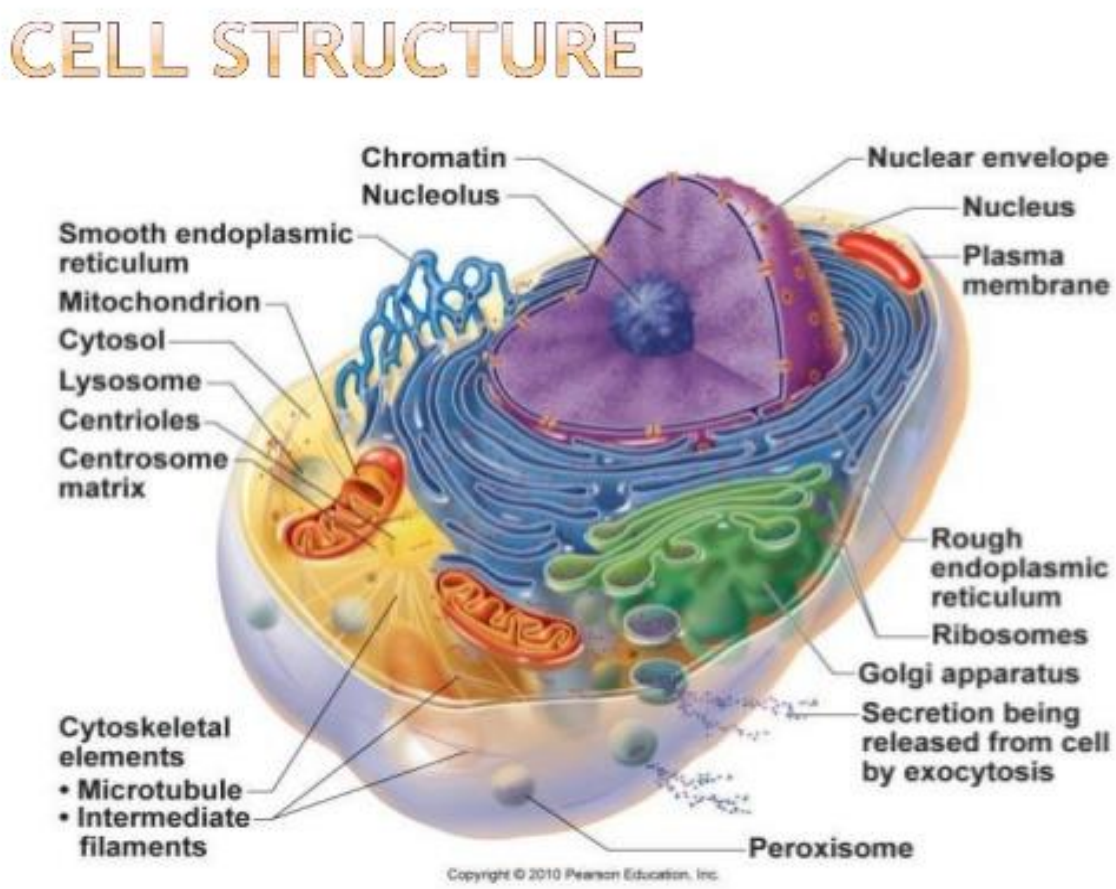
- Gene Splicing techniques/problems (Crispr-Cas9)
- Eugenics/ethical considerations
- Role inheritance plays; nature vs. nurture
- Crack babies, smoking, need for prenatal care

An Example of a rare genetic disease; Familial Mediterranean Fever

- Seen in patients with Middle East ancestry and hinges on 23 different gene mutations some of which are autosomal dominant and some recessive.
- Characterized by recurrent fever, arthritis and serosal inflammation (abdominal pain).
- Some succumb to amyloidosis with ESRD if not treated with colchicine which stabilizes the WBCs and overcomes inflammation.
- Four types have been identified TNT receptor, Hyperimmunoglbulinemia D, Cryopyrin and Mevalonate kinase deficiency.

The Cell; basic unit of you body with some 60 trillion individual cells

The Cell Structure



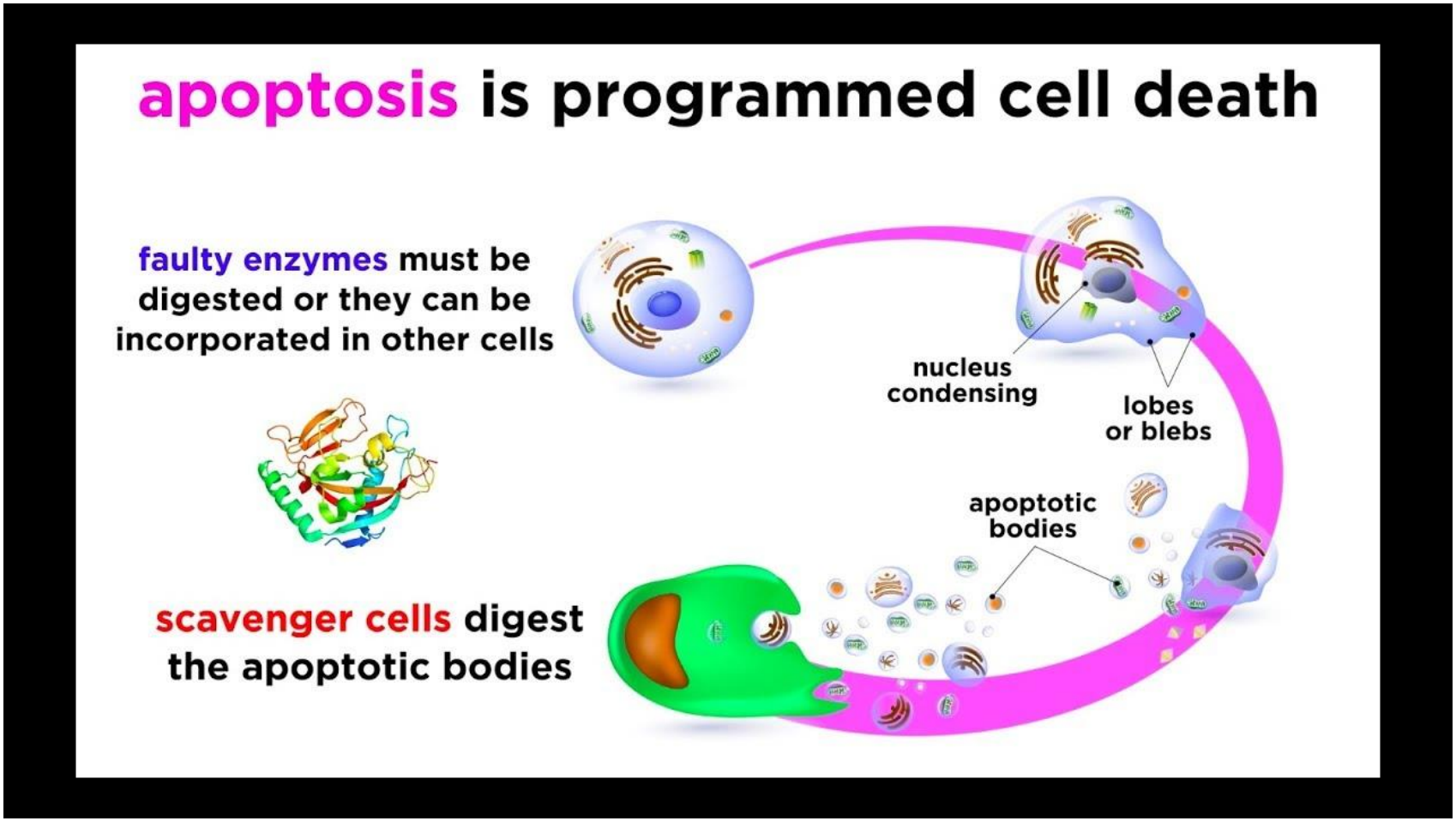
The basic cell ingredients; organelles

- The nucleus contains the hereditary DNA of the cell
- Ribosomes are granules that are the site of protein synthesis(contained in the rough endoplasmic reticulum)
- The mitochondrion is the power plant that form ATP and converts glucose, fats and protein to energy
- The rough endoplasmic reticulum manufactures proteins
- Smooth endoplasmic reticulum chemically modifies proteins, lipid and other molecules
- The Golgi apparatus processes and packages proteins and targets them
- The centrioles are associated with cell division
- A cytoskeleton composed of microtubules and microfilaments support the cell and is involved in cell movement and organelle movement.
- The plasma membrane regulates traffic of materials into and out of the cell
- The nucleolus begins the assembly of ribosomes from proteins and RNA
- Lysosome digests particles like food taken into the cell by phagocytosis.
- Peroxisome collect toxic materials

How are your Telomeres?

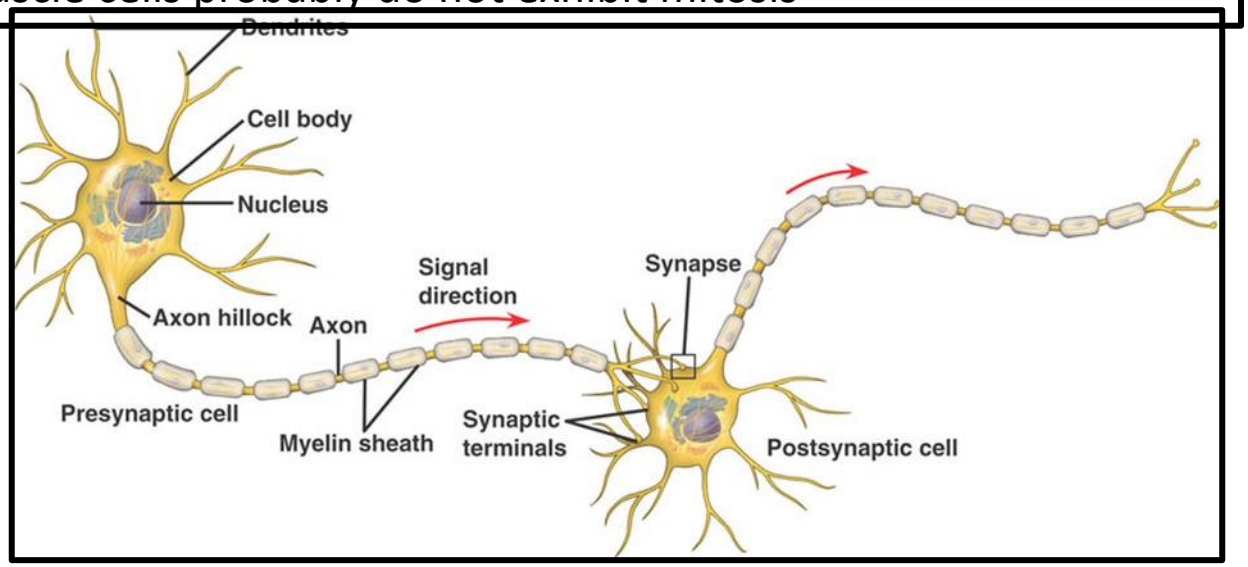
- Telomeres are repeated DNA sequences at the end of chromosomes. **Telomeres get** shorter each time a cell copies itself, but the important DNA stays intact. Eventually, **telomeres get** too short to **do** their job, causing our cells to **age** and stop functioning properly. Therefore, **telomeres** act as the **aging** clock in every cell.
- Messenger RNA (mRNA) is a single-stranded RNA molecule that is complementary to one of the DNA strands of a gene. The mRNA is an RNA version of the gene that leaves the cell nucleus and moves to the cytoplasm where proteins are made. During protein synthesis, an organelle called a ribosome moves along the mRNA, reads its base sequence, and uses the genetic code to translate each three-base triplet, or codon, into its corresponding amino acid.

Apoptosis; programmed cell death or injury (necrosis)



A Neuron; are new brain cells created in the adult and what is neuroplasticity (growth and reorganization)

The Importance of stem cells as mature neurons and cardiac muscle cells probably do not exhibit mitosis



Types of Viruses/phage particles: Lytic/virulent and lysogenic

- DNA: single stranded or double stranded
- RNA: single stranded or double stranded

More than two-thirds of human viruses can also infect non-human hosts, mainly mammals, and sometimes birds.

There are 219 **virus** species that are known to be able to infect **humans**

Viruses are entirely dependent on the host for replication and they are roughly one-hundredth the size of a bacteria

They consist of two or three distinct parts:

1. genetic material, either DNA or RNA
2. a protein coat, or capsid, which protects the genetic information
3. a lipid envelope is sometimes present around the protein coat when the virus is outside of the cell

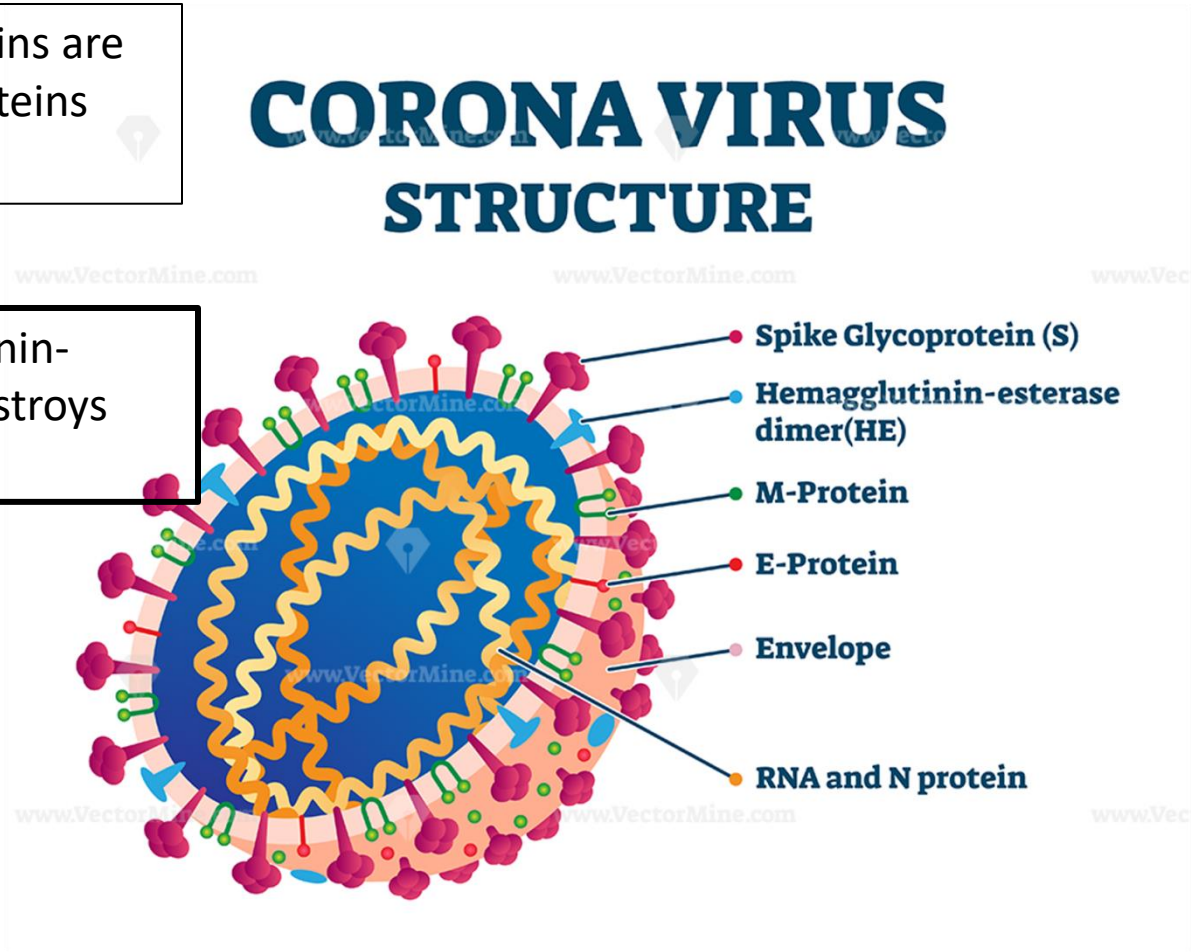
Only a small part of the total diversity of viruses has been studied. As of 2019, 4 realms, 9 kingdoms, 16 phyla, 2 subphyla, 36 classes, 55 orders, 8 suborders, 168 families, 103 subfamilies, 1,422 genera, 68 subgenera, and 6,589 species of viruses have been defined by the ICTV.(International Committee on Taxonomy of Viruses**)**

Coronaviruses are a large family of viruses found in both animals and humans, and are known to cause the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS), Severe Acute Respiratory Syndrome (SARS), and Novel Coronavirus (COVID-19). The COVID-19 virus attacks angiotensin 2 receptors present in virtually all human cells and thus attacks multiple organ systems as well as the lungs

Corona Virus

M, E, N proteins are envelope proteins

Hemagglutinin-esterase destroys receptors



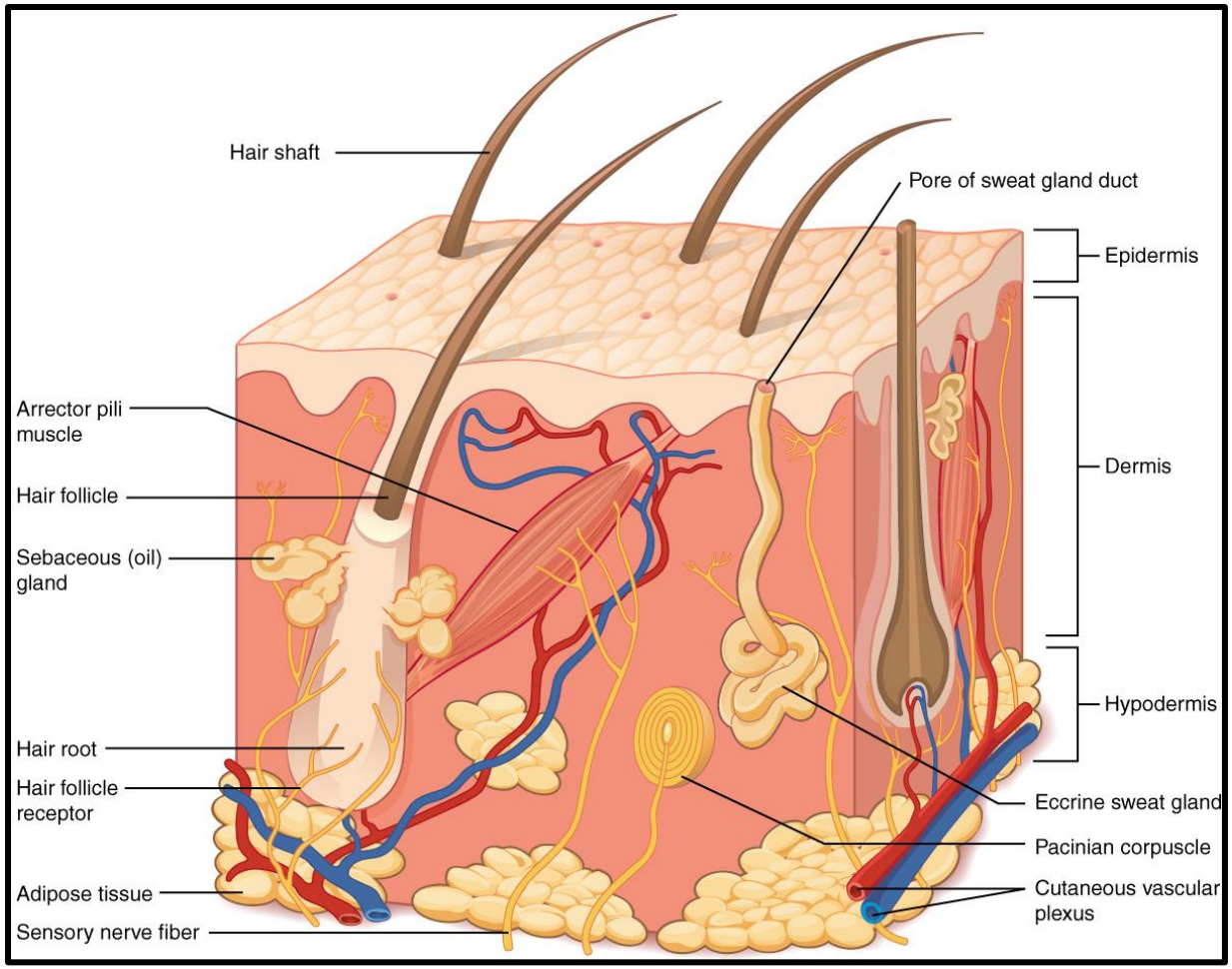
Covid-10; just a few pointers

A multisystem disease (Angiotension 2 receptors) that is much more lethal than the flu with 'long haul' symptoms. Protect yourself and listen to the medical experts. Most misinformation can be traced back to Donald Trump.

Therapy:

- Ventilation with PO2 of greater than 60% not SOB, Intubation as late a possible, use of prone position
- Antiviral treatment early Remdesivir
- Steroids (hydroxydexamethasone) 10% reduction in mortality
- Convalescent Serum-if given early in lesser sick patients.
- Anticoagulation with LMWH (Low Molecular Weight Heparin) to prevent DVT and strokes.

Skin; largest organ in the body.



The Most Common Skin Disorders

- Actinic keratosis/sun exposure related- atrophy, thinning, atypical cells that are precursors to Basal Cell and Squamous Cell cancers (these superficial skin lesions make the dermatologist a high income specialist)
- Wrinkles (genetic and farmer's skin) and many remedies.

Sun Screens and Safety

- No matter the weather forecast, you should routinely apply sunscreen to your face. Sunscreen helps to protects your skin from the sun's powerful UV rays (UVA (aging) and UVB (burning) rays) thereby minimizing your risk of sunburn, skin cancer and premature signs of aging, such as dark spots and wrinkles.
- The label on your face sunscreen needs to say "broad spectrum". An **SPF 15** (Sun Protective Factor) product filters out 94 percent of UVB rays and **SPF 30** 97 percent. Because an **SPF 50** allows just 2 percent of rays through, ratings above 30 are generally not necessary. Most individuals skimp on sunscreen that needs to be reapplied at least every 2 hours to maintain protection.
- The ingredients in today's sunscreens contain chemical filters like oxybenzone, avobenzone, octisalate, octocrylene, homosalate and octinoxate; all of which are absorbed through the skin and are unstudied with regard to safety.
- Zinc and Titanium Oxides are safe (but messy) and aminobenzoic acid, or PABA, and trolamine salicylate are considered potentially harmful.

Therefore, the Best Solution is to cover up and wear a broad rimmed hat at the beach, outdoor swimming pool and tennis courts!!!

Wrinkles: The cosmetologist's, esthetician's, plastic surgeon's and some complimentary medicine specialist's bread and butter

Common measures

- Prescription topical vitamin A retinoids/ tretinoin **cream** to increases collagen to fine small wrinkles
- Biotin Vitamin B-7 by mouth enhances hair growth and collagen in skin
- Topical antioxidants (Vit C, E, D)
- Topical collagen (a lubricant only)
- OTC wrinkle creams (The American Academy of Dermatology says that over-the-counter wrinkle creams do little or nothing to reverse wrinkles).
- Laser skin resurfacing (stimulates collage production)
- Light source and radiofrequency treatments. (stimulate collagen)
- Chemical peels. Light with glycolic acid or salicylic acid, medium with Trichloroacetic or glycolic acid, deep- carbolic (phenol) or trichloroacetic acid.
- Dermabrasion or microdermabrasion.
- Botox.

Tissue Fillers: 'recontouring'

- Hyaluronic acid
- Calcium hydroxylapatite
- Fat grafting. ...
- Other Permanent soft tissue fillers

Plastic Surgery.

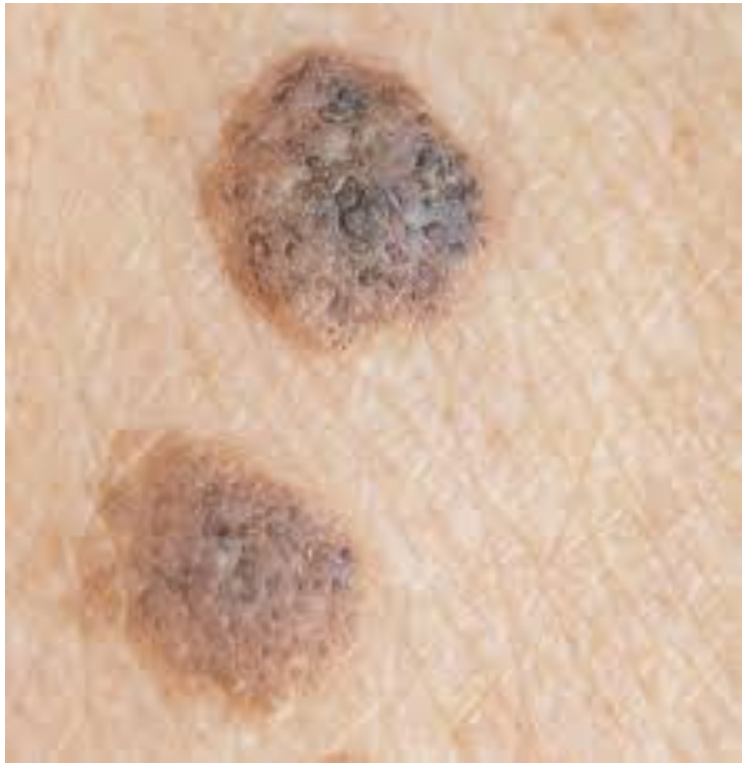
Seborrheic Keratosis/liver spots; how to differentiate from basal cell cancers

- Seborrheic keratosis are very common benign skin lesions associated with age. They are usually brown, black or light tan. The growths look waxy, scaly and slightly raised. They usually appear on the head, neck, chest, back and any skin serface.

Treatment: rarely need to be treated but can be removed for cosmetic purposes with liquid nitrogen, scrapping, cautery, or a hydrogen peroxide solution. Some clinics offer laser removal.

Typical seborrheic keratosis and basal cell cancer.

Seborrheic Keratosis



Basal Cell cancer

Squamous Cell Cancer and Malignant Melanoma

Raised and often ulcerated with Irregular margins, bleeds and enlarges

Black (95%), any change in an existing compound nevus warrants suspicion. Suspicious lesions need biopsy

Guidelines or Treatment of Melanoma

The type of treatment(s) your doctor recommends will depend on the stage and location of the melanoma

- Stage 0 (melanoma in situ) and most localized Stage I melanoma that has not penetrated the epidermis and dermis is usually treated by surgical wide excision alone
- Stage II in which the tumor has penetrated into the subcutaneous tissues is generally treated with wide excision coupled with sentinel lymph node biopsy.
- Stage III with lymph node involvement aside from wide excision adjuvant treatment is treated with an immune checkpoint inhibitors (this has revolutionized treatment in recent years) and targeted therapy drugs against BRAF genes.
- Stage IV melanomas have already spread (metastasized) to distant lymph nodes or other areas of the body are treated with surgery or radiation therapy. In about half of all melanomas, the cancer cells have changes in the *BRAF* gene. If this gene change is found, treatment with newer targeted therapy drugs plus chemotherapy

Melanoma cure rates: Many/most people with melanoma are cured by their initial surgery. The 5-year survival among all people with melanoma of the skin, from the time of initial diagnosis is 92%. Because melanoma is generally a fast growing cancer, being free of tumor at five years is indicative of cure.

Psoriasis

- **Psoriasis** is a skin disorder that causes skin cells to multiply up to 10 times faster than normal as normal skin cells replicate every 10-30 days. This makes the skin build up into bumpy red patches covered with white scales (papulosquamous erruption). They can grow anywhere, but most appear on the scalp, elbows, knees, and lower back.
- About 2.2% of people are afflicted in the United States.
- Inherited tendency for this 'autoimmune' disorder with triggers seem to be related to stress or trauma. (T cell dysfunction)
- Up to 30% of people with psoriasis get psoriatic arthritis.
- It affects men and women equally
- It can be classified in four varieties; the most common Plaques (90%), more diffuse guttate or tear drop lesions, inverse that occur in the creases in skin like under the breast, pustular that form papules, and erythrodermic or more generalized.

Psoriatic Arthritis

Psoriatic arthritis is a form of chronic inflammatory arthritis that has a highly variable clinical presentation and frequently occurs in association with skin and nail lesions. It typically involves painful inflammation of the joints and surrounding connective tissue and can occur in any joint, but most commonly affects the joints of the fingers and toes. Psoriatic arthritis can also affect the hips, knees, spine (spondylitis), and sacroiliac joints. Skin manifestations of psoriasis tend to occur before arthritic manifestations in about 75% of cases.

Treatment for psoriasis

- Topical agents are typically used for mild disease, phototherapy for moderate disease, and systemic agents for severe disease.
- For psoriasis of the scalp, a 2016 review found dual therapy (vitamin D analogues and topical corticosteroids) most effective.
- Phototherapy (sunlight or ultraviolet light) has long been used for psoriasis. Coal tar is no longer used.
- Chemotherapy agents like methotrexate is often used.
- Biologics like etanercept (Enbrel) are quite effective but expensive. Dosing is often weekly.

Images of Psoriasis

Commonly on extensor surfaces of extremities

On the scalp presents as reddish welts And ridges with excessive ‘dandruff’

Atopic dermatitis and other Eczemas

- Atopic dermatitis is a condition that makes your skin red and itchy. Atopic dermatitis is generally long lasting (chronic) and tends to flare periodically. No cure has been found for atopic dermatitis. It is the most common form of eczema and usually starts in childhood, and often gets milder or goes away by adulthood. Atopic dermatitis is part of what doctors call the **atopic** triad of atopic dermatitis, asthma and hay fever.

Contact Dermatitis

Contact dermatitis comes in two types:

1. Allergic due to an immune system reaction or allergy to an irritant like latex or metal.
2. Irritant due to a chemical or other substance irritates your skin.

Common Causes include:

- detergents
- bleach
- Jewelry/nickel
- latex
- poison ivy and other poisonous plants
- skin care products, including makeup
- soaps and perfumes
- Solvents
- Perfume

Treatment (In Dermatology, if the rash is dry you wet it; if wet you dry it and all others are treated with cortisone cream)

Medications

- Antihistamines such as diphenhydramine (Benadryl) can control the itch.
- **Corticosteroid cream** or ointment can reduce the itch. For a more severe reaction, you can take steroids like prednisone by mouth to control swelling.
- Calcineurin inhibitors applied topically such as tacrolimus (Protopic) and pimecrolimus (Elidel) reduce the immune response that causes red, itchy skin can be prescribed.

Preventative measures

- Cool compresses applied before you rub on the corticosteroid cream can help the medicine get absorbed more easily
- Moisturize your skin daily with a rich, oil-based cream or ointment to form a protective barrier against the elements. Apply the cream right after you get out of the shower or bath to seal in moisture. Blot dry after bathing.
- Avoid scratching. You could cause an infection.
- Use fragrance-free detergents, cleansers, makeup, and other skin care products.
- Wear gloves and protective clothing whenever you handle chemicals
- Avoid the irritant such as poison ivy and learn how to identify these plants.
- Wear protective gloves to bed

Atopic dermatitis and Poison Ivy allergy

Atopic causes itching that often causes scratching that results in neurodermatitis (skin injury) and more itching and scratching

Poison ivy: note **linear** rash with blisters That can rupture and spread the rash to Other areas and contacts.

Allergy Skin Testing

Allergy skin tests are widely used to help diagnose allergic conditions. A **skin prick test**, also called a puncture or scratch test, checks for immediate allergic reactions to as many as 50 different substances at once.

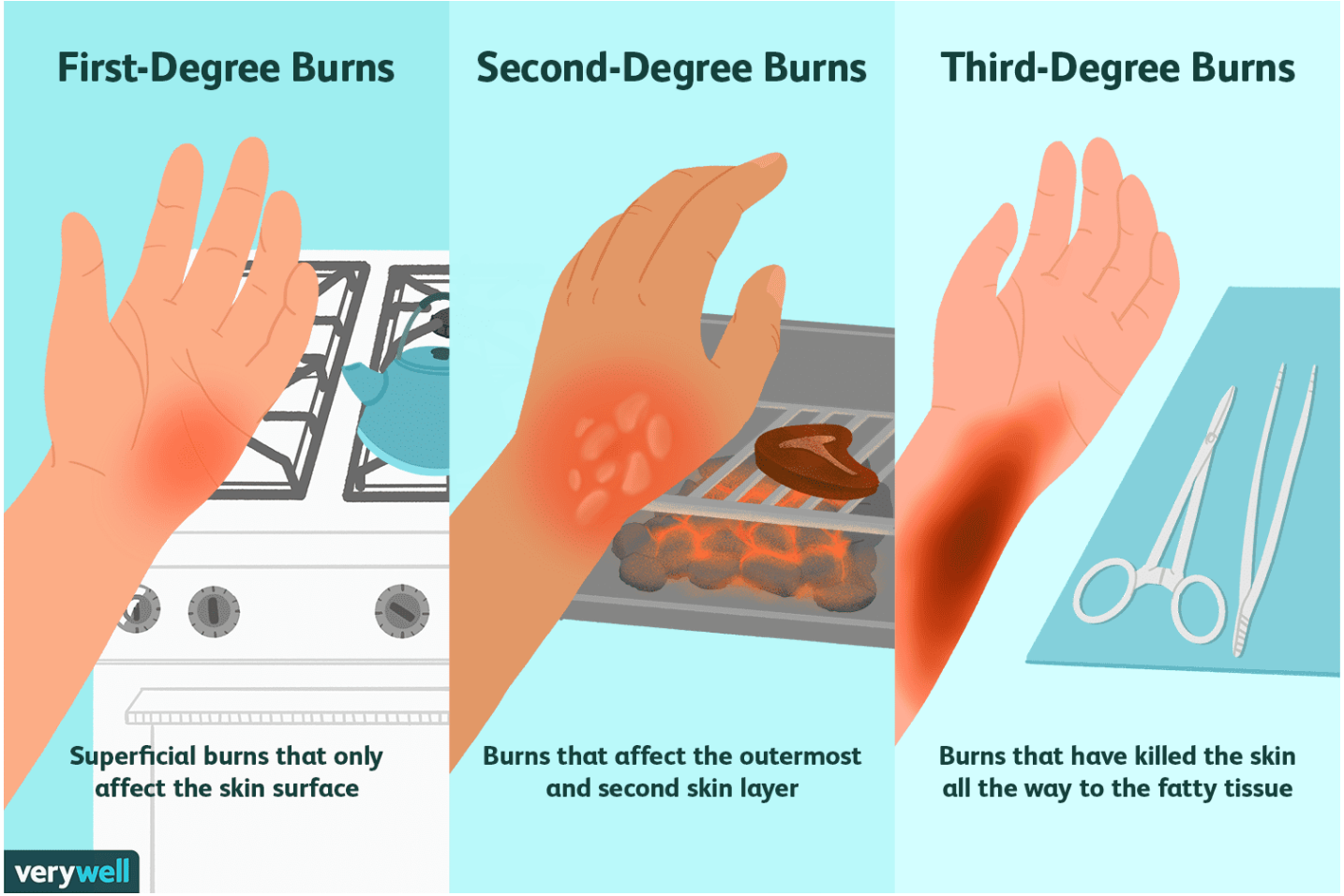
- Hay fever (allergic rhinitis)
- Allergic asthma
- Dermatitis (eczema)
- Food allergies
- Penicillin allergy
- Bee venom allergy

Information from allergy tests may help your doctor develop an allergy treatment plan that includes allergen avoidance, medications or allergy shots (immunotherapy/desensitization). In general, allergy skin tests are reliable for diagnosing allergies to airborne substances, such as pollen, pet dander and **dust mites**. Skin testing for **food allergies** can be complex and not too reliable. Additional testing may be necessary.

More Disorders of the Skin

- Vitiligo
- Warts
- Ringworm and Tinea Versicolor
- Sebaceous Cysts

Burns: 1st, 2nd, 3rd and 4th Degree



Burn Management

- With a 3rd degree burn about a 2cm defect will close/heal spontaneously over time.
- Split and full thickness grafts
- Skin substitutes; cadaver, pig, synthetic

Palliative Pain Management

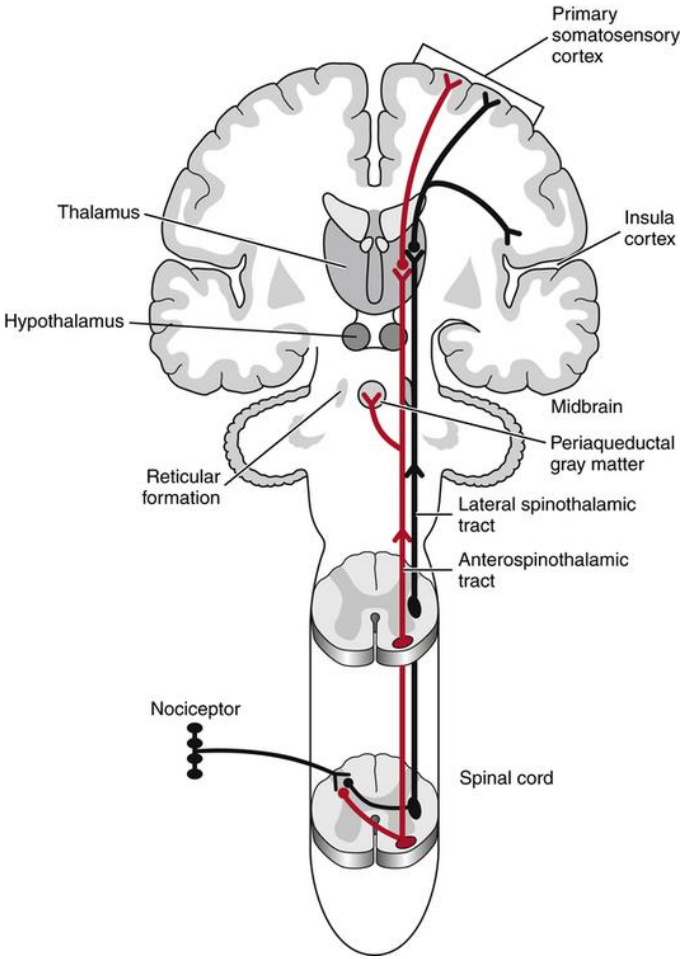
<u>Overriding issues and goals</u>

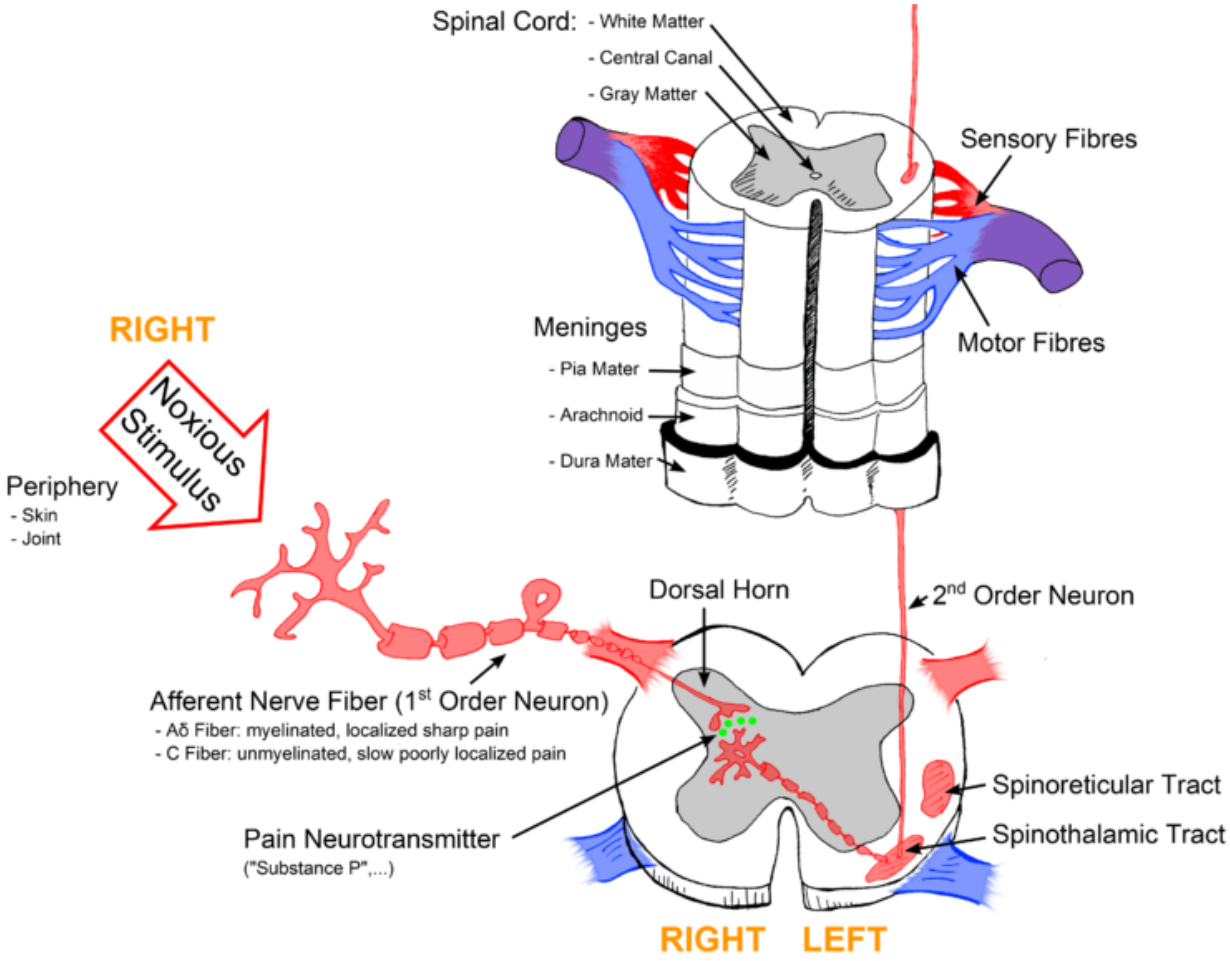
- Quality of life
- The emotions of dying as a normal process
- Relief of pain
- Integrate the psychological and spiritual
- Live as active as possible

- Pain as distress: physical, psyche, social, emotional spiritual

Pain Pathways

medial lemniscus, also known as Reil's band or Reil's ribbon, is a large ascending bundle of heavily myelinated axons that decussate in the brainstem, specifically in the medulla oblongata.




Spinal Cord:
- White Matter
- Central Canal
- Gray Matter
Sensory Fibres
Motor Fibres
Meninges
- Pia Mater
- Arachnoid
- Dura Mater
RIGHT
Noxious Stimulus
Periphery
- Skin
- Joint
Dorsal Horn
2nd Order Neuron
Afferent Nerve Fiber (1st Order Neuron)
- Aδ Fiber: myelinated, localized sharp pain
- C Fiber: unmyelinated, slow poorly localized pain
Spinoreticular Tract
Spinothalamic Tract
Pain Neurotransmitter
("Substance P",...)
RIGHT
LEFT

Nociceptive versus Neuropathic Pain

- Nociceptive pain is the body's response to actual damage or stretching like physical trauma that is divided into two categories:

Somatic pain usually related to trauma that is localized to the injury site or stimulus and often is aching, sharp, increases with movement

Visceral pain that relates to body organs (usually obstruction of a viscera like the gall bladder, bowel, ureter or myocardial infarction) that is often poorly localized, colicky and frequently radiates.

Neuropathic Pain/Somatosensory nervous system

Pain originating with the nerve that represents an abnormal processing of sensory imputes.

- Allodynia—pain due to a stimulus that does not normally provoke pain
- Hyperalgesia-- increased pain from a stimulus that usually provokes pain
- Hyperesthesia-- is an increase in the sensitivity of any of your senses, such as sight, sound, touch, and smell
- Neuralgia--extreme shooting or stabbing **pain** that follows the path of a damaged or irritated nerve **unrelated to the stimulus**. Like trigeminal neuralgia

Symptoms of Neuropathic pain

- shooting, burning, or stabbing pain
- tingling and numbness, or a “pins and needles” feeling
- spontaneous pain (just aches), or pain that occurs without a trigger
- evoked pain, or pain that’s caused by events that are typically not painful — such as rubbing against something, being in cold temperatures, or brushing your hair
- a chronic sensation of feeling unpleasant or abnormal
- difficulty sleeping or resting
- emotional problems as a result of chronic pain, loss of sleep, and difficulty expressing how you’re feeling

Some Causes of Neuropathic Pain

- Diseases: MS, multiple myeloma, diabetes, trigeminal neuralgia, alcoholism, cancer therapy, reflex sympathetic dystrophy
- Injury: is an uncommon cause of neuropathic pain: carpal tunnel syndrome and **regional pain syndrome** (**CRPS**) is chronic **neuropathic pain** that follows soft-tissue or bone injury (type I) or nerve injury (type II) and lasts longer and is more severe than expected for the original tissue damage.,
- Infections: post herpetic neuralgia
- Loss of Limb; the phantom limb syndrome

Peripheral Neuritis: Precipitating causes; diabetes, trauma, alcoholism and infection, wear and tear of age, arteriosclerosis, smoking

S**ymptoms** are often very gradual in onset.

Numbness, prickling or **tingling** in your feet or hands, which can spread upward into your legs and arms. Sharp, jabbing, throbbing or **burning** pain that can be intermittent. Extreme sensitivity to touch

- Autonomic nerves can be involved causing GI and bladder complaints

Measuring Pain

- Many investigators hold that pain is inherently a private experience that can only be quantified by asking the patient to do his or her own number assignment. This is the common denominator in the hospital setting.
- An alternative is the Visual Analog Scale (VAS), which usually consists of a 10-cm line anchored at one end by a label such as "no pain" and at the other end by "the worst pain imaginable" or "maximum pain."
- The McGill Pain Questionnaire (MPQ) is perhaps the most thoroughly evaluated multidimensional scaling device for pain. It is based on the vocabulary used by patients to describe various experiences of pain. The MPQ scales pain along three dimensions: sensory, affective, and evaluative. There are 20 sets of words that describe varying qualities of pain.

Because most individuals have varying levels of pain tolerance; it is often difficult for the physician to objectively assess the degree of discomfort.

The Clinical Assessment of Pain

- Perception-what makes it worse or better; get the story from the patient.
- Quality-what it feels like
- Radiation
- Site-severity and relation to movement or static
- Temporary, intermittent and timing
- What is impact of pain in your life

Goals; comfort and functionality realizing that there is a **large placebo** effect from treatment; “do something”

To treat Mild Pain: Non Pharmacological:

- Apply ice or heat and elevate and apply compression
- Massage therapy
- Physical Therapy and Occupational Therapy
- Ultrasound
- Meditation and Cognitive Behavioral Modification
- Prayer and mindfulness

Medications for mild pain

NSAIDS (Selective COX 2 inhibitors like Celebrex are more protective of the stomach than Aleve (naproxen) and Advil (Ibuprofen)

- Side effects may include heartburn, stomach pain, nausea, gastric ulcers and rarely kidney failure, aggravation of hypertension, bleeding, anxiety, weakness and ringing in the ears.
- Additionally, they can interacts with anticoagulant and HPT therapy, alcohol intake, and aspirin and other meds. Consult your physician.

Acetaminophen is very safe but can produce some allergic reactions

Steroids like cortisone or prednisone have a range of side effects but are very safe if taken for short periods. You need a prescription.

Capsaicin creams (chili peppers) many OTC forms

Lidocaine patches are safe and can get OTC but need a prescription for lidocaine patch 5%-salontas

Medications for Moderate to Severe Pain

- Codeine-an opioid analgesic is great for cough; and mild pain but somewhat addicting.
- Tramadol/Flexeril-is similar to opioid analgesics and often used in back pain as a muscle relaxant.
- Hydromorphone/Dilaudid-long acting opioid
- Methadone-less addicting, cheap
- Morphine, oxycodone (OxyContin)
- Fentanyl patch—long acting
- Buprenorphine patches (in combo with naloxone used to treat addiction)

Naloxone/Narcan is an opioid antagonist used to treat opioid overdose on an emergent basis.

Drug treatment for neuropathic pain – updated recommendations from the International Association for the Study of Pain

Recommendation	Drugs
First-line	SNRI (antidepressant) modulate serotonin and norepinephrine uptake that blocks pain
	Tricyclic (antidepressants)
	Gabapentin, pregabalin (anticonvulsants)
Second-line	Capsaicin 8% patches
	Lidocaine (lignocaine) patches
	Tramadol
Third-line	Strong opioids

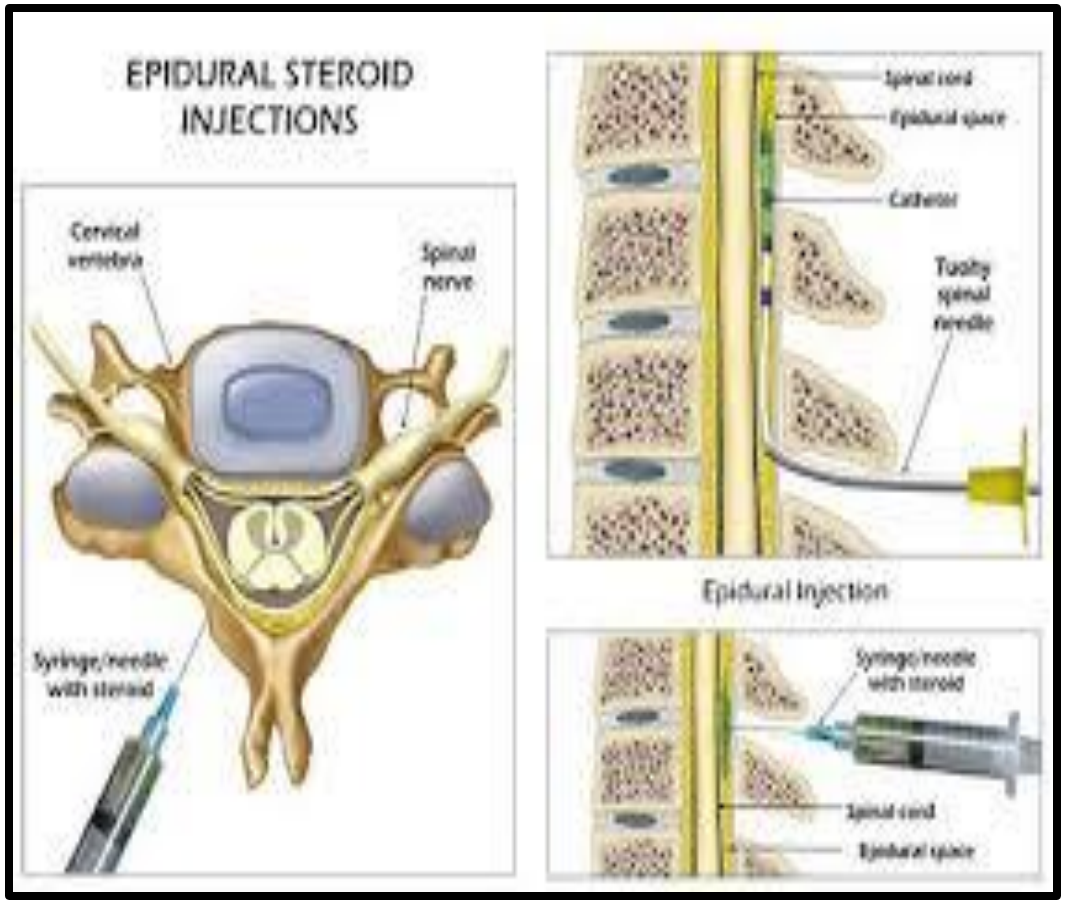
Other Treatment Modalities

- Variety of nerve blocks using ultrasound placement and lidocaine to perform surgery and post-op pain relief in joint replacement and for diagnostic purposes.
- Permanent nerve blocks for pain using agents like glycerin, hypertonic saline, phenol and thermal/cautery
- Pain point injections with lidocaine, steroids
- Tens Units: transcutaneous electrical nerve stimulation which works by sending electrical impulses through the skin.

Steroid Epidural Injections for pain; differs from Spinal Anesthetics for surgery

- **Epidural** steroid injections (ESIs) are a common treatment option for many forms of lower **back pain** and leg **pain**. They have been used for decades and are considered an integral part of the nonsurgical management of sciatica and lower **back pain**.
- 40% to 80% of patients experienced over 50% improvement in sciatica pain and functional outcome from 3 months up to 1 year when 1 to 4 **injections** were given in that year.

Spinal Cord Anatomy



Joint Replacement

CAM (Complimentary and Alternative Medicine) treatment of pain

- physical and occupational therapy
- Supports, canes, crutches, walkers, wheelchairs, stair lifts
- Braces of all kinds
- Transfer training
- Step in tubs, automation and
- acupuncture
- massage
- Yoga, meditation, Kaichi, or gentle stretching with deep breathing
- heating pads or heat baths
- cold packs or ice baths or Selontas/lidocaine patches
- progressive muscle relaxation
- guided imagery
- Biofeedback
- Increased activity

Dementia and Geriatric Syndromes

- Alzheimer's disease: (60%, Amyloid, Tau Protein with tangles)—cause unknown (APOE-e4 genetic link). No effective treatment although there is a new blood test for Tau protein that is 96% accurate in diagnosing Alzheimer’s: anticholinergics may temporarily delay the need for NH placement.
- Arteriosclerotic; multiple mini-strokes, TIA
- Temporal Frontal Lobe Dementia; usually starts with difficult in speech.
- Lewy Body Dementia; more behavioral problems and shorter course

Stroke; ischemic and hemorrhagic

- Unlike heart attach do not give aspirin because of possible intracranial bleeding
- Cincinnati Criteria: *Facial droop, Arm drift, Slurred Speech: All three present = 87% chance of stroke.*
- Emergency CT scan to differentiate
- Window of 3-4.5 hours from when symptoms first started (with new angiography techniques can estimate amount of viable brain beyond stroke (flair and penumbra) and possible large vessel disease and in some cases extract the clot to retrain maximal function up to 24 hours.)
- IV anticoagulant and fibrinolytic: plasminogen activator (tPA) and Alteplase. Cannot give after 4.5 hours.
- Carotid bruit

BRAIN DEATH IN ORGAN DONATION

1. Comatose and unresponsive
2. EEG for brain wave activity
3. Now have a nuclear scan that reveals total brain blackout. No longer need to rely on clinical findings and expert opinions, but still by law need multiple expert opinions.

“My Chart” and Hospital Information Exchange: What Lab Values Mean

A brief introduction into the practical interpretation of your blood studies and testing of bodily functions

Introduction

1. **Functionality of My Chart; and what are the future potentials**
2. **What the Lab values mean**
3. **Telemedicine**

In defense, at least it was the correct leg!

The CBC

WBC	**8.8** 10*3/uL	*3.8 - 10.8 10*3/uL*
RBC	**4.73** 10*6/uL	*4.20 - 5.80 10*6/uL*
Hemoglobin	**15.7** g/dL	*13.2 - 17.1 g/dL*
Hematocrit Blood	**46.6** %	*38.5 - 50.0 %*
MCV	**98.7** fL	*80.0 - 100.0 fL*
MCH	**33.3** pg	*27.0 - 33.0 pg*
MCHC	**33.8** g/dL	*32.0 - 36.0 g/dL*
RDW	**13.2** %	*11.0 - 15.0 %*
Platelets	**152** 10*3/uL	*140 - 400 10*3/uL*
MPV	**6.9** fL	*7.5 - 11.5 fL*

Differential Blood Count

Neutrophils Relative	**37.0** %	*bacterial infections*
Lymphocytes Relative	**53.0** %	*immune system, leukemia*
Monocytes Relative	**7.0** %	*immune system, globulins, Multiple Myeloma*
Eosinophils Relative	**2.0** %	*Allergic reactions, parasitic diseases*
Basophils Relative	**1.0** %	*inflammation*
Neutrophils Absolute	**3.3** 10*3/uL	*1.5 - 7.8 10*3/uL*
Lymphocytes Absolute	**4.7** 10*3/uL	*0.8 - 3.9 10*3/uL*
Monocytes Absolute	**0.6** 10*3/uL	*0.2 - 0.9 10*3/uL*
Eosinophils Absolute	**0.2** 10*3/uL	*0.0 - 0.5 10*3/uL*
Basophils Absolute	**0.1** 10*3/uL	*0.0 - 0.2 10*3/uL*

Serum Chemistries

Cholesterol	**179** mg/dL	*125 - 199 mg/dL*
TOTAL CHOLESTEROL INTERPRETATION: Less than 200 mg/dL Desireable 200-239 mg/dL Borderline Greater or Equal to 240 mg/dL High		
LDL Calculated	**100** mg/dL	*0 - 100 mg/dL*
LDL CHOLESTEROL INTERPRETATION: Less than 100 mg/dL Optimal 100-129 mg/dL Near optimal/above optimal 130-159 mg/dL Borderline High 160-189 mg/dL High Greater or Equal to 190 mg/dL Very High		
HDL	**63** mg/dL	*40 - 180 mg/dL*
HDL CHOLESTEROL INTERPRETATION: Less than 40 mg/dL Low Greater than 60 mg/dL Desirable		
Triglycerides	**80** mg/dL	*0 - 150 mg/dL*
TOTAL TRIGLYCERIDE INTERPRETATION: Less than 150 mg/dL Normal 150-199 mg/dL Borderline HIgh 200-499 mg/dL High Greater or Equal to 500 mg/dL Very High		

More Serum Chemistries: Electrolytes
Normal Blood Ph. is 7.4: below is acidosis, above alkalosis

Sodium	**138** mmol/L	*135 - 146 mmol/L*
Potassium	**4.5** mmol/L	*3.5 - 5.1 mmol/L*
Chloride	**102** mmol/L	*98 - 110 mmol/L*
CO2	**25** mmol/L	*22 - 29 mmol/L*
Anion Gap	**11** mmol/L	*5 - 13 mmol/L*

Basic Chemistry Profiles

BUN	**13** mg/dL	*7 - 25 mg/dL Kidney function*
Creatinine	**1.07** mg/dL	*0.50 - 1.30 mg/dL Kidney function*
Glucose	**89** mg/dL	*65 - 99 mg/dL Insulin/diabetes*
Calcium	**10.0** mg/dL	*8.4 - 10.5 mg/dL bones, parathyroid*
Total Bilirubin	**1.0** mg/dL	*0.2 - 1.2 mg/dL Red blood cells, liver*
AST(SGOT)	**20** U/L	*0 - 40 U/L Liver enzyme/damage*
ALT (SGPT)	**14** U/L	*0 - 60 U/L Liver enzyme/damage*
Alkaline Phosphatase	**66** U/L	*33 - 140 U/L Bones, gall bladder obstruction*

More Chemistries

The normal reference range is not applicable for patients less than 20 years old.

Total Protein	**6.7** g/dL	*6.4 - 8.3 g/dL*
Albumin	**4.4** g/dL	*3.5 - 5.0 g/dL liver, nutrition/osmotic presssure*
Globulin	**2.3** g/dL	*2.1 - 3.7 g/dL immune system*
Albumin/Globulin Ratio	**1.9**	*1.0 - 2.1*
BUN/Creatinine Ratio	**12**	
GFR MDRD Af Amer	**81** See Note Renal function	

GFR is estimated using Creatinine, age, gender and race. Patient's values should be interpreted as a trend.
Between 30 and 90 ml/min/1.73m2, clinical correlation is needed.
For additional information:

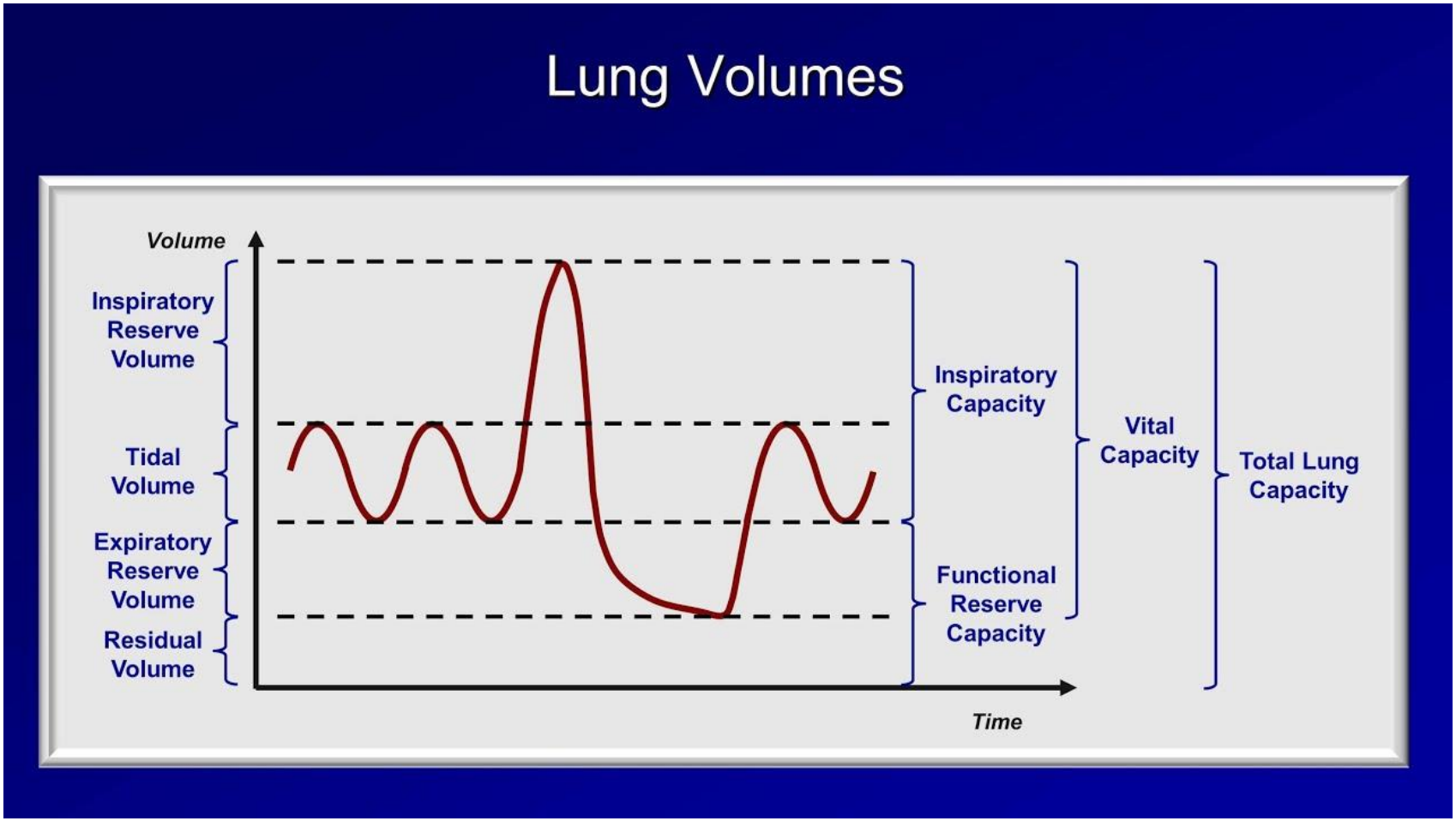
Other Common Tests

- **Serum Amylase (23 to 85 units per liter (U/L). (Pancreas)**
- **Thyroxine T4 (4.5-11.7 mcg/Dl) (Thyroid Gland)**
- **DXA Bone Density Levels (T score: 0=normal) (osteoporosis/osteopenia)**
- **Pap smear for Cervical cancer and HPV infection**
- **Stool Guaiac/ for Colon cancer and GI bleeding**
- **PSA for Prostate Cancer and Inflammation**
- **Screening Chest CT scan for detection of Lung Ca**

Common Testing Procedures

- **Cardiac Stress test-Treadmill or via Injection**
- **Echocardiogram—Heart Function; Ejection Fraction**
- **Spirometry—Pulmonary Function test**
- **Colonoscopy to detect Colon Ca or Diverticulosis**
- **Mammography**
- **Hgb A1c (4-5.6%) Elevated in poorly controlled diabetes (>6.5)**
- **MRI-Magnetic Resonance Imaging (Other scans include CT or computerize tomography and PET scans)**

Pulmonary Function Tests; spirometry

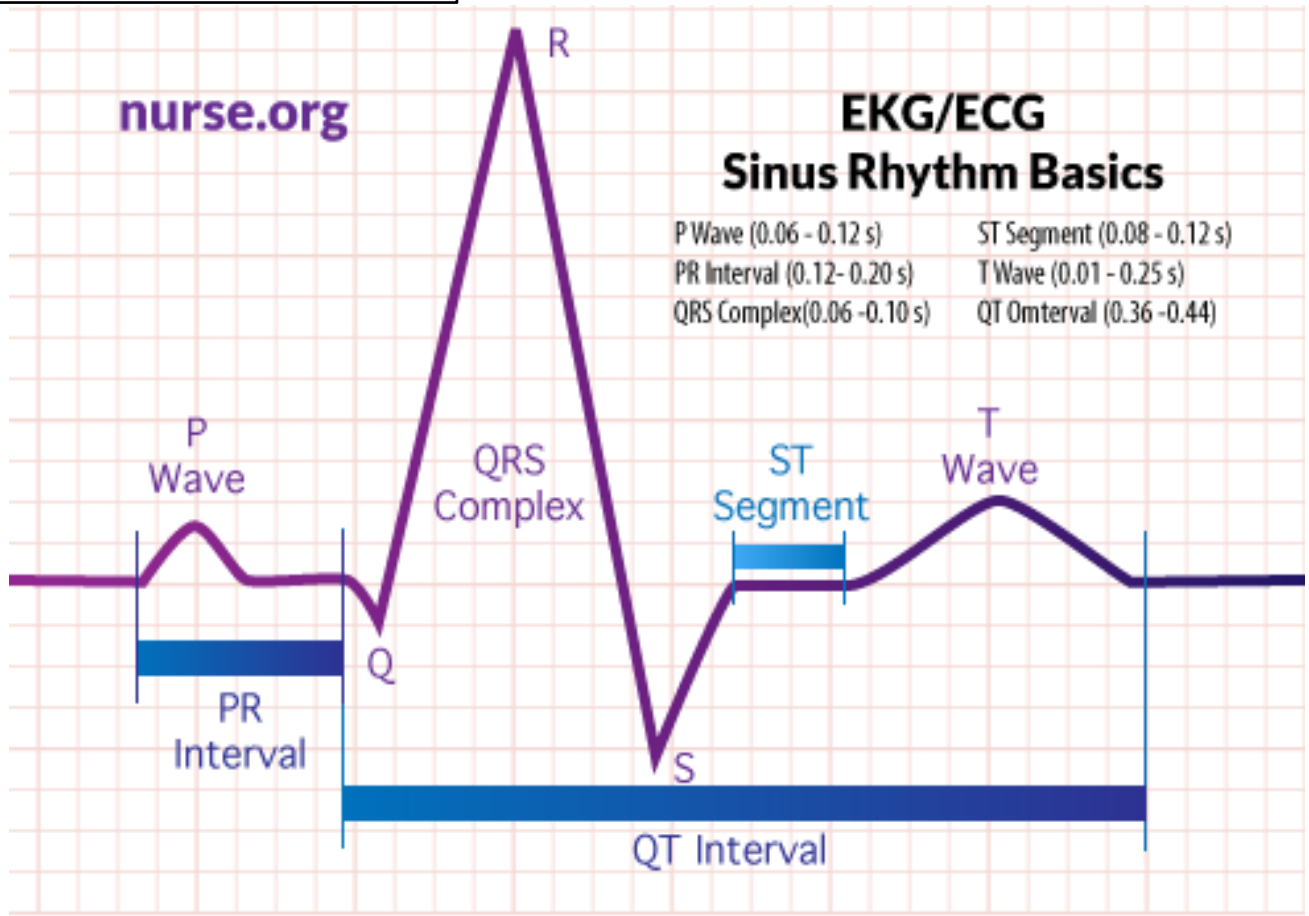


More Tests

- **ECG or EKG--Electrocardiogram**
- **CT Coronary calcium score/screening**
- **CRP/C-reactive protein (index of inflammation)**
- **RBC sedimentation rate (indicative of inflammation)**
- **Troponin—Heart damage enzyme**
- **Natriuretic Peptide (BNP)-Heart damage enzyme**
- **EMG-Electromyogram—Nerve conduction**
- **EEG-Electroencephalogram—brain waves**
- **Functional MRI-Investigative tool to map the brain**

Normal EKG tracing

STEMI=ST elevation Infarction



Bacteriology

- **Specimen/Source: SWAB/NASAL PASSAGE Collected: 11/25/2014 10:05**

  Status: Final Last Updated: 11/28/2014 02:17

  ISO1 (Final)
  No Staph aureus Isolated (no MRSA-metacillin resistant staphylococcus aureus)

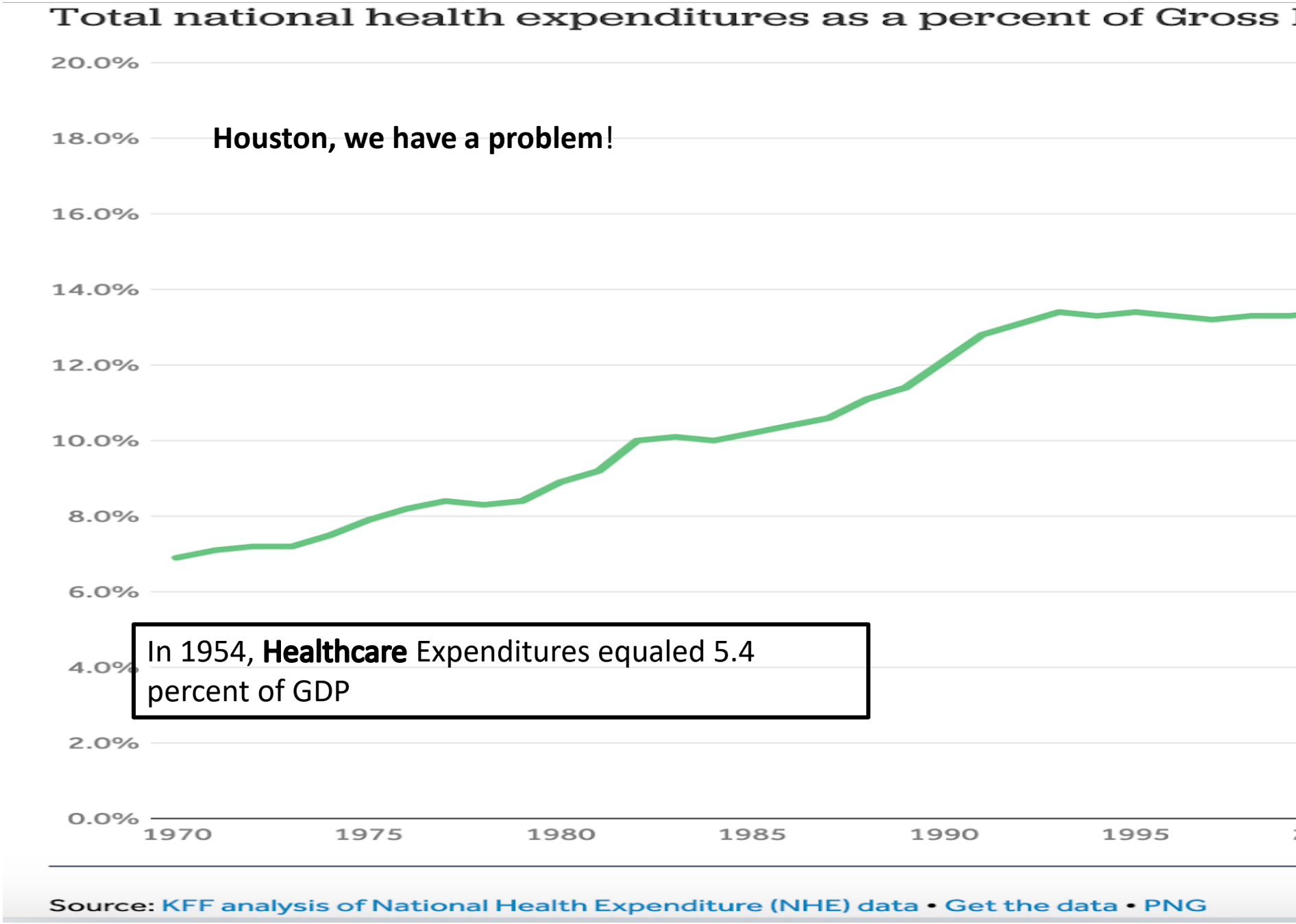
You are the main steward of you health

- All medical information can be researched on the WEB
- Understand that there are many treatment options and often standards for treatment of specific illnesses are works-in-progress and change
- Do not underestimate the value of a second opinion
- Be cost sensitivity and not reticent in asking questions about ‘what’s it going to cost doc’.
- Understand you healthcare coverage as best you can
- The vast preponderance of physicians are ethical, well-informed and strong advocates for their patients; it is increasingly a tough occupation

It may all seem confusing but you can research test Results Easily through the internet

- Medline
- WebMd
- Wikipedia

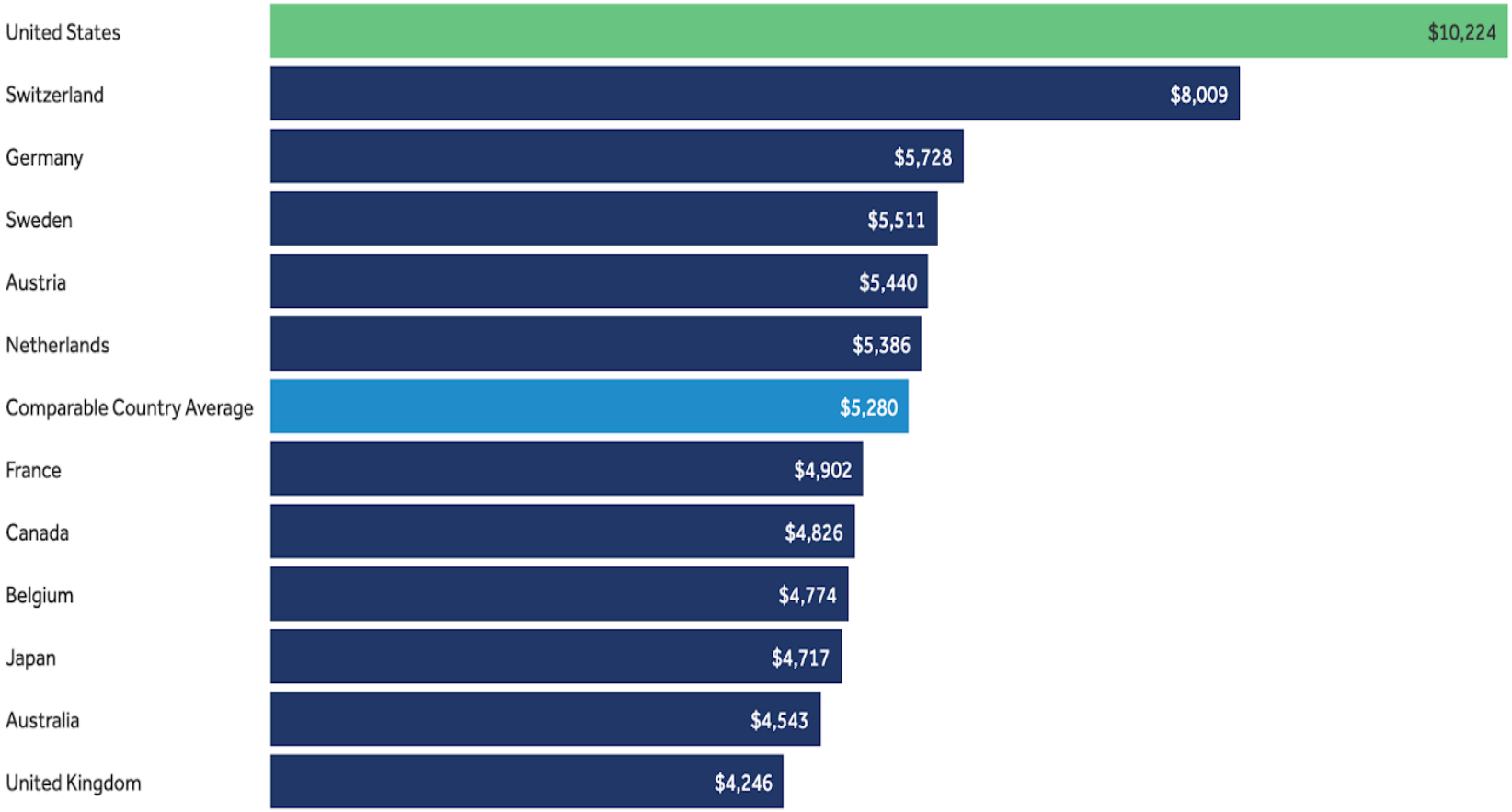
Managing Healthcare Cost


Total national health expenditures as a percent of Gross
20.0%
18.0%
16.0%
14.0%
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
1970
1975
1980
1985
1990
1995
Houston, we have a problem!
In 1954, Healthcare Expenditures equaled 5.4 percent of GDP
Source: KFF analysis of National Health Expenditure (NHE) data • Get the data • PNG

Healthcare as a % of GDP over the decades		
Year	% of GDP	% growth over previous decade
1960	5.0%	
1970	6.9%	38%
1980	8.9%	29%
1990	12.1%	36%
2000	13.3%	10%
2010	17.4%	31%
2017	17.9%	3%

On average, other wealthy countries spend about half as much per person on health than the U.S. spends

Health consumption expenditures per capita, U.S. dollars, PPP adjusted, 2017



Notes: U.S. value obtained from National Health Expenditure data. Health consumption does not include investments in structures, equipment, or research.

Source: KFF analysis of OECD and National Health Expenditure (NHE) data • Get the data • PNG

Peterson-Kaiser

- Total US healthcare costs in 2018 3.6 trillion
- Cost per citizen 10,850
- Cost of family health benefits 28,000
- Average household income in Ohio 52,334
- Predicted Spending in 2026 6 trillion

Cultural and Structural Considerations
(barriers to reform built into the system)

- ***Price elasticity***
- ***Misplaced pay incentives***
- ***Deep pocketed vested interests***
- ***Declining role of the physicians and patient in public policy***
- ***Changing Times: bigger is better?***

Price Inelasticity (an imperfect competitive market)

- “Doc what is it going to cost”?
- Asymmetry of medical info between pt & doctor.
- No marketing of healthcare services based on the price?
- Fixed fees and reimbursements based on DRG & CPT codes
- Parkinson’s law (nature abhors a vacuum) on the supply side if you build it they will come
- What is a quality-adjusted life-year of good health worth anyway? (QALY) No easy answer.
- In seminars, conferences and everyday interactions, providers rarely mention cost.

Flawed Incentives; the Productivity Model

- Our system is a production model across all providers where compensation rests upon doing ‘more rather than less’. You are paid by the numbers and your ability to rush the patient through the office encounter.
- Healthcare is treated as a commodity uncoupled from the time needed for compassionate caring.
- Quality of care and severity adjustment of disease are difficult to measure and are supplanted by the up-coding game to maximize incomes.
- The 15 minute encounter that cause physicians to burn out, short change the patient and depreciate the Doctor/Patient relationship

Deep Pocketed Special Interests; Lots of Dollars

- Hospitals, drug companies & PBMs, managed care organizations, manufactures of DME, employers, unions, disease nonprofits and research facilities all fight for their share of the healthcare dollar without burdensome regulations
- This produces an army of lobbyists that wield political power through 'directed' campaign donations, influence peddling and marketing that conspires to bypass the physician and patient in molding public policy. Indeed, the physician and organized medicine has lost the franchise and are out of the loop.
- As an egregious example, to get passage of the ACA, Obama and the Congress had to exclude the Public Option for the State Exchanges and proscribe Medicare's license to directly negotiate price with the drug companies.

Signs of the Times (Bigger, Better, and More Expensive)

- Medical schools (in 1961 a small building on Eden Ave with a mostly volunteer faculty)
- Student debt (tuition less than $2000 per year)
- Hospitals (small with few private rooms and nurses could care for 10-20 patients)
- Specialization (about 15 and now well over 125)
- Expensive sophisticated equipment

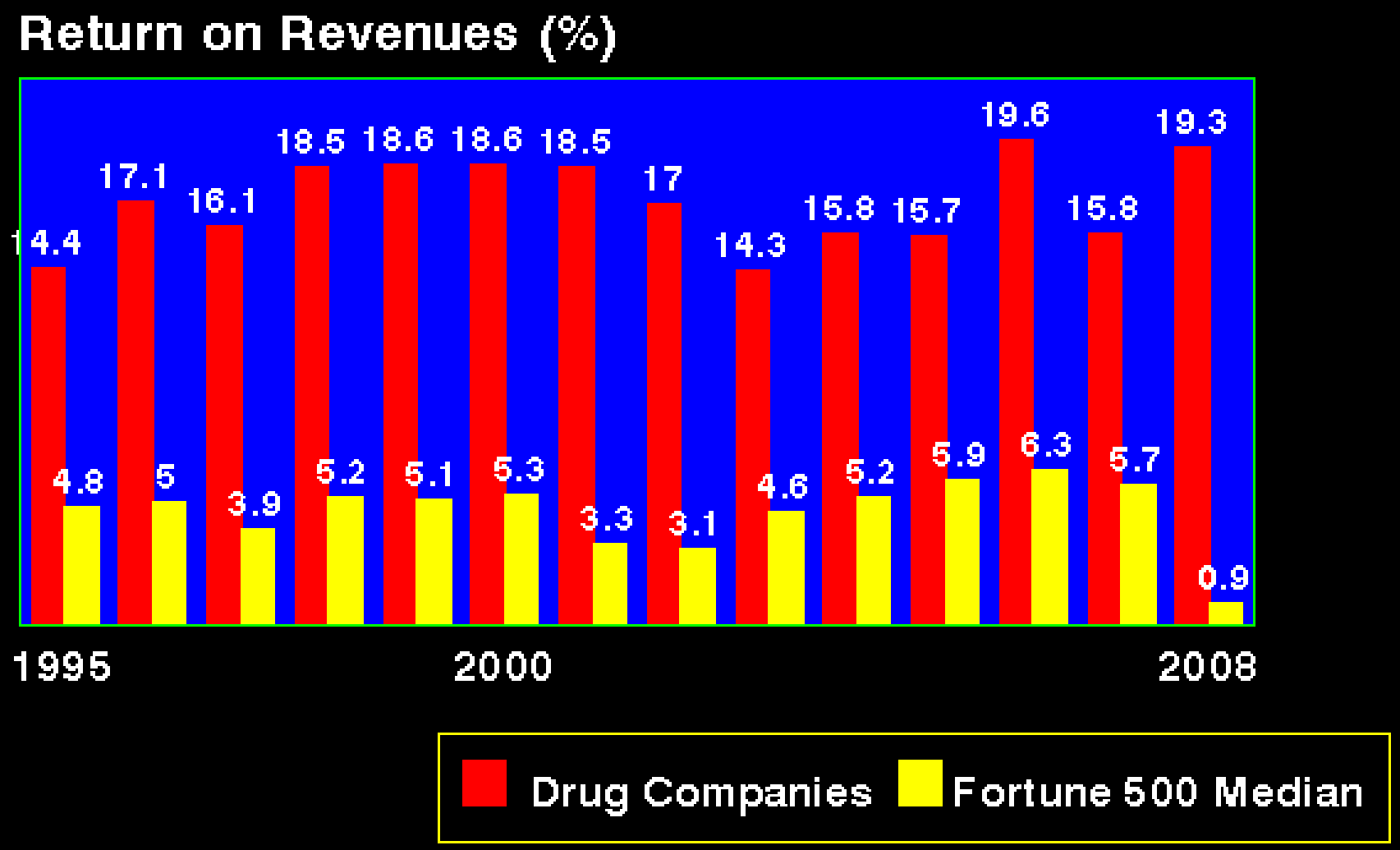
Specific Silos in which to Manage Healthcare Costs

- *Controlling Drug Prices*
- *Solving the Transactional Maze in Healthcare*
- *Decreasing Health Insurance Costs*
- *Reasons for Encouraging a Healthy Life style*
- *Providing Universal Access to Appropriate Healthcare*
- *Reducing Medical Mistakes*
- *Maintaining and Improving the Standards of Care*
- *Integrating New Technology and Treatments*
- *Reducing Duplication in the Healthcare system*

Managing Drug Costs

- In past 20 years in ‘inflation adjusted’ dollars, drug expense per person has doubled and prescription drugs now consume 10-11 percent of healthcare costs.
- Drug Companies have high profit margins and more revenue is spent on direct to the consumer advertising than R&D.
- PBM are intermediaries that end up being in bed with the insurance and drug companies rather than lowering costs for the consumer.
- Reasons foreigners pay 30-50 percent less for their drugs.

Drug Company Profits, 1995-2008



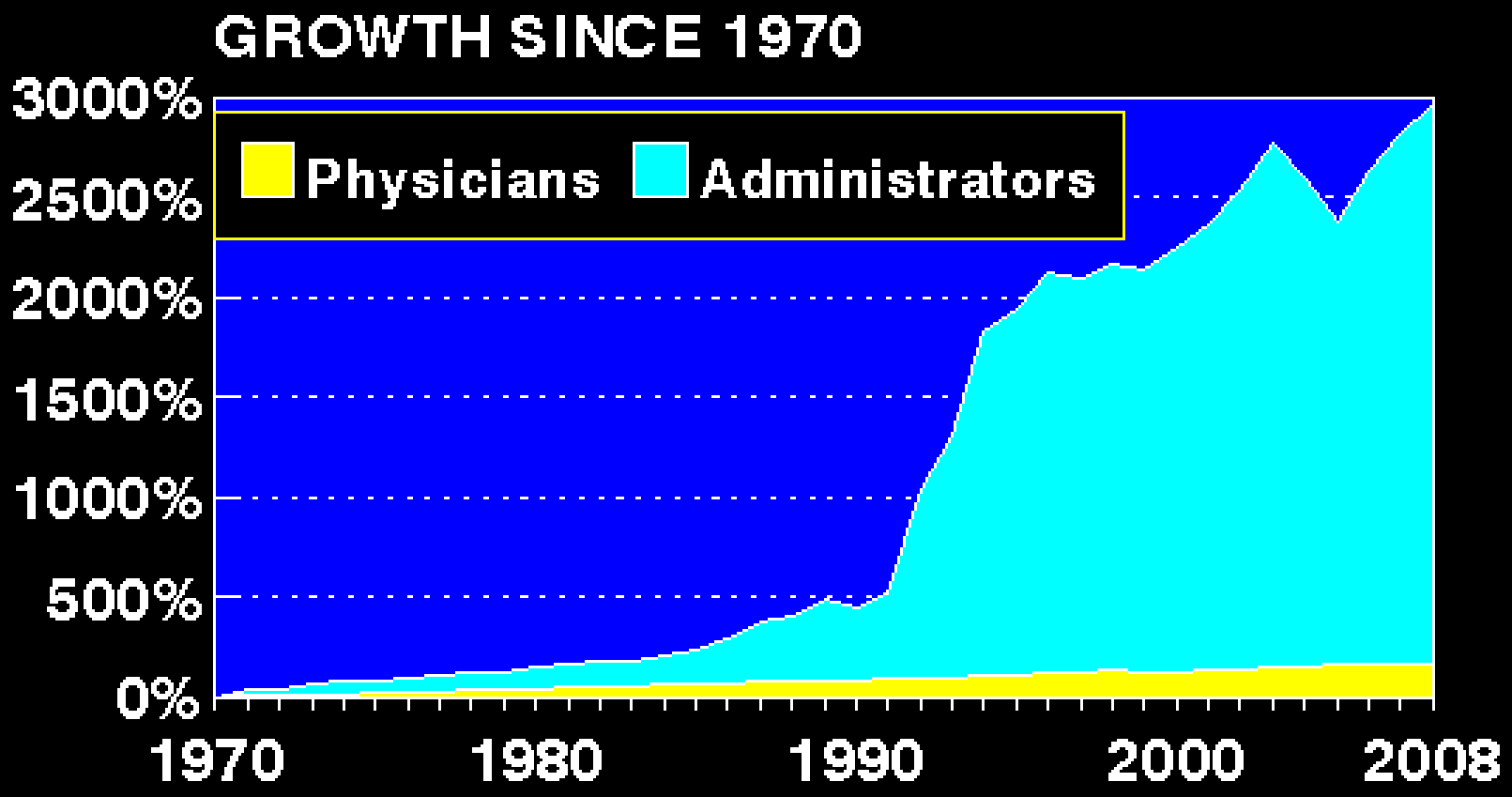
Source: Fortune 500 rankings for 1995-2008

Total drug company profits, 2008 = $51.6 billion

Solving the Transactional Maze in Healthcare

- EMRs, documentation and coding requirements(40% of a physician's time)
- Complexity of insurance coverage and payments
- Employer based insurance coverage
- Increase number of healthcare administrators
- Specialization in office personnel
- What ever happened to the idea of a paperless office?
- No population based or capitation models have yet been applied to the broader market

Growth of Physicians and Administrators 1970-2008

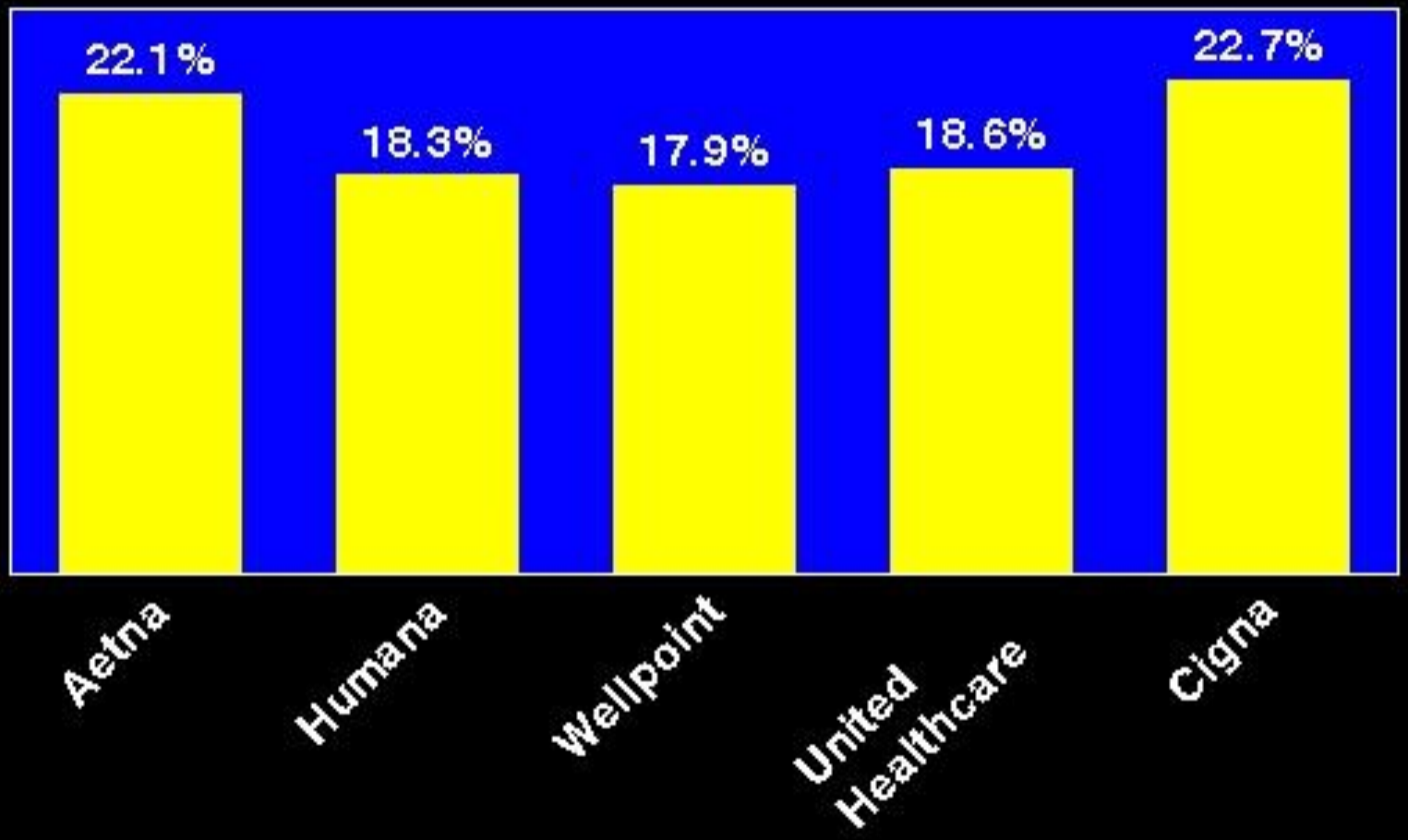


Source: Bureau of Labor Statistics; NCHS; and analysis of CPS

Rationalizing Health Insurance and Managed Care Organizations

- Health Insurance Companies are a non-value added component of healthcare with 20 percent administrative expense and five percent profit.
- Vast number of plans each with their own set of rules, coverage, carve outs, menu of policies, selection criterion and formularies.
- Objectively, these intermediaries do nothing but add another layer of transactional expense and pay the bills much like MasterCard or Visa.
- Medicare administrative expense is 3 percent

HMO Overhead, 2011



Source: SEC Filings/Reports to shareholders - Figures are for Q1 or Q2
Calculated as 100-Medical Loss Ratio
Note: Figures for Wellpoint and UnitedHealthcare include non-commercial enrollees

Reasons for Encouraging a Healthy Life Style

- Fewer chronic conditions; especially related to the metabolic syndrome
- High cost of dying in our society; encourage palliative care and death with dignity.
- Lack of a parallel cost message to the other outcomes of treatment (preserve life at all costs)

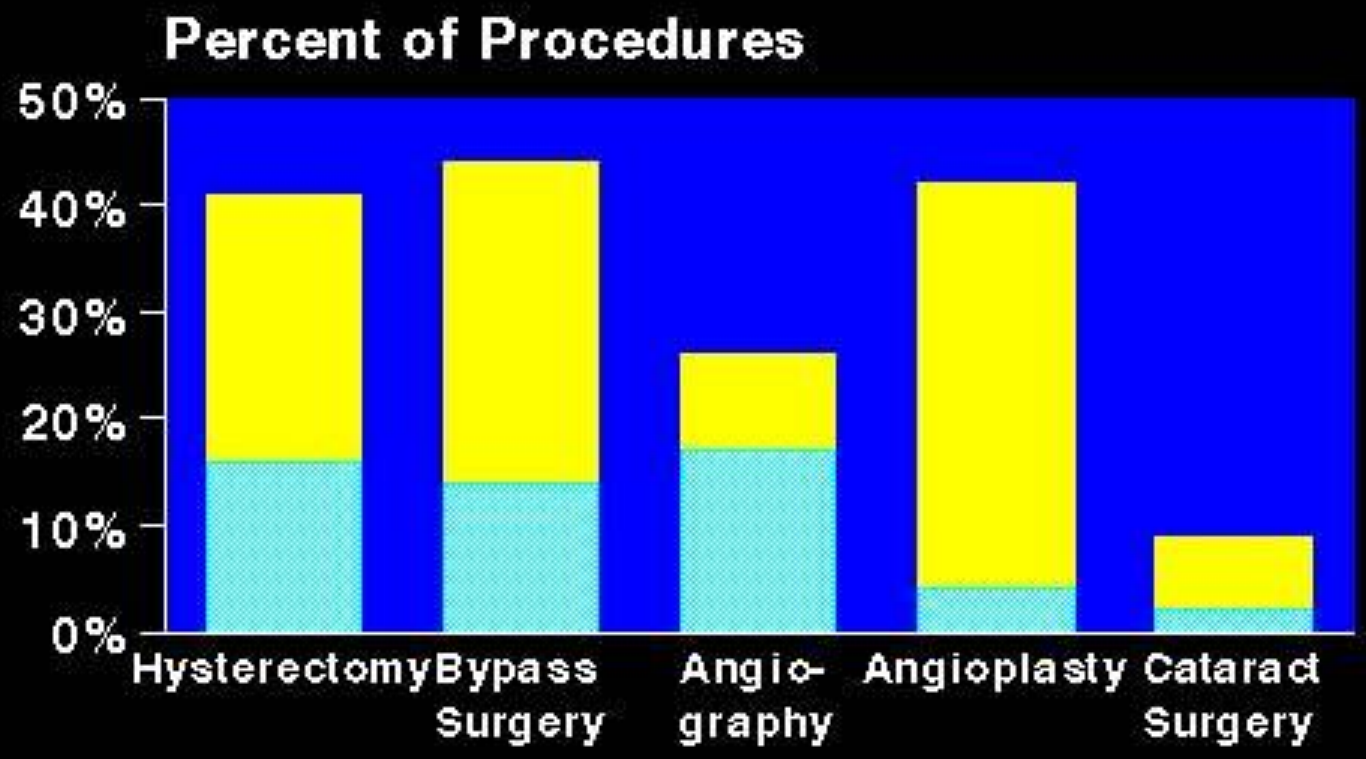
Providing Access to Appropriate Health Care for Everyone

- Before the ACA, about 44 million Americans had no health insurance and this generally young and healthy population often use the ‘high cost’ Emergency Departments as their primary care physicians and sought help at a later stage of disease progression
- Medicine as a right rather than a privilege
- A single payer system is a socialized insurance system and not socialized medicine.

Maintaining and Improving Standards of Care

- Patterns of practice used to vary greatly between providers.
- Uniformity and Quality are improving with greater oversite and big data that is defining standardized algorithms of care

Unnecessary Procedures



	Hysterectomy	Bypass Surgery	Angio-graphy	Angioplasty	Cataract Surgery
Questionable	25%	30%	9%	38%	7%
Inappropriate	16%	14%	17%	4%	2%

Source: Commonwealth Fund - Quality of Health Care in the U.S. Chartbook, 2002

Integrating New Technologies and Treatments

- Flood of new innovations all of which seem pricey.
- Most are not curative and most require long-term treatment
- IT and robotics that can crunch ‘big data’ and manage processes, diagnosis and treatment of disease.
- Will the MD degree in the future still guarantee life long employment?

Redundancy in the Hospital Systems

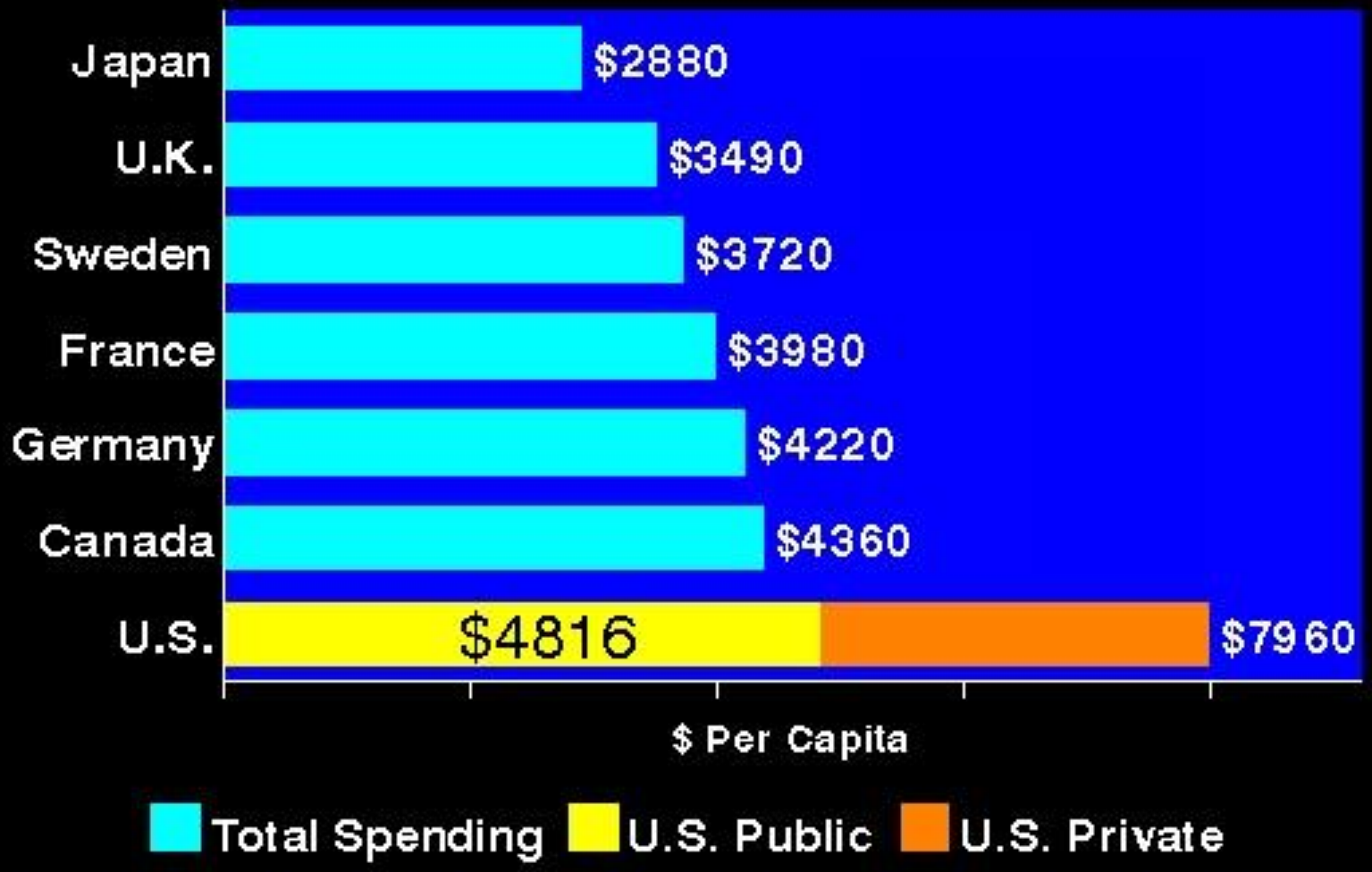
- The hospitals are a big part of the problem as they compete furiously for market share.
- Expansion and duplication of bricks and mortar facilities, huge endowments, multispecialty groups and testing facilities
- There are five hospital systems each of which claims to have the best orthopedic and cardiac units in the greater Cincinnati area. Each boasts of having the 'best group of employed physicians.'
- No CONs and regional or national planning

Brief History of Healthcare Initiatives at the Federal Level

- Across the Westernized world **universal** health care is almost universal with thirty-two of the thirty-three developed nations providing it; the sole exception being the United States. In recent decades, public opinion has evolved to where the majority of citizens now consider access to quality healthcare to be a right reflecting social justice and morality rather than a privilege.

As early as 1945, President Truman called for the creation of a national health insurance fund to be run by the federal government. This fund would be open to all Americans, but would remain optional. In 1965, during the presidency of Lyndon B. Johnson Medicare and Medicaid were enacted. In 1971, President Richard Nixon proposed more limited health insurance reform—an employer mandate to offer private health insurance if employees volunteered to pay 25 percent of premiums, plus federalization of Medicaid for the poor with dependent minor children, and support for health maintenance organizations.

U.S. PUBLIC Spending Per Capita for Health is Greater than TOTAL Spending in Other Nations



Note: Public includes benefit costs for govt. employees & tax subsidy for private insurance

Source: OECD 2010; Health Aff 2002; 21(4):88 - Data are for 2009

My Opinion about Positive Steps to Partially Solve the High Cost of Healthcare

- ***The First Steps*:**
- Reinstate the ACA or Obamacare in its original form to include:
- The Federal Mandate.
- Coverage of preexisting conditions
- Reconfirm a standardized package of healthcare benefits

Additional Initial Steps that would need Congressional Approval

- Permit Medicare to negotiate drug prices directly with the pharmaceutical companies
- Strengthen the State Health Insurance Exchanges and offer the Public Option on the Exchanges (Standard Medicare with Advantage and Supplemental plans) as a competitive offering
- Mandate Standardized Federally subsidized State Medicaid programs

The Longer Term: The Sticky Part

- First, after appointing a healthcare Czar, convene multiple panels and committees of experts with broad nonpartisan representation to piece together the ultimate goals and objectives of an optimal healthcare plan for Americans that would guarantee **universal coverage** and improve the cost/benefit ratio within our healthcare system.

Salient Questions to Address

- How do you transition to a single payer system with the least amount of disruption to the economy and jobs market?
- How do you make rational cost projections for the implementation of new initiatives and cushion or phase in the stress placed upon existing institutions and special interests?
- How to you integrate 'big' data and population based/capitation models into the healthcare system?
- How do you incorporate 'what works and what doesn't work' when you draw ideas from the single payer systems currently used in other countries?
- How do you address the ethical issues of rationing of medical care, cost/benefit ratios, and end of life futile care?
- Finally, do you have a 'one size fits all' system or a two or three tiered system of healthcare?

At the End of the Day

- Probably, the healthcare system will continue to receive many band aids for politically popular issues in the years to come. At some point, maybe 5 years, or 10 years or 20 years we will have a single payer system or a socialized healthcare insurance system. In my opinion, the current private healthcare sector is so dysfunctional that I see no other solution; especially with a congress that suffers from chronic gridlock and a populace that is so divided on healthcare issues and the other entitlement programs.

Contrasts and Very Real Changes

1961

1. Small Independent Group Practices-a cottage industry
2. Independent Physician and Patient Control
3. Paper Chart & Transactions
4. Private Pay
5. Organized Medicine influenced public policy
6. Affordable
7. Lower Tech
8. Physician Trust
9. Medical care as a Privilege

2020

1. Large Group Practices-Often Hospital Owned
2. Government, Insurance Co. & Hospital Control
3. Electronic Automation, EMRs
4. Insurance &Government Pay
5. Government and other providers influence policy
6. Very Expensive
7. Higher Tech
8. Eroded Dr/Patient Relationship
9. Medical care as a Right

The Office

a. **Cash over the counter business, POS**
b. **On job training—No office managers**
c. **Cottage industry**
d. **Record keeping and coding**
e. **Sterilization procedures**
f. **Fee schedules—no coding**
g. **Waiting times**
h. **Telephone Communications only**
i. **Doctors as unsophisticated investors**
j. **Downtown locations**

The Hospitals in 1961

- **Pill hill**
- **Very small administrative staffs**
- **Hospital as the center of the universe**
- **Staff privileges and politics**
- **Lengths of stays**
- **The doctor's lounge**
- **JCAHO**
- **Shortage of beds**

Organized Medicine

- **Privilege to belong to the AMA, OSMA and Academy of Medicine**
- **Cincinnati Academy of Medicine**
- **Role in setting public policy**
- **Specialty Societies and Board Exams**
- **No CME Requirements**
- **Board of Regents**

U.C. Medical School

- One small building on Eden Avenue
- Eighty-five students (five women)
- Few basic researchers for preclinical years
- Volunteer faculty and departments
- Tuition and medical books
- Ohio State Board exams
- Library and research
- Suture room, practice on other students

Advertising

- **Considered unethical**
- **New physician announcement**
- **No direct to the consumer advertising**
- **Some gifts and trips for doctors and free samples**

The Old Cincinnati General Hospital

- **Patient mix**
- **Open wards**
- **Architecture and Tunnels**
- **H1 & H2 Contage**
- **Op permits**
- **The Holmes Hospital**
- **Rotating Internships**
- **Evening supper**

Internship and Residency Training

- One year of surgery and three years of urology
- Responsibility came early; see one, do one, teach one
- Chief resident as master of the ship.
- Few female surgeons
- Subspecialties under the Department of Surgery
- Rotations to the VA and Drake

The Advent of 3rd Payers/Insurance

- Medicare 1965—”Usual Customary Fees”
- Indemnity Insurance-patient paid physician first
- Managed Care Organizations emerged in the late 70s (cost structures)

Doctor/Patient Relationship

Why has it deteriorated?

- Specialization
- Incentives encourage the physician to short-change the patient
- No house calls and mobility of our society
- PCPs no longer follow their patients in the hospital
- Changing insurance coverage
- Direct to the consumer advertising
- Higher patient expectations
- Hospitalists and Intensivists
- Large group practices
- Generational differences in practicing physicians
- Testing rather than laying on of hands

Higher Costs of Medical Care

- 5.4% of GDP in 1954
- Excess supply of providers, imaging and testing facilities (Parkinson's Law)
- Technology
- End of life care
- Malpractice
- Drug costs
- Marginal therapies and lack of standards of care
- Providers are incentivized to do more
- Explosion of administrators
- A system based on treatment and not prevention

The Future—my personal predictions

- Healthcare Reform—going no where fast, but ultimately a universal single payor system
- Hospitals as major players—most with a Staff Model structure like the Cleveland Clinic
- Artificial intelligence and declining need for physicians—physicians as technicians
- Technology abyss—rationing of care, assisted suicide, commoditizing of medical care, declining healthcare costs?