KNEE JERKS for Boards

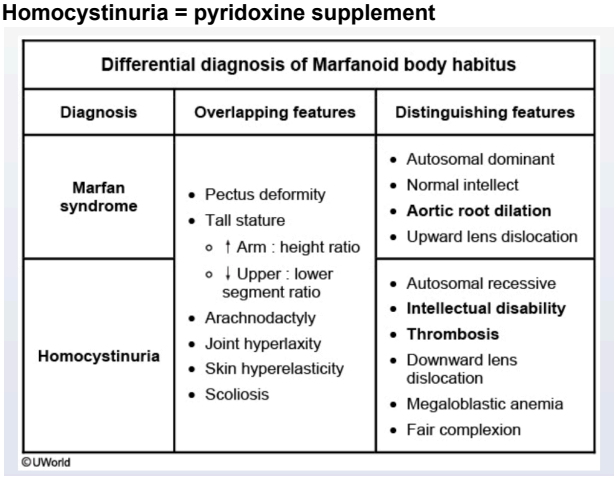
*use to quiz yourself by covering up a column *

	Key Features	physiology/ pathology
Neurotransmitters and mental illness	**Depression: decreased NE, 5HT, dopamine** **Schizophrenia: high dopamine** Anxiety: decreased GABA Addiction, ecstasy, cocaine: NE and dopamine increase	Mesocortical: negative symptoms schizophrenia Mesolimbic: positive symptoms schizophrenia (dopamine antagonists) Nigrostriatal: parkinsons Tuberoinfundibular: increase prolactin, hypogonadism
Kartagener's Syndrome	Chronic sinusitis, bronchiectasis, sinus inversus	Mutation in dynein (ciliary and intracellular vesicle transport) (primary ciliary dyskinesia)
Bullous pemphigoid	Tense subepidermal vesicular lesions . Nikolsky sign negative Type III hypersensitivity	Antibody to dystonin (BP antigen) that disrupts the hemidesmosome
Pemphigus vulgaris Pemphigus foliaceus	Flaccid intraepidermal blisters Nikolsky sign. Oral mucosa involved **Type II hypersensitivity**	Desmoglein-1 & 2 that disrupts lateral cell surface desmosomes
Lesch-Nyhan syndrome	Retardation, self-mutilation (bite lips and fingers), aggression, gout, hypotonia, chorea, arthritis, nephropathy , hyperuricemia **"He's Got Purine Recovery Trouble" - cannot salvage GMP and IMP**	X-linked absence of **HGPRT** High de novo purine synthesis, **high PRPP** and IMP. Low salvage pathway Tx: allopurinol, febuxostat to decrease uric acid .
SCID	Children with recurrent infections, candida and pneumocystis jiroveci. No plasma cells, B or T cells, no immunoglobulins	Autosomal recessive disorder of Adenosine deaminase → **high ATP,** dATP → inhibited nucleotide reductase → low T and B cell #
X-linked recessive SCID		Mutation in common gamma chain for IL-2→ defective T cell activation

Autosomal recessive	"Alpha, beta, pee-ew Iron, Copper, Bern-sou Hartnup, Glanzman, Fanconi AR yes its true!"	• Alpha-1-Antitrypsin Deficiency ("ALPHA") • Beta-Thalassemia ("BETA") • Phenylketonuria ("PEE-EW") • Hemochromatosis ("IRON") • Wilson's Disease ("COPPER") • Bernard-Soulier ("BERN-SOU") • Hartnup Syndrome ("HARTNUP") • Glanzman Thrombasthenia ("GLANZMAN") • Fanconi ("FANCONI")
Gout	Podagra, tophi (external ear, olecranon bursa, achilles) **Needle** shaped crystals, negatively birefringent (yellow= parallel)	Hyperuricemia due to excessive purine metabolism (high purine diet, PRPP hyperactivity), malignancy
Pseudogout	Positively birefringent **rhomboid** crystals	
Orotic aciduria	**UMP synthase deficiency , cannot make pyrimidines** Protein restriction is main treatment of urea cycle disorders **Normal ammonia** **High orotic acid**	Growth retardation Tx with **uridine** improves Orotic acid in urine Megaloblastic anemia, folate and B12 NO improvement
OTC (ornithine transcarbamylase) deficiency	OTC deficiency **High orotic acid** **High ammonia** **Most common urea cycle disorder** **AVOID PROTEIN**	Baby with lethargy, coma Orotic acid in urine **Hyperammonemia** Low citrulline High carbamoyl phosphate High orotic acid
Carbamoyl phosphate synthetase I and NAg synthase	Hyperammonemia - CPS1 is rate limiting enzyme " you go to CVS if you have a problem peeing"	Urea cycle occurs partially in the liver MITOCHONDRIA
Uridine monophosphate synthase	Orotic acid build up ~ OTC deficiency No hyperammonemia	Megaloblastic anemia and delayed growth
Pyruvate dehydrogenase complex deficiency	PDC **converts pyruvate into acetyl-coA**. In deficiency, glucose will be made into lactic acid, amino acids into alanine. The tx is ketogenic nutrients (**leucine and lysine)**	Tender Loving Care for Nancy- Thiamine, Lipoic acid, coenzyme A (B5), FAD (B2), NAD (B3)
Ataxia telangiectasia	Triad: cerebellar defects, telangiectasias, IgA deficiency Increase risk of cancers	ATM gene mutation (Ch 11) → G1-S progression and inability to repair dsDNA

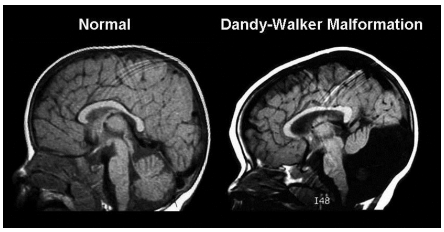
		breaks→ dsDNA repair defects
Freidrich ataxia	GAA: Hypertrophic cardiomyopathy, poor mitochondrial function, staggering gait, nystagmus, pes cavus, hammer toes, kyphoscoliosis	
DiGeorge Syndrome	3rd and 4th pharyngeal pouch malformation 22q11 microdeletion= thymic aplasia	Triad: Hypocalcemia, conotruncal abnormalities, T cell deficiency. Abnormal facies, thymic aplasia, absent parathyroid **CATCH22: cardiac abnormalities, abnormal face, thymic aplasia, cleft palate, hypocalcemia**
Most common cause of NTD	Folate deficiency	Valproic acid use in pregnancy
Most common preventable cause of congenital malformations in the US	Alcohol use in pregnancy	Smoking and drug abuse also. EtOH is most common
I cell disease	**Mannose 6 phosphate** deficiency that prevents protein localization from the golgi to **lysosome**. Lysosomal storage disorder. Phosphotransferasee deficiency : prevented phosphorylation of mannose. Lysosomal acid hydrolases accumulate in serum and decrease in cell. . cannot breakdown products in lysosomes	Inclusions in cells Coarse facial features, arthropathy, skeletal abnormality
peroxisomes	**Zellweger syndrome** mutation → absence of peroxisomes Metabolize very long fatty acids, hydrogen peroxide, ethanol Seizures, hypotonia, hepatomegaly, intellectual disability, hearing loss and craniofacial abnormalities	
Chediak higashi syndrome	Defect in Microtubule polymerization	Infections, partial albinism, silver hair, peripheral neuropathy
Clathrin	Familial hypercholesterolemia	Abnormal LDL receptor clathrin coated pit Receptor mediated endocytosis vesicles from the plasma to the endosome
Microtubule inhibitors	Griseofulvin Taxane anti-cancer Antihelminthic bendazoles Vincristine, vinblastine	vincristine/ vinblastine: inhibit microtubule polymerization Taxanes: hyper stabilize microtubules
Type I collagen mutation	Osteogenesis imperfecta (COL1A1 gene) BITE= multiple bone fractures, blue eyes, dental imperfections, hearing loss Failure to form procollagen triple helices	**Skin**, **bone**, **tendon**, **dentin, organs** ONE, things that are **STRONG**

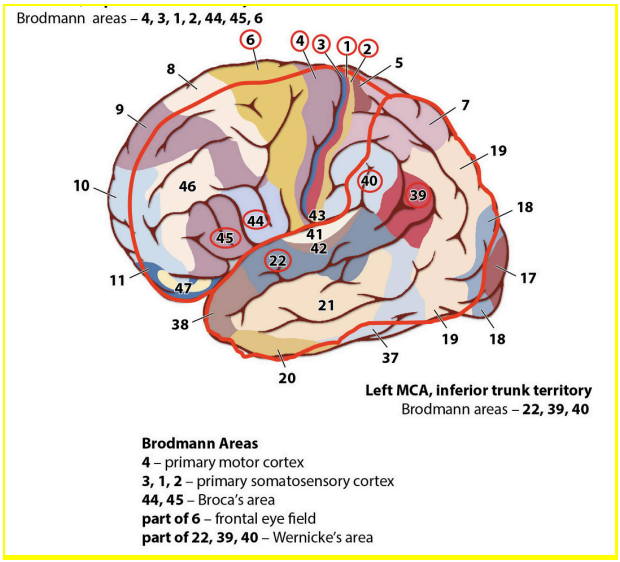
Type II collagen	cartilage	Also **vitreous** body and **nucleus pulposus** Things that are **SLIPPERY**
Type III collagen mutation	Vascular type Ehlers danlos *classic ehlers danlos is type V collagen - Normal skin - Berry aneurysms, intracranial hemorrhages, easy bruising	Reticulin, skin, blood vessels, uterus, fetal tissue, **granulation** tissue Things that are **STRETCHY**
Type IV collagen diseases	Alport syndrome (mutation) Goodpasture (autoantibody)	Basement membrane Remember: "**strong, slippery, stretchy BM for 4 types of collagen**" or SCAB
Opsoclonus myoclonus	Dancing eyes dancing feet	Associated with neuroblastoma
Meckel diverticulum	Rule of 2's **Persistence/ Failure of closure of the omphalos vitelline duct + 99 Tc** Melena, RLQ pain, intussusception, volvulus	2 inch long, 2 feet from ileum Contains 2 tissues sometimes: stomach and pancreas
Leukocyte adhesion deficiency (LAD)	LFA-1 deficiency and abnormal leukocyte tight binding during leukocyte extravasation. CD18 deficiency	Signs: delayed umbilical separation and recurrent bacterial infections
Caseating granuloma	TB or fungus	Cheese like necrosis with giant cells and walled off TB. remember macrophages secrete TNF alpha to maintain granuloma.
Noncaseating granuloma	Sarcoidosis, crohns	
Cat scratch disease	Stellate granuloma	Bartonella henselae
Crohn's disease	**Noncaseating** granuloma in GI - Thickening of muscularis mucosa, strictures and fistula	Decreased calcium oxalate absorption, leading to increased oxalate kidney stones
Acute inflammatory cytokines	TNFa, IL-1, IL-6	
Mediators that cause vasodilation	Histamine, serotonin, bradykinin, leukotriene C4, D4, E4	
Most common causes of transudate	CHF, cirrhosis, nephrotic syndrome	Increased hydrostatic pressure, decreased oncotic pressure Remember light's criteria
Most common causes of exudate	Lymphatic obstruction, inflammation, malignancy	Increased protein
E and P selectins	PMN margination and rolling	Sialyl lewis x on PMNs bind selectins on endothelium
ICAM and VCAM	PMN adhesion	LFA integrin on PMN is defective in

<table>
<tr><td></td><td></td><td>leukocyte adhesion deficiency</td></tr>
<tr><td>PECAM</td><td>PMN diapedesis</td><td>CD31</td></tr>
<tr><td>Cytokine for granuloma formation and maintenance</td><td>Formation: IFNy by T cell
Maintenance: TNFa by macrophages</td><td></td></tr>
<tr><td>Keloid</td><td>Too much collagen deposition</td><td>Know collagen synthesis (procollagen) → hydroxylation + Vit C → glycosylation into triple helix → exocytosis → proteolysis into tropocollagen → cross-linking
Vit K causes post translational carboxylation of glutamate residues during synthesis</td></tr>
<tr><td>Ehlers-danlos syndrome</td><td>Type V collagen & Type I collagen
Defect: Cannot cleave procollagen into tropocollagen</td><td>Classic: Hyperextensible skin and joint hypermobility
Hypermobile EDS only
Vascular EDS: aneurysms, bleeding and bruising</td></tr>
<tr><td>Alport syndrome</td><td>Cant see, can't pee, can't hear a bee
 (bee port wine)</td><td>Auto-ab to type IV collagen
- Nephritic disease, RBC casts
- Vision impairment, cataracts
- Hearing impairment, sensorineural</td></tr>
<tr><td>Upward lens subluxation</td><td>Marfan syndrome (tall, grow UP!)</td><td>Hyperflexible joints, arachnodactyly, aortic dissection, lens, dislocation</td></tr>
<tr><td>Downward lens subluxation</td><td>Homocystinuria = pyridoxine supplement

</td><td></td></tr>
<tr><td>Marfan syndrome</td><td>Fibrillin mutation</td><td>Myxomatous cystic medial degeneration in</td></tr>
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<table>
<tr><td></td><td></td><td>media layer and an intact intima layer of large arteries</td></tr>
<tr><td>Panacinar emphysema</td><td>Alpha 1 antitrypsin</td><td>Reduced inhibition to elastase
- Emphysema
- Liver disease
- Young, non-smoker</td></tr>
<tr><td>Collagen</td><td>Glycine, proline, hydroxyproline</td><td>Vitamin C hydroxylates lysine and proline. Deficiency causes scurvy</td></tr>
<tr><td>Elastin</td><td>Glycine, proline</td><td>Cross-linking makes it elastic
Collagen is hydroxylated, triple helix</td></tr>
<tr><td>Normal pressure hydrocephalus</td><td>Wet, wobbly, wacky</td><td></td></tr>
<tr><td>Serotonin syndrome</td><td>Abrupt onset of myoclonus, tremor, hyperreflexia and ANS instability due to concurrent use of SSRI with MAOi or TCA</td><td>Linezolid used with MAOi or TCA can precipitate serotonin syndrome</td></tr>
<tr><td></td><td colspan="2"><table>
<tr><th colspan="2">Serotonin syndrome</th></tr>
<tr><td>Causes</td><td>• Serotonergic medications, especially in combination (eg, SSRI/SNRI, TCA, tramadol)
• Drug interactions: Serotonergic medication & MAOI or linezolid
• Intentional overdose of serotonergic medications
• Serotonergic drugs of abuse (eg, MDMA)</td></tr>
<tr><td>Clinical features</td><td>• Mental status changes (eg, anxiety, agitation, delirium)
• Autonomic dysregulation (eg, diaphoresis, hypertension, tachycardia, hyperthermia, vomiting, diarrhea)
• Neuromuscular hyperactivity (eg, tremor, myoclonus, hyperreflexia)</td></tr>
</table></td></tr>
<tr><td>Neuroleptic malignant syndrome
- High potency typical antipsychotics , dopamine antagonist
- Acute mania, psychosis tx</td><td>Gradual onset 1-3 days of diffuse lead-pipe rigidity, hyporeflexia and ANS instability due to dopamine antagonist (antipsychotic Rx)
Mental status change- initial symptoms (agitated delirium with confusion)
Hyperthermia, myoglobinuria
Due to HIGH dopamine</td><td>Tx: stop antipsychotic
Give
- Dantrolene
- Dopaminergic drug:bromocriptine, amantadine</td></tr>
</table>

	<table><tr><th></th><th>Neuroleptic malignant syndrome</th><th>Serotonin syndrome</th></tr><tr><td>Precipitant</td><td>• Dopamine antagonist</td><td>• Serotonergic agent</td></tr><tr><td>Onset</td><td>• 1-3 days</td><td>• <1 day</td></tr><tr><td>Overlapping features</td><td>• Altered mental status • Sympathetic hyperactivity (eg, hyperthermia, hypertension, tachycardia, diaphoresis)</td><td>• Altered mental status • Sympathetic hyperactivity (eg, hyperthermia, hypertension, tachycardia, diaphoresis)</td></tr><tr><td>Distinct features</td><td>• Diffuse rigidity ("lead-pipe") • Hyporeflexia</td><td>• Clonus • Hyperreflexia</td></tr></table>	
Psychosis treatment	Atypical antipsychotics (haloperidol) Severe refractory psychosis: clozapine (increased risk of agranulocytosis)	
Golgi apparatus modifies these amino acids	**asparagine**=N; serine and threonine= O, tyrosine	
Fried egg appearing cells	Oligodendrocytes Koilocytes (HPV infected) Seminoma	Large clear cytoplasm
oligodendrocytes	Multiple sclerosis Tx: baclofen spasmolytic GABA-B	COPS= CNS oligodendrocytes, PNS schwann cells
Schwann cells	Schwannoma Guillain barre syndrome	
Degeneration of basal nucleus of meynert	Alzheimers	Location of Ach synthesis
Glutamate	Excitatory NT in brain	Glutamate + B6= GABA
Glycine	Inhibitory in spinal cord	**GABA** is the main inhibitory neurotransmitter. Decreased in huntington disease and anxiety
Reticular activating system	Reticular formation Locus coeruleus (pigmented area in posterior rostral pons near lateral floor of 4th ventricle) Raphe nuclei	Reticular formation: alertness, consciousness. Damage → coma. Locus coeruleus: NE Raphe nucleus: 5Ht/ serotonin
AFP	Increased in NTD, anterior abdominal wall defect	Sonogram + AFP= confirm NTD

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<tr><td></td><td>Decreased in Down's syndrome
In adults, high AFP = Hepatocellular carcinoma, yolk sac tumor</td><td></td></tr>
<tr><td>Holoprosencephaly</td><td>Sonic hedgehog gene mutation
Fetal alcohol syndrome
Patau syndrome, trisomy 13 SHH mutation</td><td></td></tr>
<tr><td>Chiari I vs II malformation</td><td>I= cerebellar tonsils → syringomyelia
II= tonsil, vermis → lumbosacral myelomeningocele, noncommunicating hydrocephalus and large 3rd ventricle</td><td rowspan="2">
</td></tr>
<tr><td>Dandy walker malformation</td><td>Agenesis of cerebellar vermis leading to enlarged 4th ventricle, noncommunicating hydrocephalus</td></tr>
<tr><td>Pharyngeal arch, pouch, cleft</td><td>arch= mesoderm
cleft= eCtoderm
pouch= endoderm</td><td>Pharyngeal cleft cyst= midline
Thyroglossal duct cyst= lateral, moves with swallowing</td></tr>
<tr><td></td><td colspan="2"><table>
<tr><th colspan="2">Pharyngeal Pouch</th></tr>
<tr><th>Pouch</th><th>Derivatives</th></tr>
<tr><td>1st pharyngeal pouch</td><td>Middle ear cavity, eustachian tube, mastoid air cells, thyroid</td></tr>
<tr><td>2nd pharyngeal pouch</td><td>Epithelial lining of palatine tonsil, thyroid</td></tr>
<tr><td>3rd pharyngeal pouch</td><td>Inferior parathyroids, thymus</td></tr>
<tr><td>4th pharyngeal pouch</td><td>Superior parathyroids, parafollicular cells (C-cells) of the thyroid</td></tr>
</table></td></tr>
<tr><td>Treacher collins syndrome</td><td>1st and 2nd pharyngeal arch malformation</td><td>Ears and mouth deformity</td></tr>
<tr><td>Anterior cerebral artery stroke</td><td>Lower extremities</td><td></td></tr>
<tr><td>Middle cerebral artery stroke</td><td>Aphasia, arms and face
- Can causes macular vision loss</td><td>Broca, wernicke aphasia - dominant side
Face and arm sensory and motor loss</td></tr>
<tr><td>Posterior cerebral artery stroke</td><td>Vision loss with macular sparing</td><td></td></tr>
<tr><td>Broca's aphasia</td><td>Inferior frontal gyrus of frontal lobe</td><td>Nonfluent speech, poor repetition, good</td></tr>
</table>

	MCA- superior trunk EXPRESSIVE, non-fluent aphasia. Generate speech with great effort. Cannot read or write aloud, **difficulty producing language** MCA stroke. **Brodmans area 44 and 45**	comprehension Cannot say or communicate what they want to say
Wernicke aphasia	**Superior temporal gyrus** of temporal lobe **MCA- inferior trunk** RECEPTIVE aphasia MCA stroke Brodman area **22**.  	Fluent speech, poor comprehension, poor repetition Difficulty understanding words, writing **Word salad**
Conduction aphasia	Arcuate fasciculus lesion Can hear and speak, cannot repeat words back Impaired repetition and difficulty finding words Normal comprehension, speals fluently	Fluent speech, good comprehension, poor repetition
Global aphasia	Both broca and wernicke affected	Impaired comprehension Non-fluent aphasia
Hemispatial neglect syndrome	Lesion to non dominant right inferior parietal lobe	Neglect to contralateral side of body or world
Gerstman syndrome	Lesion to dominant **LEFT** parietal lobe Angular gyrus damage Lesion to **right parietal lobe**= left-sided hemineglect	**Agraphia and acalculia, right-left disorientation, finger agnosia**

G1 to S phase	Rb, p53 CDK4= cyclin D CDK2= cyclin E	
Aneurysm	Autosomal Dominant polycystic kidney disease Ehlers danlos, HTN, smoking, increased age	Berry aneurysm Common near anterior communicating artery and CN III Suspected stroke order a non-contrast CT
Epidural hematoma	Middle meningeal artery Lense shaped that does not cross suture lines	CN III palsy, **lucid interval** → coma Head injury
Subdural hematoma	Bridging veins and midline shift	Shaken baby syndrome Chronic or acute lentiform/ **crescent** shaped that crosses suture lines
Brain regions highly susceptible to ischemia	Vulnerable hippos need pure water Hippocampus, neocortex, cerebellum purkinje cells, watershed	Watershed areas have dual blood supply. Hypoxia causes even more loss of blood supply
Subarachnoid hemorrhage	Aneurysm rupture > AVM rupture Cerebral **vasospasm** is a common complication. 3-12 days post incident. CCBs improve outcomes, neuroprotective	Thunderclap headache/ worse HA of life
Lacunar infarcts	**Lenticulostriate arteries**→ deep branches of MCA that supply the internal capsule and basal nuclei	
Supraoptic nucleus	ADH secretion	Anterior hypothalamus, damage causes permanently dilute urine. Damage to posterior pituitary causes transient DI.
Lateral nucleus	Regulates **hunger** Inhibited by leptin (thin, little) **Lateral like Lunch, but Lesions/ leptin make you little**	Damage causes weight loss and **anorexia**
Ventromedial hypothalamic nuclei	Stimulation causes **satiety** - Stimulated VM by leptin, makes you Thin	Regulated by leptin
Paraventricular nucleus	TSH, ACTH secretion regulation Secretes oxytocin	Receives input from retina, controls circadian rhythms, master clock
Suprachiasmatic nucleus	Input from retina and regulates circadian rhythm	Hypothalamus nucleus
Lateral hypothalamic nuclei	Stimulation leads to eating, hunger Destruction leads to anorexia	Stim the lat get fat

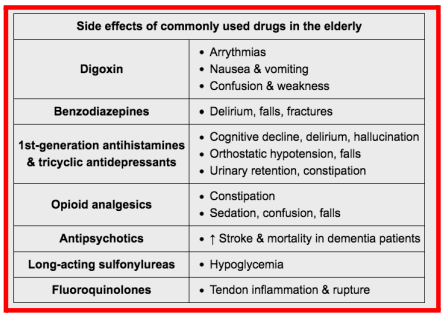
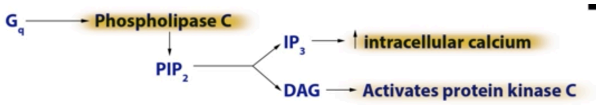
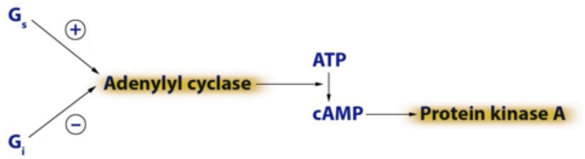
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<tr><td>Dorsomedial hypothalamic nuclei</td><td>Stimulation causes savage behavior and obesity</td><td></td></tr>
<tr><td>Supraoptic hypothalamic nuclei</td><td>ADH release
Destruction causes diabetes insipidus</td><td>SIADH: treat with ADH antagonist conivaptan. Fluid restriction, Na tablets and water restriction.
Diabetes insipidus: vasopressiin</td></tr>
<tr><td>Anterior hypothalamic nuclei</td><td>Keeps you cool, parasympathetics</td><td>Vasodilation and sweating</td></tr>
<tr><td>Posterior hypothalamic nuclei</td><td>Keeps you warm , sympathetics</td><td>Shivering and vasoconstriction</td></tr>
<tr><td></td><td colspan="2"><table>
<tr><th>Nucleus</th><th>Stimulation</th><th>Lesion</th></tr>
<tr><td>Anterior</td><td>Panting or sweating</td><td>Difficulty lowering body temperature</td></tr>
<tr><td>Dorsomedial</td><td>Sham rage</td><td>Decreased aggression and feeding</td></tr>
<tr><td>Lateral</td><td>Increased feeding</td><td>Decreased feeding</td></tr>
<tr><td>Supraoptic</td><td>Increased blood volume, blood pressure, and metabolism</td><td>Diabetes insipidus</td></tr>
<tr><td>Ventromedial</td><td>Decreased feeding</td><td>Increased feeding</td></tr>
</table></td></tr>
<tr><td>Thalamic nuclei
- Relay stations</td><td colspan="2">LGN: visual
MGN: primary auditory
VPL: somatosensory of body
VPM: somatosensory of face
Ventral lateral : basal nuclei and cerebellum</td></tr>
<tr><td>Thiamine B1 deficiency</td><td>Wernicke-korsakoff syndrome= depleted thiamine and NAD+
Memory loss is permanent, all other signs are curable.
- wernicke= short term, confusion, nystagmus, ophthalmoplegia, ataxia, sluggish , coma and death
- Korsakoff: anterograde/ retrograde amnesia, hallucinations
- Triad: altered mental status, ophthalmoplegia, ataxia → irreversible amnesia and confabulation if untreated
Alcohol use is the most common cause > malnutrition.
Cofactor for alpha-ketoglutarate, pyruvate dehydrogenase, transketolase
Delirium Tremens: due to abrupt cessation of EtOH, upregulated NMDA/ down regulated GABA-a → CNS overexcitation</td><td>Destruction of mammillary bodies
Increased NADH/ NAD ratio → inhibits citric acid cycle.
Administering glucose before thiamine can worsen symptoms
IV thiamine → glucose
Thiamine is cofactor in glucose metabolism.</td></tr>
<tr><td>Alcohol disorders</td><td>Alcohol intoxication: slurred speech, ataxia, emotional,</td><td>Alcohol withdrawal causes changes in GABA</td></tr>
</table>

<table>
<tr><td></td><td>memory lapses
Alcohol withdrawal: anxiety, tremors, diaphoresis, NV, hallucinations 6-24 hours post drink.
Alcoholic ketoacidosis: starvation state, anion gap metabolic acidosis.
Delirium tremens: complicated alcohol withdrawal seizures, delirium, agitation, ANS hyperactivity.
Hepatic encephalopathy:cirrhosis, systemic portal hypertension, hyperammonemia → asterixis, flapping tremor</td><td>and NMDA receptors. Discontinued alcohol causes sympathetic overdrive and cortical hyperactivity</td></tr>
<tr><td></td><td colspan="2"><table>
<tr><th colspan="3">Alcohol withdrawal syndrome</th></tr>
<tr><th>Manifestations</th><th>Symptoms/signs</th><th>Onset since last drink (hr)</th></tr>
<tr><td>Mild withdrawal</td><td>Anxiety, insomnia, tremors, diaphoresis, palpitations, gastrointestinal upset, intact orientation</td><td>6-24</td></tr>
<tr><td>Seizures</td><td>Single or multiple generalized tonic-clonic</td><td>12-48</td></tr>
<tr><td>Alcoholic hallucinosis</td><td>Visual, auditory, or tactile; intact orientation; stable vital signs</td><td>12-48</td></tr>
<tr><td>Delirium tremens</td><td>Confusion, agitation, fever, tachycardia, hypertension, diaphoresis, hallucinations</td><td>48-96</td></tr>
</table></td></tr>
<tr><td>Kluver bucy syndrome</td><td>Bilateral amygdala lesions</td><td>Hypersexuality, hyperorality</td></tr>
<tr><td>Amino acids in nuclear localization</td><td>Proline, arginine, lysine</td><td>PALS, 4 amino acid sequences needed to allow molecules in through the nuclear pores</td></tr>
<tr><td>Hypoblast</td><td>Endodermal yolk sac</td><td></td></tr>
<tr><td>Genes for skeletal development</td><td>HOX, SHH, wnt-1, FGF</td><td></td></tr>
<tr><td>Organogenesis</td><td>3-8 weeks</td><td></td></tr>
<tr><td>Cavernous sinus</td><td>CN III, IV, V1, VI
ICA</td><td>Ophthalmoplegia, diplopia, decreased sensation to upper face</td></tr>
<tr><td>Bell's palsy etiology</td><td>Lymes disease
Herpes zoster (ramsay hunt)
AIDS, sarcoidosis, tumors, diabetes</td><td>Lovely bella had an STD</td></tr>
<tr><td>Facial nerve / nucleus lesion</td><td>Paralysis of ipsilateral side of entire face</td><td>5 branches: temporal, buccal, zygomatic,</td></tr>
</table>

		cervical, marginal mandibular
Facial motor cortex lesion	Paralysis of contralateral side of LOWER face. Due to bilateral UMN innervation	Eyes and forehead spared
Tongue innervation - taste	Cn VII- anterior ⅔ CN IX- posterior ⅓ CNX- extreme posterior	
Rostral midbrain	Red nucleus, superior colliculus, CNIII	Caudal midbrain: no red nucleus, inferior colliculus, CN IV nuclei
Pons	Middle: Median and paramedian branches of basilar artery Lateral: AICA CN VI and VII arise from caudal pons near 4th ventricle	
Nucleus ambiguus	Motor to pharynx, larynx, and upper esophagus	
Nucleus solitarius	Sensory from pharynx, trachea, and esophagus. Taste Baroreceptor and chemoreceptor, gut distension Decreased BP: decrease Baroreceptor signaling, increase SNS (alpha 1 vasoconstriction, B1 receptors(Increased BP, increased baroreceptor signaling (decrease SNS, increase PNS)	Nucleus soliTASTIEST
Horner syndrome	Ptosis, miosis, anhidrosis	Pancoast tumor, stroke of lateral medulla
Corticospinal tract	Decussates at medullary pyramids	Lateral
Dorsal columns	Decussates at medial lemniscus in medulla Fasciculus cuneatus= UE, more lateral Fasciculus gracilis= LE, more medial	Note: dorsal motor nucleus sends autonomic info to the heart, lungs, upper GI tract
Vestibulospinal tract	Postural adjustments and head movements	
Spinocerebellar tract	Proprioceptive information to the cerebellum	
Neural tube defects	**Methotrexate / folate antagonists** Valproic acid Spina bifida: caudal neuropore closure failure. Hair tuft. Meningocele, meningomyelocele	Most common anomaly: f**acet tropism**
DES use in pregnant mothers causes	Clear cell vaginal cancer in offspring	
Medulla	Middle: Anterior spinal artery Lateral: PICA	
PPRF	Gaze away from lesion	

Medial longitudinal fasciculus (MLF)	Ipsilateral internuclear ophthalmoplegia (Cn III paralysis) - Medial pontine stroke - Multiple sclerosis	Coordinates lateral and medial rectus muscles Right INO, left INO= side unable to adduct Eye that does not adduct, that MLF is affected. Nystagmus of abducting eye
Wallenberg syndrome	Lateral medullary syndrome PICA	
Locked in syndrome	Basilar artery stroke bilateral superior pons Rapid correction of hyponatremia, central pontine myelinolysis	
Carotid sheath	Internal jugular vein, common carotid artery, vagus nerve	
Communicating hydrocephalus	Decreased CSF absorption by arachnoid granulations	
Normal pressure hydrocephalus	Wet, wobbly, wacky - Magnetic gait - Urinary incontinence - Dementia	Normal ICP, expansion of ventricles, distortion of corona radiata
Idiopathic intracranial hypertension	Causes: excess Vitamin A, **isotretinoin**, tetracyclines, danazol Female, young, fat, fertile, elevated ICP > 200-250	Tx: weight loss, acetazolamide
Partial horner syndrome	Ptosis and miosis associated with cluster headache	
Migraine	Unilateral throbbing pain +/- aura, scotoma, photophobia, phonophobia Stimulation of trigeminal afferents in meninges cause peptide release (calcitonn gene rp, vasoactive neuropeptides). Triptans are 5HT 1b/ 1d agonists, inhibit CGRP release	Avoid foods with tyramine: coffee, chocolate, cheese, alcohol, deli, pickled foods, wine
Stages of embryo development	Zygote → morula → blastocyst with inner cell mass	
Adult brain tumors	Supratentorial **MGM studios: metastasis, glioblastoma (necrotic, malignant), meningioma (well-circumscribed), schwannoma**	MRI best for tumors
Glioblastoma multiforme	Most common primary tumor arising from astrocytes Poor prognosis, rapidly prpgressive	GFAP Pseudopalisading cells with a central necrotic mass
Meningioma	Benign, 2nd most common. Arises from arachnoid cells, peripheral. Asymptomatic.	Radiation and NF2 increases risk Whirled pattern with psammoma bodies
Schwannoma	Benign nerve sheath tumor. Acoustic schwannoma	S100 Bilateral associated with NF2

oligodendroglioma	Fried egg appearance, slow growing, frontal lobes	O leggo my eggo
Pituitary adenoma	Most common functional tumor is **lactotrophs** → **hyperprolactinemia** Nonfunctioning causes **bitemporal hemianopia** Other causes of hyperprolactinemia: pregnancy, stress, dopamine antagonists	Prolactinoma → galactorrhea, amenorrhea, decreased bone density, libido, infertility . Prolactin inhibits GnRH→ decrease LH and FSH → decreases libido, causes infertility/ amenorrhea Tx: dopamine agonist cabergoline, bromocriptine (reduce prolactin)
Pediatric brain tumors	Animal kingdom, magic kingdom, epcot Astrocytome, medulloblastoma, ependymoma (infratentorial), craniopharyngioma (supratentorial). Causes non-communicating hydrocephalus	medulloblastoma= homer wright rosettes ePendymoma= perivascular pseudorosettes craniopharyngioma= motor oil fluid (car), rathke pouch
Lithium	Teratogen causes **ebstein's anomaly**: right atrium LARGE and ASD, malformed tricuspid valve	
Parkinson's disease	Lewy bodies= alpha synuclein that stains PAS and ubiquitin, loss of melanin pigmentation in SNPC	
Alzheimer's disease	Neurofibrillary plaques and tangles, amyloid deposits in the gray matter Hirano bodies= eosinophilic rod-like inclusions in hippocampus	MOST common cause of dementia #2 cause iis vascular dementia Tx: Grandma doesn't remember⇒ done[ezil, galantamine, rivastigmine Memantine: NMDA antagonist
Frontotemporal dementia	**Hyperphosphorylated tau- round pick bodies or tangles** Degeneration of prefrontal cortex Abnormal TDP-43 protein inclusions	**FTD= Tau/ TDP-43** Alzheiimers has parietal and temporal lobe neuron loss, amyloid plaques and tangles with tau
Anticholinergics for urge type urinary incontinence	Off the darn toilet seat - **Oxybutynin**, tolterodine, darifenacin, trospium, solifenacin	Bladder blood supply is anterior division of internal iliac artery
Cholinergic for urinary retention (post-op)	Bethanechol or alpha antagonist	Alpha agonist would promote urinary retention

Elderly with delirium	H1 antagonists: diphenhydramine, doxylamine, chlorpheniramine TCAs, neuroleptics, amantadine	
Pharyngeal pouches	1= ear 2= tonsils 3= inferior parathyroid, thymus 4= superior parathyroid	
Black widow spider toxin	Stimulates release of Ach at Ach neurons	Spastic paralysis
Botulinum toxin	Inhibits Ach release	Flaccid paralysis
Gq receptors - GnRH - Oxytocin - ADH - TRH - Histamine - AgII - Gastrin	**HAVE 1 M&M** 	PIP2 → IP3+ DAAG Increase Ca, activates protein kinase C Activates phospholipase C
Gi receptors	**MAD 2s** 	Inhibit adenylyl cyclase Decrease cAMP, less activation of protein kinase A
Gs	Everything else	Stimulates adenylyl cyclase Increase cAMP Activates protein Kinase A
Tyrosine kinase - Insulin - IGF 1 - EGF - PDGF	Ligand to SH2 domain→ activation of cross phosphorylation of tyrosine residues GDP → GTP + Ras activation → RAF/ MAPK Serine threonine kinases **RTK= Ras Three Kinases**	

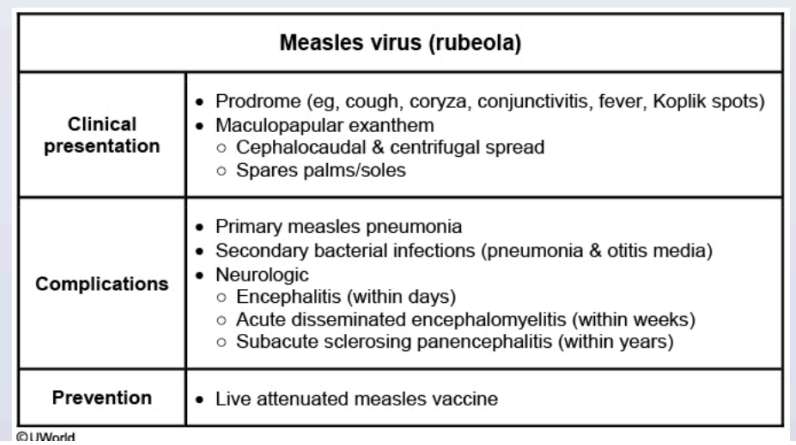
Guanylate cyclase - BNP, ANP	NO activates guanylate cyclase → cGMP ---> PKG Smooth muscle	
Therapeutic index	Drug safety TD/ ED50 - Safe drug has high lethal dose and low drug dose	Some Drugs With Low Therapeutic Index - Seizure meds - Digoxin - Warfarin - Lithium - Theophylline
Fomepizole	Inhibits alcohol dehydrogenase Treats methanol and ethylene glycol toxicity	Methanol metabolized to formaldehyde, fatal (acidosis , retinal damage) antifreeze/ ethylene glycol metabolized to oxalic acid (high anion gap metabolic acidosis, kidney damage)
Disulfiram	Inhibits acetaldehyde dehydrogenase → increase acetaldehyde Treats alcoholism	If alcohol consumed with this drug, causes flushing, sweating, headache, N/V, hypotension
Disulfiram like reactions	Metronidazole, cephalosporins, procarbazine, 1st generation sulfonylureas	Avoid alcohol consumption , toxic accumulation of acetaldehyde
Alcohol induced cirrhosis	Steatosis and hepatitis are reversible Cirrhosis is irreversible → decreased coagulation factors, albumin, prolonged PT, elevated bilirubin	
Phase I	Lost in elderly, P450	
CYP450 **inducers**	Guinness, Coronas and PBRs induce chronic alcoholism Griseofulvin Carbamazepine **Phenytoin** Barbiturates **Rifampin** St john's wort **Chronic alcoholic** Decrease drug concentration	griseofulvin= inducer, konazoles= inhibit Inhibitors: SICKFACES.COM, I Am drinking Grapefruit Juice Sodium valproate Isoniazid Cimetidine Ketoconazole Fluconazole Acute alcohol Chloramphenicol Erythro/ clarithromycin sulfonamides/ bactrim Ciproflocacin Omeprazole Metronidazole Amiodarone Grapefruit
CYP 3A4 inhibitors	Azoles, fluvoxamine, ciprofloxacin, clarithromycin, cimetidine	

<table>
<tr><td>Cell connections</td><td>Tight junctions- zonula occludens (glandular cells)
Intermediate junctions (zonula adherens)
Gap junctions: exchange nutrients</td><td></td></tr>
<tr><td>Tetralogy of fallot</td><td>Anterior-superior displacement of the infundibular septum
<table><tr><th colspan="2">Tetralogy of Fallot</th></tr><tr><td>Key findings</td><td>• Ventricular septal defect
• Overriding aorta
• Right ventricular outflow tract obstruction
• Right ventricular hypertrophy</td></tr><tr><td>Clinical presentation</td><td>• Based on severity of RVOT obstruction
◦ Severe (eg, pulmonary atresia): profound cyanosis & hypoxemia in the neonatal period
◦ Moderate: tet spells in infancy/childhood
◦ Mild: heart failure in childhood/adulthood</td></tr><tr><td>Cardiac examination</td><td>• Harsh, systolic ejection murmur at LUSB</td></tr><tr><td>Chest x-ray</td><td>• Boot-shaped heart</td></tr></table></td><td>Tet spell: L → R shunt becomes R → L shunt
Due to increased pulmonic stenosis</td></tr>
<tr><td>Transposition of the great vessels</td><td>Linear, rather than spiral, development of the aorticopulmonary septum</td><td></td></tr>
<tr><td>Zero order elimination</td><td>Constate amount of drug eliminated per unit time
Acts as tho enzymes are saturated , linear decrease
Clears drug faster
Maximum concentrations</td><td>Phenytoin, ethanol, aspirin
Shaped like a zero round PEA</td></tr>
<tr><td>First order elimination</td><td>% Constant proportion of drug eliminated per unit time, plasma concentration decreases exponentially with time</td><td></td></tr>
<tr><td>Basic drug OD</td><td>Treat with NH4Cl to trap the basic drug in the acidic urine</td><td>amphetamine</td></tr>
<tr><td>Acidic drug OD</td><td>Terat with to trap the acidic drug in the basic urine</td><td>Salicylates, phenobarbital, methotrexate
TCA for cardiac toxicity</td></tr>
<tr><td>Gynecomastia causing drugs</td><td>Some drugs cause awesome knockers Mary
Spironolactone
Digoxin, estrogen
Cimetidine, chronic alcohol
Ketoconazole
Marijuama</td><td>Galactorrhea: bromocriptine</td></tr>
<tr><td>SJS causing drugs</td><td>CLAPPPERS- seizures and sulfa + allopurinol
Carbamazepine, lamotrigine, allopurinol, phenytoin, phenobarbital, penicillin, ethosuximide, RASH, Sulfa drugs</td><td>Ethacrynic acid - loop diuretic without sulfa component. Safe to use in sulfa allergy (furosemide)</td></tr>
<tr><td>Drug induced lupus</td><td>SHIPP
Sulfonamide, hydralazine, isoniazid, phenytoin, procainamide
Minocycline, TNF inhibitor, quinidine</td><td>Anti-histone DNA Ab</td></tr>
</table>

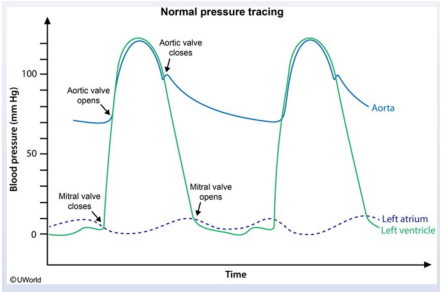
Fanconi syndrome	Tetracyclines, heavy metal toxicity, wilsons Polyuria, acidosis, hypophosphatemia Lead can cause a fanconi-like syndrome	Proximal tubule defect
Cinchonism	Dizziness, headache, vision changes, tinnitus	Quinidine, quinine Vs. ototoxicity from aminoglycosides, loop diuretics
Methamphetamines	Tachycardia, dilated pupils, agitation, poor dental hygiene	Ammonium chloride antidote
Acetaminophen	> 12 g in 24 hours, max dose 4 g/ day	N-ac is antidote NAC= nephropathy, Acetaminophen OD, Cystic Fibrosis - Also used as mucolytic in CF - Contrast nephropathy
Aspirin toxicity	Nausea, vomiting, dizziness, tinnitus, reye's syndrome in kids Hepatic Encephalopathy: cellular mitochondria damage No aspirin in children. only for Kawasaki disease*	Sodium bicarbonate= salicylates
Beta blocker and verapamil overdose	Glucagon, atropine, calcium Glucagon increases cAMP in cardiac myocytes	Theophylline OD: beta blockers
Digitalis	K, Mg, anti-dig Fab fragments, atropine	Digoxin blocks NA/K ATPase, causes heart block (ECG)
Iron overload	Deferoxamine	Iron poisoning: kid consumes iron-fortified vitamins (prenatal vitamins)
Lead poisoning	Dimercaprol, calcium EDTA, succimer	
Heavy metals	Dimercaprol, succimer Copper: penicillamine “penny” Arsenic: dimercaprol (garlic odor) CaNa2EDTA= lead poisoning deferoxamine= iron overdose hydroxocobalamin= cyanide Methylene blue= methemoglobinemia	Mercury, arsenic, gold Arsenic binds sulfhydryl groups, impairs pyruvate dehydrogenase
Carbon monoxide	Cherry red lips, confusion, headache, vertigo, flu-like	100% O2
Cyanide poisoning	Inhibits cytochrome C oxidase Antidote: hydroxocobalamin, thiosulfate, nitrites	Causes: House fires, inhaled polyurethane or vinyl , **Sodium nitroprusside**
Opioid overdose	Pinpoint pupils, respiratory depression	Naloxone, naltrexone
Truncus arteriosus	Ascending aorta and pulmonary trunk	Spiral septum (aorticopulmonary septum) spirals 180 degrees. Derived from neural crest

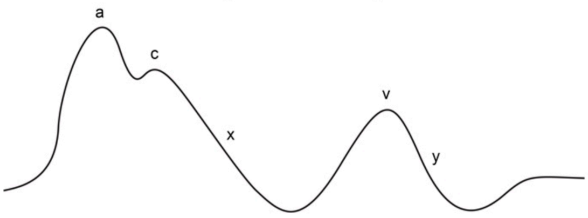
SVC	Right common and anterior cardinal vein	
Bulbus cordis	Smooth left and right ventricle Trabeculated part comes from primitive ventricle	
Highest O2 in fetal circulation	Umbilical vein -> ductus venosus -> IVC -> right atrium	
Closure of ductus arteriosus	Infant breathing - increased O2 in aorta - decreased PG and closure	
Closure of foramen ovale	Decreased pulmonary vascular resistance , high LA pressure, push septum primum against septum secundum	
Endoplasmic reticulum	Hepatocytes and steroid producing cells are rich in SER	
Tetralogy of fallot **	IHOP Interventricular septal defect, hypertrophy of right ventricle, overriding aorta, pulmonic stenosis	Blue baby crying, feeding. Squatting improves oxygenation, tet spell increases
Maternal alcohol use- fetal heart defects	Tetralogy of fallot, VSD, ASD, PDA	
Diabetic mother - fetal heart defects	Transposition of the great vessels	
Congenital rubella in utero	PDA, pulmonary artery stenosis	Mental retardation, microcephaly, deafness, blindness, cataracts, jaundice, PDA, pulmonic stenosis, blueberry muffin rash, radiolucent bone lesions
Norepinephrine catabolism	COMT, MAO	
Clinical uses of atropine	Bradycardia, AV block Decrease airway secretions Pupillary dilation and ciliary muscle paralysis Organophosphate poisoning	
Heparin induced thrombocytopenia	Potentiation of antithrombin III → antibody against endogenous platelet factor 4 Reversed with direct thrombin inhibitors- **argatroban**	Heparin inactivates factor xa, inactivates thrombin LMWH used in unstable angina or MI
Hydroxyurea	Treats sickle cell, causes myelosuppression	Sickle cell disease: glutamate to valine. Sickled cells obstruct small vessels, lead to ischemia. Papillary necrosis → bloody urine and flank pain.
Tricuspid valve	Left lower sternal border	
Pancreatic cancer	Trousseau sign: migratory superficial thrombophlebitis Courvoisier sign: enlarged gallbladder	

Diethylcarbamazine	Loa loa and wuchereria bancrofti	
Nifurtimox	Chagas by trypanosoma cruzi	Chagas from reduviid bug causes megacolon, achalasia, myocarditis, megaesophagus
Sodium stibogluconate	Visceral leishmania donovani	
Ivermectin	**Onchocerciasis** volvulus, black fly transmission subQ nodules in groin, iridocyclitis	
Ankle sprain	**Anterior talofibular ligament** always tears first with inversion ankle sprains Calcaneofibular ligaments also tear	ATF
Dysmorphic RBC in urine	Post strep glomerulonephritis	
Niacin	Vitamin B3 deficiency: Dermatitis, dementia, diarrhea and death	Lipid lowering agent causes redness, flushing, and pruritis due to prostaglandin
Riboflavin	Vitamin B2 deficiency: angular dermatitis, geographic tongue, skin desquamation and **seborrheic dermatitis**	
Zinc deficiency	**Poor wound healing,** dermatitis, skin ulcers, **alopecia**, **decreased taste and smell,** depression, diarrhea , acrodermatitis enteropathica (rash around mouth and anus) Impaired night vision Important for immune system, carbonic anhydrase, lactate dehydrogenase	Zinc-finger: DNA binding domain for intracellular receptors of lipid soluble hormones: steroids, thyroid, ADEK
Calcium	**Important for muscle contraction, neurotransmitter release, platelet function, clotting cascade, intracellular processing**	
Subacute panencephalitis	Measles Vitamin A critical	

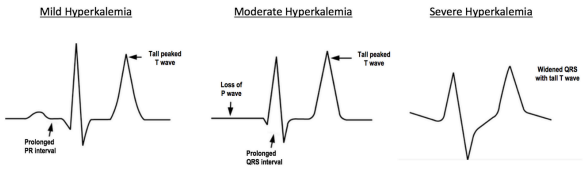
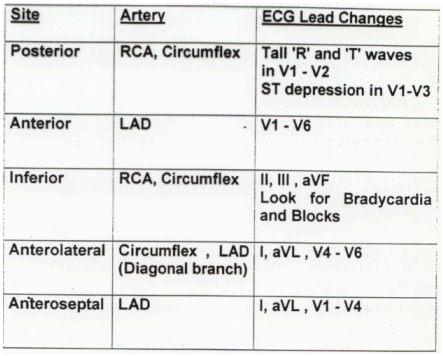
		
Myenteric plexus	Achalasia of esophagus in LES - Loss of NO synthase producing neurons	Hirschsprung disease: failed neural crest cell migration in the ganglion. myenteric , auerbach plexus. Migrate from top to bottom rectum. No peristalsis. Chronic constipation.
Euthyroiid sick syndrome	Severe sickness and stress leading to decreased conversion of T4 to T3, leading to transient hypothyroidism	
Confidence interval	If values do not include the null value 1, then it is statistically significant	
B12 deficiency	Vegan 4-5 years > gastrectomy > medication induced	
Fat belly and stick legs	Antiretroviral therapy HAART Body fat redistribution	
Zika virus	Destroys neural progenitor cells, ss **RNA** flavivirus → still birth	Microcephaly, arthrogryposis (contractures), cortical thinning and enlarged ventricles, subcortical calcifications
Parvovirus B19	Non enveloped ssDNA virus. Aplastic anemia, **hydrops fetalis**	**Pure red cell aplasia** - **parvoB19, thymoma and lymphocytic leukemia**
Wilson's disease	Impaired biliary excretion of copper transport in hepatocytes - Kayser-fleischer ring - Basal ganglia atrophy	ATP7B
Migraine pathogenesis	Trigeminal calcitonin gene-related peptides	CGRP → vasodilation. Triptans inhibit CGRP release

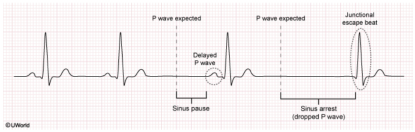
Mitochondrial myopathy	Inherited from mother. Myopathy, seizures, lactic acidosis, ragged red fibers	mitochondria= oxidative phosphorylation for ATP production . decreased with end organ damage
Zenker diverticulum	Cricopharyngeal motor dysfunction	
Kawasaki disease	Desquamated squamous, rash, conjunctivitis, mucositis, coronary artery aneurysm, prolonged high fever for 5 days, < 5 yo, swelling extremities	
Scarlet fever	Strawberry tongue, sandpaper rash along skin folds	Strep pyogenes exotoxin A → superantigen
Medium chain acyl-coA dehydrogenase deficiency	Impraired fatty acid beta oxidation	Undetectable acetoacetate Prolonged fast: hypoketotic hypoglycemia
Infiltrative cardiomyopathy	Transthyretin misfolded proteins leading to amyloidosis	
Schizoaffective disorder	MDD/ bipolar + schizophrenia	Delusions, hallucination w/ out mania or depression
Loeffler syndrome	Eosinophilic pneumonitis, major basic protein	
immunosenescence	Decreased naive lymphocytes, no change in antibody quality, increased memory lymphocytes	Normal age-related decline
Hepatic encephalopathy	Increase ammonia production	Rifaximin decreases GI production and absorption of ammonia
HIV encephalopathy	AIDS, progressive memory loss, movement disorders, psychomotor impairment. T2 hyperintense lesions in subcortical white matter. Multinucleated giant cells	
blood / gas partition coefficient MAC	High MAC= high solubility, rises more slowly	
CHF improved survival	**ACE inhibitors, ARBS, aldosterone antagonists**, certain beta blockers (carvedilol, metoprolol), nitrates + hydralazine. Decreases work on the heart in HF	ACE inhibitor contraindicated in hereditary angioedema
Acute heart failure treatment	LMNOP: loop diuretics, morphine, nitrates, Oxygen, position and pressors	
Agranulocytosis	Clozapine, carbamazepine, colchicine, propylthiouracil, methimazole	
Osteoporosis	Corticosteroids, heparin	
Pulmonary fibrosis	Bleomycin, busulfan, amiodarone	Repeated epithelial injury → disordered repair. Low Type 1, high type 2 (fail to

		differentiate), increased fibroblasts and abnormal basement membrane
gynecomastia	Spironolactone, THC, chronic alcohol, cimetidine, ketoconazole, estrogen, digoxin	
Photosensitivity	Sulfonamides, amiodarone, tetracycline	SAT for photo
Drug-induced lupus	Sulfonamides, hydralazine, isoniazid, procainamide, phenytoin	Common in SLOW ACETYLATORS
Decrease plasma colloid osmotic pressure	Low protein: Liver disease, protein malnutrition, kwashiorkor, nephrotic syndromes, protein losing enteropathy	Kwashiorkor: protein loss (swollen belly) Marasmus: complete nutrient deficiency, loss of fat and muscle
Increased hydrostatic pressure	CHF, venous thrombosis, venous compression -tumor or clothing, sodium and water retention (RAAS, renal disease)	
Increased colloid osmotic pressure	Lymphatic obstruction- tumor, obstruction, surgery, radiation	
Edema	Pitting edema: excess fluid, gravity dependent, in shins Non-pitting edema: colloid in interstitium, hypothyroidism myxedema	
Cardiogenic shock	MI, pulmonary embolism, CHF, arrhythmias, cardiac tampons, tension PTX, cardiac contusion	
Central line placement	Femoral vein, internal jugular vein, subclavian vein	
S1	Mitral and tricuspid closure	
S2	Aortic and pulmonary closure	
S3	**Dilated ventricles: dilated cardiomyopathy**, CHF, mitral regurgitation, left to right shunt *VSD, ASD, PDA Kentucy	Normal in children and pregnancy Lots of preload

<table>
<tr>
<td>S4</td>
<td>Atrial kick, stiff Left ventricle/ LVH
HOCM, aortic stenosis, chronic HTN, LVH, post-MI
Tennessee
https://youtu.be/KcMF8rJDTIk
Isolated presystolic/ late diastolic
Gallop heart sounds<table><tr><th></th><th>Features</th><th>Normal</th><th>Abnormal/associated conditions</th></tr><tr><td>Third heart sound (S3)</td><td>• Ventricular gallop sound (after S2)
• Heard during rapid passive filling of ventricles in diastole
• Sudden cessation of filling as ventricle reaches its elastic limit</td><td>• Age <40
• Pregnancy</td><td>• Systolic heart failure
• Mitral regurgitation
• High-output states</td></tr><tr><td>Fourth heart sound (S4)</td><td>• Atrial gallop sound (before S1)
• Heard immediately after atrial contraction as blood is forced into a stiff ventricle</td><td>• Healthy older adults</td><td>• Younger adults, children
• Diastolic dysfunction (eg, LVH)</td></tr></table></td>
<td>Comparing the 3rd and 4th heart sounds
LearnTheHeart.com<table><tr><th>S3 - "ventricular gallop"</th><th>S4 - "atrial gallop"</th></tr><tr><td>Occurs in early diastole</td><td>Occurs in late diastole</td></tr><tr><td>Occurs during passive LV filling</td><td>Occurs during active LV filling</td></tr><tr><td>May be normal at times</td><td>Almost always abnormal</td></tr><tr><td>Requires a very compliant LV</td><td>Requires a non-compliant LV</td></tr><tr><td>Can be a sign of systolic CHF</td><td>Can be a sign of diastolic CHF</td></tr></table></td>
</tr>
<tr>
<td>Atrial pressure wave</td>
<td>Jugular venous tracing

a = Right atrial contraction
c = Bulging of tricuspid valve during right ventricular contraction
x = Right atrial relaxation
v = Continued inflow of venous blood
y = Passive emptying of right atrium after tricuspid valve opening
©UWorld</td>
<td>a= atrial contraction
c= bulge tricuspid
X descent= atrial relaX
v= venous blood
y= passive emptying</td>
</tr>
<tr>
<td>Benign heart sounds</td>
<td>Split S1, split S2 on inspiration, S3 in < 40 yo, early quiet systolic murmur</td>
<td>Wide splitting: pulmonic stenosis, RBBB
Fixed splitting: ASD, patent foramen ovale
- PULMONARY vascular remodeling is irreversible</td>
</tr>
<tr>
<td>Diastolic murmur</td>
<td>Mitral stenosis, tricuspid stenosis</td>
<td></td>
</tr>
<tr>
<td>Aortic regurgitation</td>
<td>Left side of sternum, wide pulse pressure. Head bobbing
High pitched blowing early diastolic decrescendo
Marfan's syndrome- dilated aortic root
Early diastolic decrescendo murmur → heard best with leaning forward.</td>
<td>Low diastolic pressure
Water-hammer pulses= widened pulse pressure
Dilated aortic root: syphilis, marfan syndrome, bicuspid aortic valve, rheumatic fever.</td>
</tr>
<tr>
<td>Mitral stenosis</td>
<td>Apex of heart 5th ICS MCL, left lateral decubitus position.
Severity determined by length of time between S2 and</td>
<td>Opening snap that doesn't change with breathing</td>
</tr>
</table>

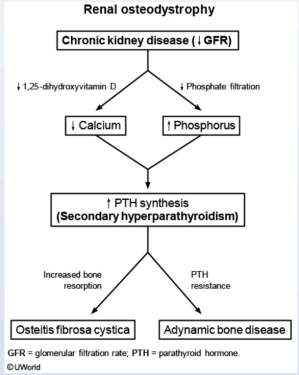
	opening snap. Progression: exertional dyspnea with normal heart findings. Elevated PCWP	Rheumatic heart disease, left atrial dilation
Lateral decubitus position	Mitral stenosis, mitral regurgitation, left sided S3, S4	
PDA	Continuous machine like murmur (left to right shunt) PGE2 levels too high. Indomethacin closes it.	Arises from 6th aortic arch embryological derivative
Aortic stenosis	**Crescendo-decrescendo,** systolic ejection click Can cause syncope, angina, dyspnea Causes: bicuspid aortic valve, age related changes/ senile degenerative calcification, rheumatic valve disease, unicuspid valve, tertiary syphilis	Radiates to carotids, weak delayed peripheral pulses “pulsus parvus et tardus”
mitral/ tricuspid regurgitation	Holosystolic blowing murmur, high pitched at apex MCL radiates to left axilla, LLD History of rheumatic heart disease	Increased with handgrip and squatting
Mitral valve prolapse	**Midsystolic click and late systolic murmur**	Marfan, ehlers-danlos Myxomatous change, rheumatic fever, chordae rupture
Tricuspid stenosis	Late diastolic decrescendo murmur along LL sternal border	
Familial genetic cardiomyopathies	HOCM NOTCH1; bicuspid aortic valve Restrictive: sarcomere mutations Dilated: TTN titin gene in sarcomere Arrhtyhmogenic: desmosomal	
antiarrhythmics	No Bad boy Keeps Clear Na+ channel blockers, beta blockers, K channel blockers, Ca+ channel blockers	
Class I antiarrhythmics	Double Quarter Pounder: quinidine, procainamide disopyramide Lettuce and Mayo: lidocaine, mexiletine Fries and Pickles: flecainide, propafenone	procainamide= tx wolff parkinson white, causes drug induced lupus Quinidine: cinchonism, torsades de pointes
Menetrier disease	Hypertrophic gastropathy that look like cerebriform gyri, cork screw glands with mucinous cells	Atrophy of parietal cells, decrease gastric acid, enteric protein loss, hypoalbuminemia → edema
Roundworm	Enterobiasis vermicularis , perianal itching, tape test Larvae mature in 6 hours → perianal itching	Tx: albendazole, mebendazole, pyrantel pamoate.
GAA	Friedreich ataxia. Frataxin mitochondrial protein in iron detox and storage. Degenerates sensory neurons, hypertrophic cardiomyopathy, DM, pes cavus	AR

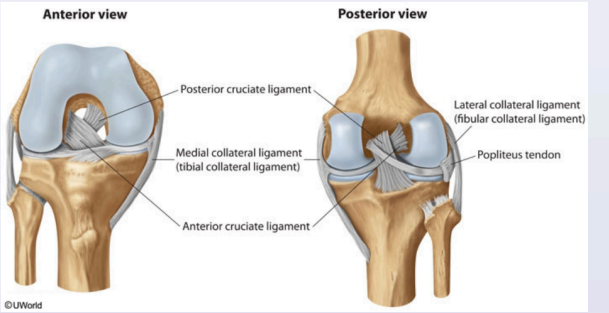
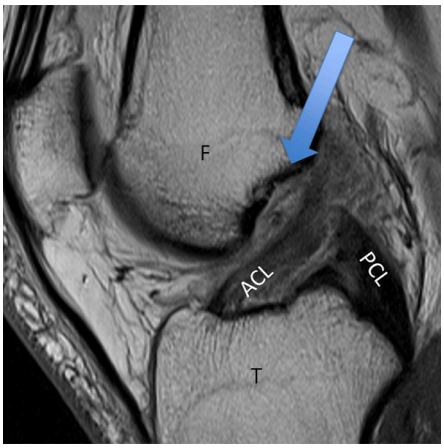
		First Aid menonics: ***CAG**: **C**audate has ↓ **A**Ch and **G**ABA* ***CTG**: **C**ataracts, **T**oupee, small **G**onads* ***CGG**: **C**hin (protruding), **G**iant **G**onads* ***GAA**: Ataxic **GAA**it*
CAG	Huntington disease, chr 4, agee 40. Chorea, depression/ cognitive decline, CAUDATE atrophy. Excess excitation by glutamine. High dopamine, low GABA (loss of inhibition), Low Ach	AD Tx: tetrabenazine, olanzapine, haloperidol
CGG	Fragile x syndrome, AR Trinucleotide repeats: Looping ssDNA triggers MMR → expansion - **MOST COMMON INHERITED form of AUTISM SPECTRUM DISORDER**	Gene HYPERmethylation → inactivated **FMR1**
CTG	Myotonic dystrophy: cataracts, toupee, gonadal atrophy	
Minimal change disease	Most common nephrotic syndrome - Decreased plasma oncotic pressure - Liver increases lipoprotein synthesis → hyperlipidemia	
Peaked T waves	Hyperkalemia → long P waves, prolonged QRS 	U waves and flat T waves= hypokalemia
ECG axis deviation	Left: LVH, LBBB Right: RVH, RBBB Posterior: V1-V3 Anterior: V1-V6 Interior: 2, 3, AvF Anterolateral: avL RCA: bradycardia LAD: heart block transmural= ST elevation Partial thickness *angina= ST depression	
Aortic arch derivatives	3= carotids, ICA	

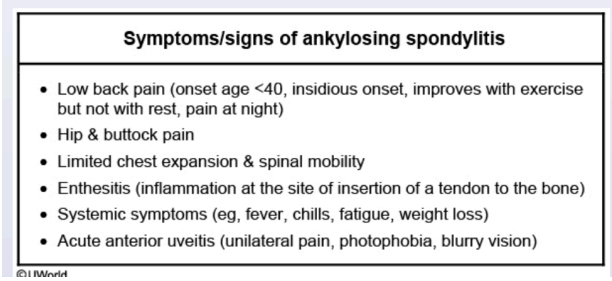
	4= aortic arch, R subclavian artery 6= PDA, pulmonary arteries	
Norepinephrine release	+ Tyramine, amphetamine, ephedrine + Block reuptake: cocaine, SNRI, TCA	Increased NE in mania and anxiety
Sick sinus syndrome	Degenerative change to sinus node → bradycardia and sinus pauses	
Atrial flutter	Saw tooth pattern, regular rhythm Arises from reentrant current above **cavotricuspid** isthmus (between the crista terminalis and the tricuspid annulus)	Reentrant circuit in atrial flutter between the tricuspid valve and IVC in the right atrium
Atrial fibrillation	Irregularly irregular rhythm, no P waves **ARISES** from **Pulmonary Veins! → sporadic depolarization of atrial cells** - Tachycardia arises from SA node	Tx: rate control with beta blockers or CCB. in lung disease, give Verapamil or selective B1 blocker.
First degree heart block	Asymptomatic, borrelia burgdorferi Increased PR interval	Lymes disease can cause 1st and 3rd degree heart block Drugs: digoxin, CCB, beta blockers
Second degree AV block Type 1	Progressively prolonged PR intervals, then a wenckebach “Longer, longer, longer block that is a wenckebach”	W= warning
Type 2 second degree AV block	Normal ECG then randomly lost QRS	Progresses to 3rd degree AV block
3rd degree heart block	Independent rhythms of atria and ventricles **Degenerative changes to AV node or bundle of His**	
Wolff-parkinson-white syndrome	Bundle of kent. Most common ventricular pre-excitation syndrome. **Delta wave** **Accessory conduction pathway that bypasses AV node, preexcitation of ventricles.**	Can lead to SVT→ give procainamide, not adenosine, catheter ablation
Brugada syndrome	AD asian males. pseudo-RBBB and ST elevation → death	
Torsades de pointes	**QT prolongation:** Anti-arrhythmics: 1A **quinidine** , III **sotalol** Antibiotics: macrolides, chloroquine, navirs Antipsychotics: haloperidol, risperidone Antidepressants: TCA Antiemetics: ondansetron methadone	Treat with magnesium sulfate Amiodarone prolongs PR but does not cause torsades Prolonged QT= Quinidine, Sotaolol
Adrenal medulla tumor	Adults: pheochromocytoma (episodic HTN)	

	Kids: neuroblastoma (sustained HTN) Fetal adrenals produce cortisol to promote type II pneumocyte maturation	
Pheochromocytoma	**Tx: phenoxybenzamine Pre-op, phentolamine** **Increased action of PNMT enzyme** - NE → Epinephrine	Adrenal hyperplasia treat with spironolactone
Endochondral ossification	Cartilage → bone Axial skeleton and limbs	Epiphyseal plate
Membranous ossification	Bone made without cartilage foundation	Skull and face bone
Achondroplasia	FGFr3 gain of function → inhibits chondrocytes proliferation, no membranous ossification	Advanced paternal age Autosomal dominant
Soap bubble bone lesion in knee region	Giant cell tumor (benign) - 20-40 yo	
Bone chunk	Osteochondroma in knee, benign , < 25	
Malignant bone tumor	Osteosarcoma - Codman's triangle, sunburst pattern - 10-20 yo	Retinoblastoma **Li-Fraumeni syndrome : Ch 17 Tp53 mutation → breast cancer, bone, adrenal, and brain tumors in young**
Ewing sarcoma	Shaft, onion skin in cortical disruption Malignant, children < 15	t(11;22) MIC2+, CD99+ Small blue cells with hyperchromatic nuclei and scant cytoplasm
Mets to bone	“Permanently relocated tumors like bone” - Prostate, renal cell, testes, thyroid, lung, breast - Bone pain, spinal cord compression	Lytic: RCC, thyroid → hypercalcemia Blastic: prostate Both: breast, lung
Masson trichrome stain	Hepatic cirrhosis, thick COLLAGEN is BLUE by the stellate Ito cells	Ito cells store Vit A
Vit D supplements to infant	Prevents genu varus/ Ricketts	
Mullerian agenesis	mayer-rokitansky-Kuster-Hauser Vaginal agenesis and amenorrhea in XX female	
21 hydroxylase deficiency	Hirsutism, oligomenorrhea, acne High 17-OHP, high renin	Salt wasting and virilization in neonates Females show more signs
Androgen insensitivity	Males that look like females 46 XY that are females. No uterus, no testicular descendeed. High testosterone, high estrogen, high LH	

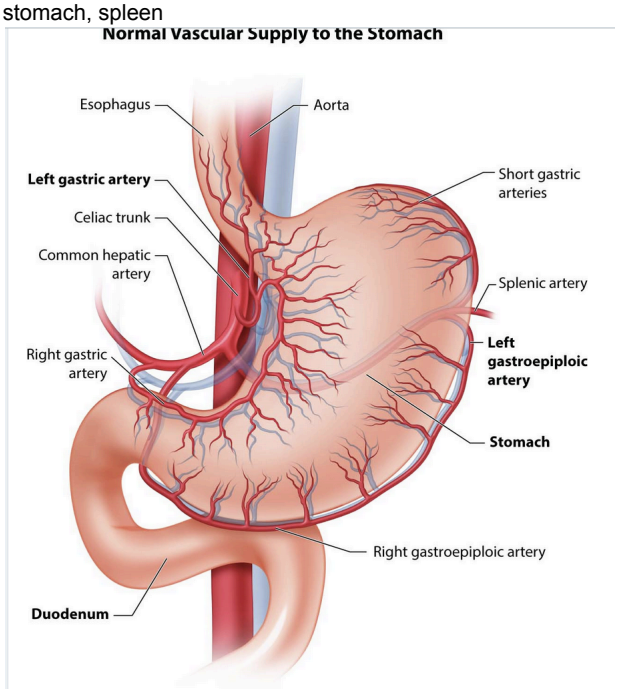
11B hydroxylase deficiency	Congenital adrenal hyperplasia, decreased aldosterone and cortisol	Females affected from elevated androgens
5 alpha reductase deficiency	Testosterone → DHT blocked.	Lack of masculine features in neonate, normalizes in puberty with increased testosterone production
Factitious disorder	Conscious self-inflicting trauma to obtain attention	Fecal bacteria in wounds
RER	Produced membrane bound proteins that are secreted	Ribosomes bind via translocon
Confounding factors	inadequate matching between groups	Similar to selection bias
COPD pulmonary test	Decreased FEV1, decreased FVC, decreased ERV	Increased FRC due to air trapping Increased TLC Increased RV
candida	Yeast and pseudohyphae	
Polygenic	Balding, epilepsy, HTN, schizophrenia, T2DM, glaucoma	
neostigmine	MG, reverse NMS blockade post surgery	
physostigmine	Anticholinergic toxicity, atropine toxicity	**Anticholinergic activity:** Dry as a bone, hot as a hare, red as a beet, blind as a bat, mad as a hatter, bloated as a toad
Pyridostigmine	Gets RID of myasthenia gravis	Dx: tensilon test, Edrophonium
Rivastigmine	Alzheimer's disease	
Osteoporosis	Smoking cessation, weight bearing activity Bisphosphonates, Ca, VitD, SERMs decrease fracture risk, teriparatide stimulates osteoblasts Denosumab is RANKL inhibitor Vertebral bone fractures Blocking of RANK+ RANKL→ decreased osteoclast activation, decreased bone resorption	Normal labs DEXA scan Slow working osteoblasts Seizure meds, aromatase inhibitors, progesterone, GnRH agonist, PPIs, glucocorticoids
Acromegaly	GH adenoma that increases IGF-1 from liver. Insulin resistance, increased lipolysis and hepatic gluconeogenesis, hypertriglyceridemia	
osteomalacia	Imbalance bone deposition → soft bones, Vit D deficiency or impaired calcium resorption	
Osteopetrosis	Osteoclast cannot resorb bone Slow working osteoclasts, thick bone that fractures or impinges cranial nerves	Normal labs Genetic mutation of carbonic anhydrase II Osteoclasts arise from monocyte -

		macrophage lineage
Paget disease Osteitis deformans	**Mosaic bone architecture** Overactive **osteoclasts**, that burn out, so osteoblasts take over	Bone enlargement, bone pain, arthritis Get **ALP**
Osgood-schlatter disease	Joint pain at insertion of patellar tendon → traction apophysitis due to rapid growth spurt	
Recklinghausen disease of bone	**Osteitis fibrosa cystica (primary hyperparathyroidism)** - **Subperiosteal absorption** - **Brown tumors** - **Tapering clavicle** - **Salt and pepper skull** Type 1A pseudohypoparathyroidism/ Albright hereditary osteodystrophy → PTH resistance in renal tubules - Short stature, obesity - Underdeveloped 4-5th digits - Osteitis fibrosa cystica	Endocrine disorder Renal osteodystrophy from 2ndary hyperparathyroidism (hyperphosphatemia and hypocalcemia) due to CKD 
Hyperparathyroidism - High calcium - Low phosphate - PTH high	Signs and symptoms of primary hyperparathyroidism Stones • Renal stones • Nephrocalcinosis • Polyuria/polydipsia • Uremia Bones • Osteoporosis • Osteitis fibrosa cystica • Osteoarthritis Abdominal groans • Constipation • Nausea/vomiting • Peptic ulcers • Pancreatitis Psychiatric overtones • Lethargy and fatigue • Depression • Psychosis • Confusion, stupor, coma Other • Proximal muscle weakness • Keratitis and conjunctivitis • Hypertension • Itching	
Legg-Calve-Perthes disease	Young children with isolated idiopathic osteonecrosis of the hip	
McCune-Albright syndrome	Precocious puberty, cafe-au-lait spots, fibrous dysplasia of bone (polyostotic fibrous dysplasia)	CALM: constitutive activation of Gs/ cAMP/ AC, Cafe au lait macules
Carpal bones	Spartans Love To Play Terribly Tough and Crazy Hockey	

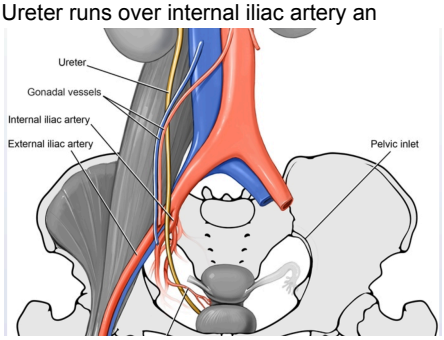
Anatomical snuff box	Scaphoid fracture, radial artery	
epicondylitis	lateral= tennis, medial = golfers	
Achilles tendon rupture	Fluoroquinolones	
Shoulder dislocation	Bankart lesion (anterior) Hill-sachs lesion (posterior) Anterior: musculocutaneous nerve from lateral cord, C5-7	Anterior most common Posterior: seizure **Axillary n, posterior circumflex artery**
Unhappy triad	ACL, MCL, lateral meniscus > medial meniscus Anterior drawer test: ACL ~ Lachman test 30 degrees  Anterior: ACL seen (lateral to medial) Posterior: PCL (medial to lateral)	Internal rotation: lateral External rotation: medial 
Posterior drawer test	PCL	
mcMurray test	Medial or lateral meniscus	
Competitive antagonist	Right shift curve Decrease potency, no change efficacy	Increase Km No change vMax
Benzo overdose	flumazenil	
osteoarthritis	Bouchard's nodes, heberdons Pain after activity Asymmetric joint involvement	Joint space narrowing, sclerosing Tx: acetaminophen, celecoxib
Rheumatoid arthritis	Autoimmune anti-CCP, HLA-DR4, RF+ = IgM Ab against IgG MCP and PIP **Pannus**, swan neck deformity, boutonniere deformity, radial deviation of wrist, bakers cyst Symmetric joint involvement **RF is autoAb IgM against fragment crystallizable Fc portion of IgG --< inflammation of synovium** Felty syndrome: lung fibrosis, eye involvement, hypersplenism	Type III hypersensitivity Pain worse in morning, systemic findings Tx: DMARDS - Hydroxychloroquinee, methotrexate, minocycline, sulfasalazine (takes weeks to work) - Prednisone more rapid acting

biologics	TNF-alpha inhibitors: etanercept, infliximab, adalimumab, golimumab, certolizumab	
Gout	MSU crystals, podagra and **tophi (chalk),** needle shaped crystals, negative birefringence Tx: acute= indomethacin, colchicine; chronic = probenecid (decrease uric acid secretion), allopurinol and febuxostat (xanthine oxidase inhibitors)	High uric acid - Purine rich foods, lesch-nyhan, leukemia - High Alcohol intake - NIACIN, thiazides
Pseudogout	Calcium pyrophosphate, rhomboid, positive birefringence	Calcification of cartilage
Seronegative spondyloarthropathies	Spinal arthritis, HLA-B27 positive **PAIR**: psoriatic arthritis, ankylosing spondylitis, IBD, reactive arthritis 	HLA-B27 positive MHC I Watch for limited chest expanding
SI joint arthritis	Ankylosing spondylitis, bamboo spine Uveitis, aortic regurgitation	HLA-B27 positive
Reactive arthritis	Reiter syndrome: conjunctivitis, **urethritis**, arthritis Follows a GI bacterial illness	HLA-B27 positive
Juvenile idiopathic arthritis	Still's disease: fever, rash, leukocytosis, anemia, hepatosplenomegaly, lymphadenopathy, arthritis	
Psoriatic arthritis	Sausage fingers, dactylitis Pencil in cup deformity of fingers on xray	
SLE	4/11 diagnosis: malar, discoid rash, photosensitivity, painless ulcers, arthritis 2 joints +ANA, anti-dsDNA, anti-smith, + Anti-histone, anti-phospholipid ab, decreased C3, C4 Renal failure, neuro, heme, immune	Libman sacks endocarditis Lupus nephritis: wire loop Lupus - Subendothelial DNA and anti-DNA complexes (type III) - DPGN - Tx: mycophenolate
Diffuse scleroderma	Involves visceral, skin tightness, rapid progression	anti-scl 70/ topoisomerase 1
CREST syndrome	CREST: calcinosis, raynaud phenomenon, esophageal dysmotility, sclerodactyly, telangiectasias	anti-centromere

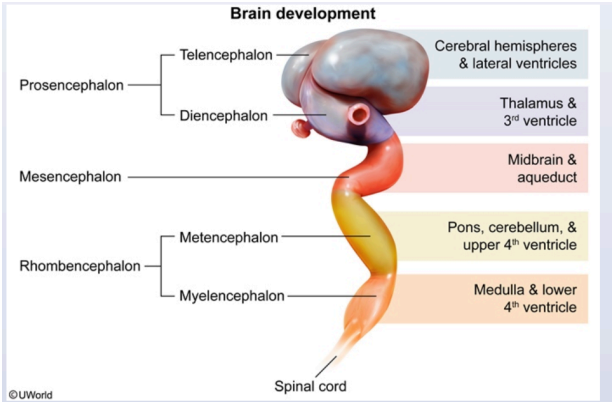
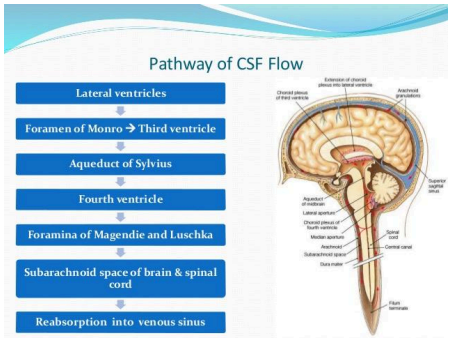
Sjogren's syndrome	Lip biopsy, B cell lymphoma	
Polymyositis	CD8+ T cell injury, endomysial inflammation Shoulder and pelvic	High CK, high aldolase Muscle biopsy Anti-Jo
Dermatomyositis	Purple heliotrope rash, gottron's papules, shawl sign, V sign , dirty darkening of feet and hands	High risk of malignancy Perimysial inflammation
Polymyalgia rheumatica	Proximal muscle involvement with systemic findings > 50 yo, associated with giant cell arteritis Joint pain, no weakness/ pain	ESR, CRP IL-6 treatment (tocilizumab)
Dopamine	Treats shock	
Clonidine	Hypertension	
amphetamine	ADHD, narcolepsy, obesity	
Terbutaline	Asthma, tocolytic B2 agonist Ritodrine used outside of US	Tachycardia, hypotension, pulmonary edema
Tight junction	Zona occludens, prevents diffusion	Claudins, occludins
Zona adherens	Actin cytoskeleton, intermediate junction	E-cadherin, calcium dependent
Desmosomes	Macula adherens	Keratin and desmoplakin Desmoglein: pemphigus vulgaris
Gap junction	Cardiac cells, myocytes, electrical impulses and ions exchange	Connexon
Melanocytes	Pigmentation, from neural crest cells. Melanin is made and transported to skin cells by phagosomes, endosomes, etc.	
Psoriasis	Parakeratosis, hyperkeratosis, Auspitz sign (bleed when silver scales scraped off), salmon patches Reither syndrome and ankylosing spondylitis. Tx: moisturize, steroids, Vit D, retinoids, phototherapy, biologics	Nail pitting Psoriatic arthritis Elevated ESR
Albinism	Defective tyrosinase, decreased melanin production. Normal melanocyte number	
Vitiligo	Decreased melanocyte number	
SJS vs TEN	Nikolsky sign. > 30% = TEN	Caused by seizure meds, sulfa, penicillins, allopurinol
Erythema nodosum	Sarcoidosis, histo, coccidioid, TB, leprosy, Group A strep	

Pityriasis rosea	Christmas tree pattern, herald patch, sunlight improves	
Lichen planus	Pruritic, purple, polygonal, planar papules and plaques Saw tooth lymphocytic infiltrate at dermal-epidermal junction	Hep C
DNA polymerase I	5-3' exonuclease activity	**DNA polymerase III has 3-5 exonuclease**
Heavy painful menses	Adenomyosis, endometriosis	Common in multiparous women
Pronator teres syndrome	Worse during DAY, involves thenar eminence, negative tinel and phalen test	Pain in proximal forearm
Carpal tunnel syndrome	Worse at NIGHT, spares thenar eminence Positive tinel and phalen test	Pain in wrist
Elevated anion gap metabolic acidosis	Aspirin OD: mixed primary respiratory alkalosis Ethylene glycol OD and ethanol tox do not have the mixed primary respiratory alkalosis	ASA OD: deep and raid breathing, fever, NVD, tinnitus
Ryanodine receptor antagonist	Dantrolene Inhibits opening of RR	Malignant hyperthermia Neuroleptic malignant syndrome
Splenic artery supplies	Body of pancreas, greater curvature of stomach, posterior stomach, spleen 	Left gastric artery: celiac trunk, lesser curvature and distal esophagus Right gastric artery: hepatic artery, lesser curvature

Carcinoid syndrome	Tx: octreotide (somatostatin) Flushing, wheezing, diarrhea, telangiectasias Serotonin release in small bowel BFDR: bronchospasm, flushing, diarrhea, right-sided valvular heart disease (outside GI tract, mets)	Arise from small bowel. Mets to Liver
Conditional probability	Part / whole	
Fibular neck fracture	Injury to common fibular nerve, weak extensor hallucis longus	
mesencephalon	midbrain	
metencephalon	Pons and cerebellum	
Myelencephalon	Medulla	
Power of a test	Reject a false null hypothesis. B= percent that there is NO difference power= 1-B	
P-value	Probability that observed results are due to chance	
polyhydramnios	Impaired swallowing: GI malformation, **anencephaly**	Oligohydramnios results in the potter sequence (posterior urethral valves, pulmonary hypoplasia, renal agenesis)
Manic episode	> 7 days of manic symptoms that causes impaired function, hospitalization or psychosis	Hypomania os > 4 days but does cause hospitalization, psychosis or loss of function
Rotor syndrome	Altered transport of bilirubin glucuronides into bile canaliculi, increased urine coproporphyrin excretion	Normal liver 3:1 ratio of Cop III> Cop I
Gibert or crigler najjar syndrome	Absent or decreased glucuronyl transferase enzyme	
Dubin johnson syndrome	Black liiver, Altered transport of bilirubin glucuronides into bile canaliculi D= dubin, direct bilirubin, dark liver	1:3 ratio of cop I> Cop III
Null hypothesis	In cohort, risk is the same in both groups	
Tuberous sclerosis	Angiomyolipomas, ash leaf spots, astrocytoma, tuberous lesions, cardiac rhabdomyoma, RCC Triad: seizure, intellectual disability, angiofibroma	TSC1, 2 gene, incomplete penetrance OR spontaneous mutation
Clinical trials	Preclinic: animal studies Phase 1: healthy humans dose, toxicity, PK, safety. Is it safe? Phase 2: efficacy, safety, side effects. Does it work? Phase 3: patients, efficacy, safety, side effects. Is it efficacious ? Phase 4: post marketing surveillance (drug named), rare or delayed side effects in larger patient population.	

	May lead to restrictions or withdrawal.	
Superior mesenteric artery	Small intestines, ascending and transverse colon to the splenic flexure	
Cardinal ligaments	Cervix to pelvic sidewall Uterine vessels	
Ovarian ligament	Ovary to uterus, derived from gubernaculum	Ureter runs over internal iliac artery an  d under ovarian artery in pelvis
Suspensory ligament of ovary	Infundibulopelvic ligament, ovary to pelvic wall, ovarian vessels	Ligate to reduce bleeding during procedures
Ovaries and testes drainage	Para-aortic LN	
Upper vagina, uterus, cervix, prostate	External and internal iliac nodes (hypogastric) Testes/ Ovary = para-aortic nodes	Lower vagina, vulva, scrotum drain to superficial inguinal nodes
Groin hernias Men: indirect> direct Women: femoral	**Indirect hernias** common: processus vaginalis incomplete closure. Deep inguinal ring , **lateral to vessels**→ superficial inguinal ring - Follow the path of the spermatic cord/ uterine round ligament thru deep **(internal) inguinal ring** - **Protrude medial to inferior epigastric vessels into Hesselbach triangle**	**Direct inguinal hernias:** Hesselbach's triangle: Medial to inferior epigastric vessels, lateral rectus abdominus, inguinal ligament. weak abdominal wall, increased pressure, acquired. - Weakness in transversalis fascia - **Inferior epigastric vessels= LANDMARK** - Indirect are lateral to IEV

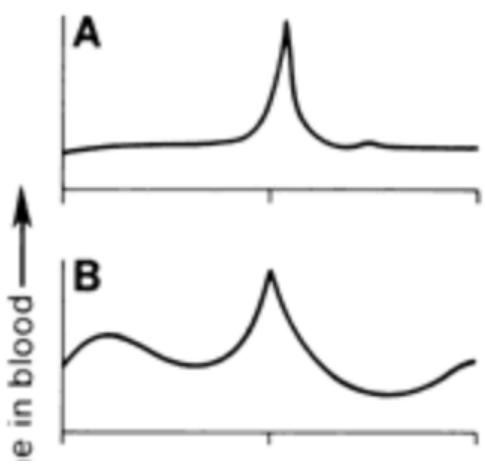
<table>
<tr><td></td><td>
<table>
<tr><th colspan="4">Groin hernias</th></tr>
<tr><th>Type</th><th>Classic presentation</th><th>Pathophysiology</th><th>Anatomy</th></tr>
<tr><td>Indirect inguinal</td><td>Male infants</td><td>Patent processus vaginalis</td><td>• Originates lateral to inferior epigastric vessels
• Protrudes through the deep inguinal ring into inguinal canal
• May extend into the scrotum (following spermatic cord)</td></tr>
<tr><td>Direct inguinal</td><td>Older men</td><td>Weakness of transversalis fascia</td><td>• Protrudes medial to the inferior epigastric vessels into Hesselbach's triangle
• May pass through superficial inguinal ring
• No direct route into the scrotum</td></tr>
<tr><td>Femoral</td><td>Women</td><td>Widening of the femoral ring</td><td>• Emerges inferior to inguinal ligament
• Protrudes through the femoral ring into the femoral canal</td></tr>
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</td></tr>
<tr><td>Pudendal nerve</td><td>S2-S4, sensation to perineum and genitals
Motor to sphincters and muscles</td><td>Ischial spine is landmark</td></tr>
<tr><td>Wolffian duct</td><td>Mesonephric duct. Develops with testosterone
Malformation → posterior urethral valves (calyx dilation, bilateral hydronephrosis)</td><td>SRY on Y chromosome ⇒ testis determining factor</td></tr>
<tr><td>Mullerian duct</td><td>Paramesonephric duct. Develops into female, unless testosterone inhibits</td><td>Fallopian tubes, uterus, upper vagina</td></tr>
<tr><td>Sertoli cells</td><td>MIF inhibits mullerian duct, Testosterone from leydig cells promote development of the mesonephric duct</td><td>DHT stimulates the urogenital sinus and geniital tubercle to become the external genital structures</td></tr>
<tr><td>epispadias</td><td>Extrophy of bladder: congenital gap in anterior bladder and abdominal wall</td><td></td></tr>
</table>

Ureteric bud	Pronephros: 1st embryologic kidney Mesonephros: 2nd embryology kidney, primitive nephron structures Metanephros/ blastema : adult kidney glomeruli, proximal and distal tubules, loop of henle. Ureteric bud forms collecting ducts, calyces, renal pelvis and ureters 1. The pronephros forms first and later completely regresses. 2. The mesonephros forms next from the midportion of the nephrogenic cord. a. In males, it persists as the Wolffian ducts, forming the ductus deferens and epididymis. b. In females, the mesonephros regresses and becomes vestigial Gartner's ducts. 3. The **metanephros** forms last from the caudal end of the nephrogenic cord. a. It gives rise to the glomeruli, Bowman's space, proximal tubules, the loop of Henle, and **distal convoluted tubules**.	
Brain development		Pro- tel and dien - dien= thalamus and 3rd ventricle Mesne= midbrain and aqueduct Rhomb - Met= pons, cerebellum, 4th ventricle - Myel= medulla and below, 4th ventricle
CSF flow		choroid plexus Lateral → foramen of monro → 3rd → cerebral aqueduct → 4th Circulates and reabsorbed in arachnoid granulations
Gubernaculum	Males: anchors testes and scrotum, forms tunica vaginalus around testes Testes descend through the superficial inguinal ring → external oblique muscle aponeurosis Cremaster muscle arises from the internal oblique muscle	Females: ovarian ligament and round ligament of uterus.
Genital homologs	Vestibular bulbs: corpus cavernosum and spongiosum	

	Labia minora: ventral shaft of penis (hypospadias) Bartholin glands: bulbourethral glands Urethral glands: prostate	
Drugs with anticholinergic side effects	Neuroleptics, 1st generation antihistamines (diphenhydramine, hydroxyzine), TCAs, amantadine	
seminoma	Most common in young men. Fried egg appearance in water + PALP	Females: dysgerminoma
Yolk sac tumor	Schiller-duval bodies (cells around a capillary), young children, yellow, high AFP. most common in children < 3	Endodermal sinus tumor
Leydig cell tumor	Most common non-germ cell. Reinke crystals	Produce androgens > estrogens Sertoli tumors produce estrogen
Embryonal carcinoma	Normal AFP, high hCG, painful tumor Teratomas have multiple tissue types	Mixed tumors. Very malignant Alveolar and tubular appearance with papillary convulsions
Testicular lymphoma	Most common in older men. Metastatic lymphoma	
Drug induced parkinsonism	EPS, rigidity, tremor, masked facies, bradykinesia	Tx: benztropine, trihexyphenidyl
Pilocarpine	Nicotinic agonist - Contracts ciliary muscle: open angle glaucoma - Contracts pupillary sphincter: closed angle glaucoma (carbachol does this too)	
Acid base disturbance pyloric stenosis	Vomit: decreased H+ (increase pH), HCO3 shifts into ECM (eleevates), hypoventilation (increase CO2)	
Hartnup disease	Tryptophan deficiency due to neutral amino acid transporter deficiency in PCTand decreased absorption	Autosomal recessive
Diabetic ketoacidosis - T1DM	Hyperglycemia > 250, acidosis, decreased bicarb, **hyperkalemia**, **ketones** , polyuria, polydipsia, weight loss H increases, HCO3 drops from buffering effect. Drops CO2, but ventilation kicks in and increases RR, leading to decreased CO2. (high anion gap metabolic acidosis) **Fruity odor breath, kussmaul breathing**, delirium Presenting symptoms in Type 1 DM in children. - Undiagnosed DM, noncompliance, infection, physiologic Stress, dehydration, alcohol and stimulant abuse - **Decreased glucagon secretion → rapid hypoglycemia** - **Alpha and beta cell failure**	H2O + CO2 -> H + HCO3 - Low pH, low HCO3, low pCO2 pH= 6.1 + log (hco3)/ 0.03 x PCO2 Monitor for **hypokalemia** - **Arrhythmia** - V tach, torsades de pointes - Wide QRS - No P wave - Fungal infections: abscess Tx: FLUIDS, insulin drip, K+
Hyperosmolar hyperglycemic	No ketoacidosis, Extreme hyperglycemia (> 800), serum osm	**No anion gap.**

state - T2DM	> 340 - Confusion, delirium, coma - Dehydration, N/ V, abdominal pain	Tx: FLUIDS, insulin drip, K+
Catatonia	1st line is benzos, 2nd like is ECT	
Hurler syndrome ~ hunter syndrome (later onset, more aggressive behavior)	Mucopolysaccharidosis type I Deficiency in alpha-L-iduronidase → heparan and dermatan sulfate GAGs accumulate in lysosomes hunter: iduronate sulfatase deficiency Hurler syndrome features HURLER'S Hepatosplenomegaly.. Ugly face.. Recessive (AR inheritance).. L-iduronidase deficiency (alpha).. Eyes clouded.. Retarded.. Short/Stubby fingers..	Coarse facial features, **gargoylism** **Corneal clouding**, intellectual disability Broad nose and large head  Heparin sulfate= hunch back of notre dame
Borderline personality disorder	Labels people as all good or all bad= **SPLITTING**	
RIPE therapy	**Rifampin**: inhibits DNA dependent RNA pol, induces P450m decreases INR. P450 inducer. RED fluids. Resistance if monotherapy via altered RNA polymerase. Prophylaxis for TB and N. meningitidis ORANGE **Isoniazid**: inhibits mycolic acids. **Hepatotoxicity**, peripheral **neuropathy** + B6. **monotherapy**, **active TB.** resistance via altered KatG, catalase peroxidase, altered INH site of mycolic acids. *does a lot of bad shit **Pyrazinamide**: hyperuricemia (**gout**), hepatotoxicity. Unknown MOA. resistance via altered pyrazinamidase. **Ethambutol**: arabinosyl transferase, cell wall. Optic neuropathy, color blindness, low visual acuity (optic neuritis). Resistance via increased arabinosyl transferase. **Streptomycin**: aminoglycoside, 30S inhibitors. Resistance via modification of 30S ribosomal protein	Isoniazid resistance: catalase-peroxidase, protein target binding . DO NOT treat active TB with one drug → resistance

	 **RIPE ONGO**	
Whipple disease	Macrophages that phagocytose organism and obstruct lacteals Tx: doxycycline, macrolides PAS+	Tropheryma whippelii GI, arthralgia, derm changes, neuro changes, cardiac problems
PDE inhibitors	Txs erectile dysfunction Cilostazol treats intermittent claudication Milrinone: PDE3 inhibitor, prevent cAMP breakdown. Used to improve heart failure (increase contractility, vasodilation)	Blue-green tinted vision, little blue pill
Balanitis	Glans penis infection by candida, etc.	Uncircumcised, diabetics
Posterior urethral injury	Pelvic injury → blood in retropubic space	
Anterior urethral injury	Saddle injury → Buck's fascia, scrotum, spongy urethra rupture	
BPH	Hyperplasia of prostate glands and stroma. Do to BPH	Alpha 1 antagonists: zosin → decrease SMC tone. Tamsulosin best * - **Doxazosin treats HTN and BPH** 5-alpha reductase→ acts on glandular epithelium PDE5 inhibitor (causes **BLUE** vision)
Prostatic adenocarcinoma	Posterior lobe, rectal exam. Biopsy confirms.	TX: FLUTAMIDE, RESECTION
Meiosis 1 prophase 1	Primary oocyte 2N arrest at 5 months gestation	
Meiosis 2 metaphase 2	Secondary oocyte 1N + polar body	
Follicular and luteal phase	Follicular= FSH and estrogen dominant Luteal= LH and progesterone dominant	Ovulation in 1 day of LH surge. Occurs at ampulla of fallopian tube. Implantation at day 6.

		Corpus luteum maintained by BhCG
hCG analogs	LH, FSH, TSH	1 week after fertilization in blood bCG+ 2 weeks in urine bHCG +
Estrogen	Endometrial hyperplasia and cancer, ER+ breast and ovarian cancer, DVT/ PE, hepatic adenoma Obesity independently increases risk of thrombosis Smoking + OCPs= BAD IDEA Increase risk of cervical cancer Decrease risk of **endometrial** and **ovarian** cancer Unclear risk on breast cancer The absolute contraindications to the use of OCPs are: 1. Prior history of thromboembolic event or stroke 2. History of an estrogen-dependent tumor 3. Women over age 35 years who smoke heavily 4. Hypertriglyceridemia 5. Decompensated or active liver disease (would impair steroid metabolism) 6. Pregnancy	P450 inducers + estrogen= less effective OCP⇒ decreased risk of ovarian and endometrial cancer.increased risk of hepatic adenoma , Contraindications: **hypertension.** smoking, > 35 yo, VTE, heart disease, uncontrolled hypertension, stroke, migraine and personal breast cancer
Progestins	Birth control, abnormal uterine bleeding Decrease bone mineral density	
Menopause	Mood change, sleep disturb, hot flash, vaginal atrophy and dryness, osteoporosis, CAD 12 months amenorrhea , low estradiol, inhibition	Diaphoresis, palpitations **High FSH, high LH, low estrogen** Estrone most predominant
Hormone replacement	Avoid in CAD, liver disease, breast cancer, stroke, embolic	

therapy	disease	
Catecholamine catabolism,	Phenylalanine → tyrosine → homogentisic acid Tyrosine → DOPA → Dopamine → NE, Epi Dopamine → HVA homovanillic acid Norepinephrine → normetanephrine, VMA Epinephrine → metanephrine → VMA	
Cervical transition zone	HPV and squamous cell carcinoma of cervix	Junctions between squamous and columnar epithelium
Barrett's esophagus	Glandular metaplasia	
Grape-like vaginal tumor	Sarcoma botryoides, rhabdomyosarcoma	In girls < 4 yo
PCOS	LH: FSH > 2:1, high androgens, high insulin, insulin resistance High estrogen (estrone), low SHBG , high AMH Most common cause of infertility → tx= clomiphene→ enlarged follicles Coarse hair, amenorrhea, obese	LH + theca cells to make androstenedione FSH + granulosa cells to make estrogen
clomiphene	Binds estrogen receptors in hypothalamus, blocks negative feedback of endogenous estrogens	Used to treat hot flashes, ovarian enlargement, multiple gestations, visual disturbances, infertility
Mittelschmerz	Mid Cycle pelvic pain with ovulation	
Vitamin B2 riboflavin deficiency	Cheilosis, stomatitis, glossitis, diarrhea	
Vit C toxicity	High ICP, skin changes, hepatosplenomegaly	Vit E toxicity can ses hemorrhagic stroke in adults, necrotizing enterocolitis in infants
Tetrahydrobiopterin BH4	Synthesis of serotonin, tyrosine, DOPA	
M phase anticancer drugs	Vinca alkaloids and taxanes	S phase: topoisomerase inhibitors, antimetabolites G2: intercalating DNA drugs like bleomycin and doxorubicin.
Glycolysis	Hexokinase, phosphofructokinase and pyruvate kinase are unidirectional	Hexokinase: all tissues (not liver and Beta cells), low glucose levels. Glucokinase: liver and pancreas, induced by insulin.Needs lots of glucose to work
Gluconeogenesis	Committed step: biotin dependent carboxylation of pyruvate oxaloacetate by pyruvate carboxylase → phosphoenolpyruvate Irreversible enzymes: pyruvate carboxylase, PEP carboxylase, F16BP, G6P	F 1,6 BP and g6P bypass the above listed unidirectional enzymes

Capitation	Fixed, predetermined fee / patient for all services. Health maintenance organizations	Discounted fee-for service: payment for pre-arranged service Global payment: single payment to cover all expenses (pre post op & surgery)
Melanocytes	Derived from NEURAL CREST CELLS	Basal layer of epidermis, give melanin to skin cells to protect from sun. astrocyte shaped. Melanoma is highly malignant, S100+
GLUT 4	Uptake in skeletal muscles via facilitated diffusion in fed state → lowers blood glucose Glucagon and epinephrine stimulate GNG to increase glucose **GLUT 2: liver and pancreas, insulin-independent.**	Insulin dependent translocation Diabetics have lack on insulin, less GLUT 4, less glucose uptake by muscles
Alkaptonuria	AR tyrosine metabolism disorder. Deficiency of homogentisate → black color urine after sitting in air oxidation Cannot convert tyrosine to fumarate	Ochronosis, ochronotic arthropathy
TTP	Pentad: thrombocytopenia, hemolytic anemia +/- fever, renal failure, neurologic manifestations	autoAb ADAMTS-12 decrease, decreased uncleaved vWF multimers
Gastric bypass	Iron, thiamine, folate, B12, Vit D, calcium	
Fallopian tube cancer	**Serous** cystadenocarcinoma w/ **psammoma** cancer	Most malignant and Bilateral. 40-60 yo Benign serous cystadenoma is most common**
Epithelial tumors of ovary	Serious epithelial malignancy are clearly bad Serous, endometrioid, mucinous, clear cell, brenner	
Struma ovarii	Teratoma with functional thyroid tissue → hyperthyroidism and uterine mass	
Meigs syndrome	**Ovarian fibroma**, ascites and pleural effusions	

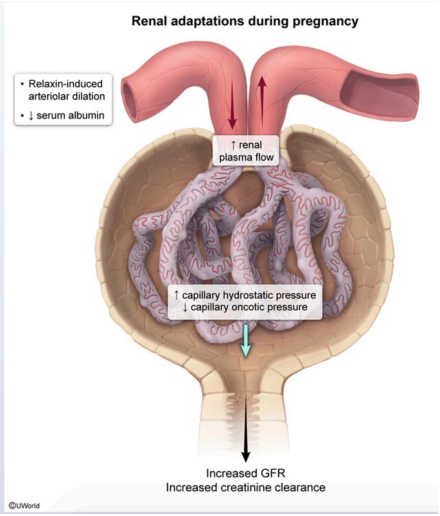
Sex-Cord Stromal Tumor Characteristics

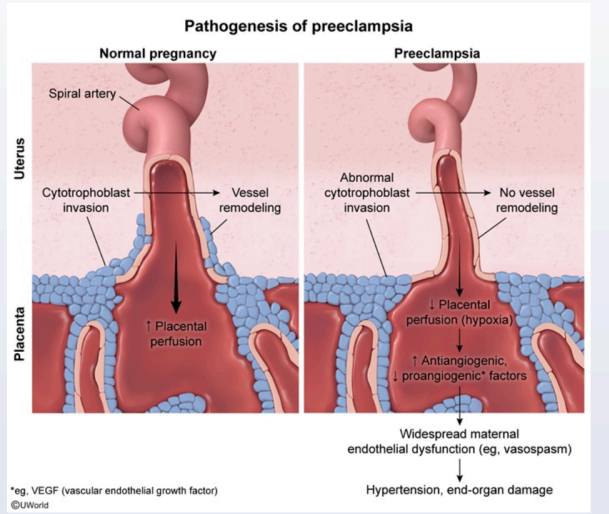
Type of Tumor	Characteristics
Ovarian fibromas	• Benign, unilateral, solid tumors • No hormonal activity • May be associated with Meigs syndrome: ascites and/or pleural effusion
Granulosa cell tumors	• Generally large, unilateral, malignant potential • Typically produce estrogen, causes signs of hyperestrogenism • May also lead to elevated levels of inhibin, anti-Mullerian hormone, estradiol
Ovarian thecomas	• Benign, solid, fibromatous tumors • Unilateral • May produce estrogen, present with abnormal uterine bleeding
Sertoli-Leydig cell tumors	• Benign or malignant tumors • Produce androgens • Typically occur in women < 40 years old

Granulosa cell tumors	Produce estrogen. Cause puberty in children. Post menopause causes AUB, endometrial hyperplasia/ cancer	Call-exner bodies. Call Granny
Brenner tumor	Benign mets of bladder tissue to the ovaries bilaterally	Krukenberg tumors: malignant GI tumor signet ring cells bilaterally
Pseudomyxoma peritonei	Mucinous cystadenocarcinoma, rare ovarian epithelial cell tumors	Appendix tumors
Ovarian cancer markers	CA-125	AFP= yolk sac, germ cell tumor, hemangiocarcinoma hCG= choriocarcinoma, dysgerminoma LDH= dysgerminoma
Urachus	Median umbilical ligament	Vesicourachal diverticulum - urine out of umbilicus
Vitelline duct	Yolk sac to mid gut Obliterates around 7th week	Meconium out of umbilicus, lower GI bleed from meckel's diverticulum (pancreatic tissue or gastric tissue)
Triple or quadruple screen	AFP, estriol, Hcg, inhibin at 15-20 weeks	AFP= abdominal wall defects, NTD, multiple

<table>
<tr>
<td></td>
<td>Edwards 13= all low
Trisomy 21= only high Hcg and inhibin
<table><tr><th colspan="2">Maternal serum alpha-fetoprotein screening</th></tr><tr><th>↑ MSAFP</th><th>↓ MSAFP</th></tr><tr><td>• Open neural tube defects (eg, anencephaly, open spina bifida)
• Ventral wall defects (eg, omphalocele, gastroschisis)
• Multiple gestation</td><td>• Aneuploidies (eg, trisomy 18 & 21)</td></tr></table></td>
<td>gestations

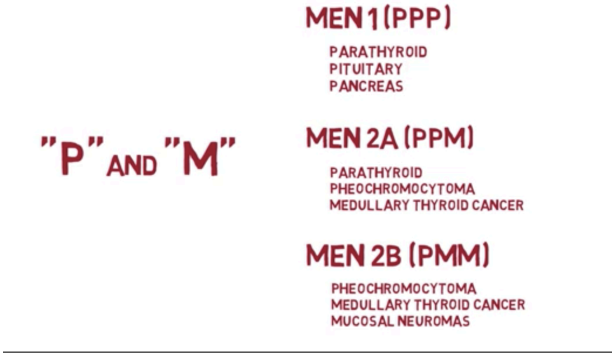
Levels depend on gestational age. Too high levels can indicate a dating error</td>
</tr>
<tr>
<td>Physiologic changes in pregnancy</td>
<td>High BMR
Very high plasma volume, high RBC mass (low RBC by dilution), high CO
Increased GFR, increased aldosterone
Increased Thyroid binding globulin, Total free T4 increases, T3/4 normal, TSH normal (estrogen increases protein synthesis)
Decrease GI motility
Progesterone → SOB, increased ventilation, breath off more CO2 (respiratory alkalosis) → metabolic compensation decreased HCO3 reabsorption
Estrogen increases cholesterol synthesis
Progesterone reduces bile acid secretion
Renal: increased GFR, Renal blood/ plasma flow, decreased creatinine , decreased serum albumin, decreased oncotic pressure, increased hydrostatic pressure
<table><tr><th colspan="2">Maternal cardiopulmonary adaptations to pregnancy</th></tr><tr><td>Maternal adaptations</td><td>• Cardiac
○ ↑ Cardiac output
○ ↑ Plasma volume
○ ↓ Systemic vascular resistance
• Respiratory
○ ↑ Tidal volume
○ ↓ Functional residual capacity (elevation of diaphragm)</td></tr><tr><td>Clinical manifestations</td><td>• Peripheral edema
• ↓ Blood pressure
• ↑ Heart rate
• Systolic ejection murmur
• Dyspnea</td></tr></table></td>
<td>Decreased BP in early pregnancy, then returns to normal
Decreased SVR
Chadwick sign (blue vagina)= first sign of pregnancy

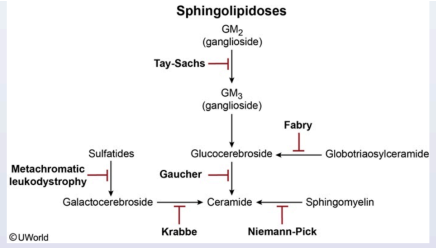
Goal: optimize blood flow and perfusion to the fetus
- Decreased PVR
- Decrease SVR to accommodate the increased preload
- Increased venous capacitance
Leg swelling due to compression of uterus on IVC and diluted oncotic pressure (due to increased plasma volume)

</td>
</tr>
</table>

Ectopic pregnancy	Sudden onset adnexal pain, blood, missed period	Prior ectopic, tubal surgery, PID, smoking, IUD, infertility
Molar pregnancy	High HCG. theca lutein cyst	
Placenta previa Vasa previa: placenta over OS, velamentous unprotected umbilical vessels	Painles Vaginal bleeding late in pregnancy Placenta accreta: abnormal adherence to myo Placenta increta:invades myo Placenta percreta: through the serosa and organs	Increased risk with scarring of uterus, especially from prior C-section
Abruptio placentae	Hematoma under placenta Painful vaginal bleeding Fetal distress	HTN, trauma, smoking, COCAINE
Postpartum hemorrhage	MOST COMMON cause is Uterine Atony	
HTN in pregnancy	**Methyldopa** (M=mother), **labetalol**, **amlodipine**, **nifedipine**, **hydralazine** > 140-90 after 20 weeks. Close monitoring	No ACE inhibitors!
preeclampsia	Gestation HTN, proteinuria + end organ dysfunction Placental ischemia → reduced proangiogenic factors like BEGF, PGF Increased endothelin and TXA2→ vasoconstriction Abnormal spiral arteries → inadequate perfusion → abruptio placenta (tender uterus, cervical os bleeding) 	Risks: prior history, high age, nulliparity, HTN, diabetes, multiple gestation, hydatidiform moles
Eclampsia	Preeclampsia + seizure (magnesium sulfate)	Hydralazine, labetalol, nifedipine

		Magnesium sulfate (monitor DTR) Delivery
diabetes in pregnancy	Gestational DM= macrosomia, shoulder dystocia, TRANSIENT fetal hypoglycemia	Overt DM: cardiac defects, caudal regression, still birth
prostaglandins	Cervical dilation and uterine contractions= abortifacient, or labor induction	Dinoprostone: PGE2 analog Misoprostol: PGE1 analog
Mifepristone	Progesterone competitive inhibitor	
Down syndrome trisomy 21	Endocardial cushion defects, flat facies, epicanthal folds, simian crease, duodenal atresia **Most common genetic cause of intellectual disability** - **2nd most common is fragile X syndrome** High bHCG, high inhibin A Maternal nondisjunction of homologous chromosomes anaphase of meiosis 1, advanced age, mosaicism GI: duodenal atresia, hirschsprung, annular pancreas, celiac disease	Alzheiimer and AML/ ALL "ALL fall DOWN" Polycythemia Nuchal translucency
Robertsonian translocation	Long arm of acrocentric chromosomes fuse, makes big chromosome. 14 and 21 → passed thru germline → down syndrome	
Edwards syndrome trisomy 18	Rocker bottom feet, prominent occiput, clenched hands, micrognathia	Low quad screen
Patau syndrome trisomy 13	~ edwards, holoprosencephaly, SHH mutation, death in 1 year High nuchal translucency Associated with polycystic kidney disease **Cutis Aplasia** **Cleft lip/palate** **Holoprosencephaly** **Omphalocele** **Microphthalmia (tiny eyes)** **Polydactyly** **Rocker-bottom feet**	Low Hcg Low PAPP-A
Klinefelter syndrome 47 XXY	male with female features Tall, gynecomastia, reduced fertility Low inhibin, high FSH	Barr body Aneuploidy, meiotic nondisjunction
Turner syndrome	45 XO short stature, shield chest, webbing of neck. Streak fibrous ovaries Coarctation of aorta, bicuspid valve, amenorrhea	Low estrogen, high LH, FSH Horseshoe kidney

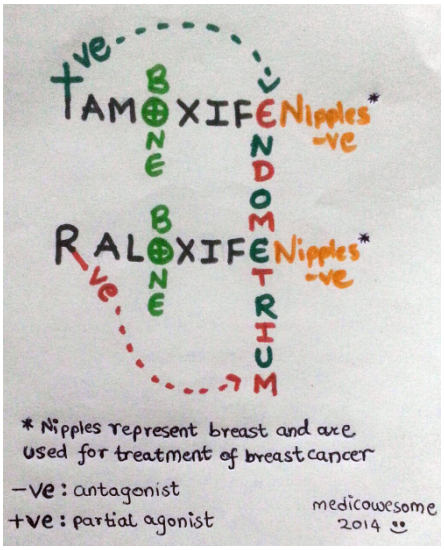
Double Y males	47 XYY. normal, tall, severe acne. Autism or antisocial	
cri-du-chat	Microcephaly, cat cry, intellectual disorder, cardiac abnormality 5p short arm deletion	
Williams syndrome	Elfin face, friendly, talkative Microdeletion of long arm of chromosome 7 hypercalcemia	
22q11 (FISH)	Digeorge syndrome, velocardiofacial syndrome Cleft lip, thymic aplasia, T cell deficiency, cardiac defects Hypocalcemia: chvostek sign, trousseau sign (carpopedal, tightened cuff) Recurrent viral, fungal, protozoal)	CATCH 22 3rd and 4th pharyngeal pouch fails
ADPKD	B/L kidney cysts with renal failure, berry aneurysms Most common cause of death is cardiac disease > aneurysm rupture. Vesicoureteral reflux → recurrent kidney infections. Upper and lower poles susceptible, cortical scars	Chrom 16
Familial adenomatous polyposis	Colon cancer in young, APC gene on 5q21 → adenocarcinoma Frameshift mutation or premature stop codons Increased risk of desmoid fibromatosis in the mesentery	APC- Beta catenin pathway
Gardner syndrome	Colon polyps, jaw osteomas, cysts	AD
Familial hypercholesterolemia	Type 2AL LDL receptor defective Homozygous worse	
Osler weber rendu syndrome	Hereditary hemorrhagic telangiectasia: nose bleed and GI bleeds	AD
Spherocytosis	Increased osmotic fragility (lysis in glycerol). Spectrin or ankyrin defect. Hemolytic anemia is worse with infection. Pigmented gallstones	Tx splenectomy
MEN 1	PPP= **parathyroid**, **pituitary**, **pancreas** (zollinger-ellison syndrome, insulinoma, glucagonoma, VIPoma)	AD
MEN2A	PPM= parathyroid hyperplasia, **pheochromocytoma**, medullary thyroid cancer (spindle cells with amorphous background, calcitonin secreting C cells)	AD- RET
MEN2B	PMM= **pheochromocytoma**, medullary thyroid cancer, neuromas (ganglioneuromatosis, mucosal neuromas)	AD- RET

		**Classification of multiple endocrine neoplasia** **Type 1**: • **Primary hyperparathyroidism** (parathyroid adenomas or hyperplasia) • Pituitary tumors (prolactin, visual defects) • Pancreatic tumors (especially gastrinomas) **Type 2A**: • **Medullary thyroid cancer** (calcitonin) • Pheochromocytoma • Primary hyperparathyroidism (parathyroid hyperplasia) **Type 2B**: • **Medullary thyroid cancer** (calcitonin) • Pheochromocytoma • Mucosal neuromas/marfanoid habitus
NF1	Pigmented lisch nodules, café au lait, neuromas	Ch 17 NF
NF2	**b/l acoustic neuromas**, cataracts, nodules	Ch 22
Tuberous sclerosis	Nonmalignant tumors hamartomas: astrocytoma, rhabdomyoma, etc.	
VHL	Hemangioblastoma in brain, **RCC**, pheochromocytoma HVL gene → HIF and angiogenic factors Eye hamartomas	Ch3
Cystic fibrosis	CFTR Na/ Cl channel (hyponatremia, hyperchloremia) Thick secretions, pseudomonas and opportunistic infections No vas deferens, fat soluble vitamin deficiency Chloride sweat test, meconium ileus Bronchiectasis (thick dilated bronchi), friable hypertrophied bronchial arteries	**Pancreatic insufficiency/ diabetes, chronic pancreatitis** Meconium ileus cannot pass Tx: NAC, fluoroquinolones, enzymes, ADEK vitamins
Fabry disease	**Alpha galactosidase, high ceramide trihexoside** Neuropathy, angiokeratomas, hypohidrosis, renal failure	X-linked lysosomal disorder
Gaucher disease	**MOST COMMON** lysosomal storage disease. **Glucocerebrosidase deficiency** Hepatsplenomegaly disease, **tissue paper cells**	AR
Niemann pick disease	Deficiency in **sphingomyelinase** **Pick the Cherries!** Cherry macular lesion. Hepatosplenomegaly. Foamy macrophages	AR

Tay-sachs disease	**Hexosaminidase A → GM2 ganglioside** Fatal. Ashkenazi jews. Startle reflex, macrocephaly, cherry red macular spot, regression of milestones	ar 
Krabbe disease	Galactocerebrosidase, myelin sheath disease. Fatal.	ar
X-linked recessive	Ocular albinism, fabry disease, wiskott aldrich, **G6PD**, hunters, bruton, hemophilia, kesch-nyan, DMD	“Oblivious female will give her boys her x-Linked disorders”
Scissor gait	UMN disease , cerebral palsy	
Sleep in infants	Stage 2 for largest percent of sleep, growth hormone, replenishing	
Glucocorticoid therapy	Lipolysis, altered fat distribution. Increased expression of liver enzymes vie increased GNG and glycolysis, skin thinning, atrophy of muscle	Transient increase in neutrophils due to demargination
Kinesin	Anterograde axonal transport	Retrograde axonal transport: dynein
MDD with psychotic disorder	MDD with an episode of psychotic features (delusion, hallucination) that are mood congruent / incongruent	
MDD with atypical features	Mood reactivity, leaden paralysis, rejection sensitivity, increased sleep and appetite	MOAi
Schizophrenia	> 6 months of positive or negative symptoms	
Schizoaffective disorder	> 2 weeks of schizophrenia symptoms in **absence** of mood disorder.	

<table>
<tr><td>Schizophreniform disorder</td><td colspan="2">
<table>
<tr><th colspan="2">Differential diagnosis of DSM-5 psychotic disorders</th></tr>
<tr><td>Brief psychotic disorder</td><td>≥1 days & <1 month, sudden onset, full return to function</td></tr>
<tr><td>Schizophreniform disorder</td><td>≥1 months & <6 months, same symptoms as schizophrenia, functional decline not required</td></tr>
<tr><td>Schizophrenia</td><td>≥6 months (includes ≥1 months of active symptoms, can include prodromal & residual periods), requires functional decline</td></tr>
<tr><td>Schizoaffective disorder</td><td>Mood episode with concurrent active-phase symptoms of schizophrenia + ≥2 weeks of delusions or hallucinations in the absence of prominent mood symptoms</td></tr>
<tr><td>Delusional disorder</td><td>≥1 delusions & ≥1 months, no other psychotic symptoms, normal functioning apart from direct impact of delusions</td></tr>
</table>
1-6 months of symptoms
</td></tr>
<tr><td>Schizotypal</td><td colspan="2">Personality disorder, eccentric bizarre people, ODD</td></tr>
<tr><td>Schizoid</td><td colspan="2">Personality disorder, voluntary loners
<table>
<tr><td>Schizotypal</td><td>Personality disorder with interpersonal awkwardness, odd thoughts, odd appearance</td></tr>
<tr><td>Schizophrenia</td><td>Delusions or hallucinations
+/- negative symptoms
≥ 6 months</td></tr>
<tr><td>Schizoaffective</td><td>Schizophrenia symptoms + mood disorder</td></tr>
<tr><td>Schizoid</td><td>Personality disorder with voluntary social withdrawal</td></tr>
<tr><td>Schizophreniform</td><td>Schizophrenia symptoms
1-6 months</td></tr>
</table>
</td></tr>
<tr><td>HIV</td><td>Pol mutation = inconsistent use of HAART therapy, Pol codes for HIV enzymes (resistance to protease inhibitors -NAVIR)
Pol gene codes for protease, RT, and integrase
R5 uses CCR5 for viral entry → macrophage tropic (HIV predominate type)
X4: uses cxcr4, T cells.
Env gene codes for gp120 (viral attachment), binds CD4</td><td>gp120= neutralizing Ab against HIV</td></tr>
</table>

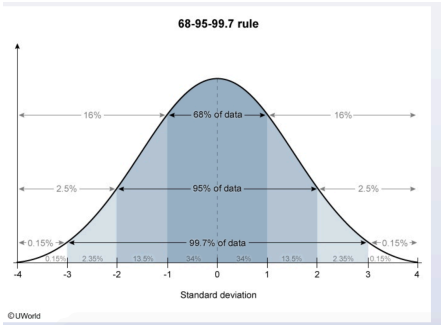
	Gp41 mediates fusion: ccr5 Gag gene: p24, p 17 capsid and matrix proteins	
Insulin resistance	Elevated FFA → increased insulin resistance High C-peptide	
Sevelaner	Nonabsorbable anion-exchange resin that binds GI phosphate to reduce systemic absorption	Treats high phosphate in chronic kidney disease
fibroadenoma	< 25 yo, benign firm breast mass. Mobile, increases with estrogen. Fibrocystic is similar in presentation, but multiple diffuse nodularities	Not precursor to malignancy **Benign breast disease** **Diagnosis** / **Clinical features** / **Pathology** **Fat necrosis**: • Posttraumatic • Irregular mass • Ecchymosis / • Central necrotic liquefactive fat • Neutrophils & lipid-laden macrophages **Fibroadenoma**: • Solitary round mass • Firm with clear borders • Nontender • Mobile / • Tan or white on cross-section • Proliferation of stromal & ductal elements • Surrounded by fibrous capsule **Fibrocystic changes**: • Solitary mobile cyst or multiple, diffuse nodulocystic masses • Cyclic premenstrual tenderness / • Flattened epithelial or apocrine metaplasia surrounding brown or blue fluid (blue dome cyst) • Compressed fibrous stroma
Intraductal papilloma	Lactiferous duct, serous or bloody nipple discharge	Low risk of malignancy
Phyllodes tumor	Leaf like projections lined with epithelium 50s, benign	
Breast cancer	Menopause, UOQ, most common cancer.	Risk factors: more estrogen or periods, obesity, BRCA, HNPCC ER/ PR/ HER2
DCIS	Ductal carcinoma in situ, not invasive yet. Comedocarcinoma: central necrosis; solid, papillary patterns	**Paget disease:** extension of eczema like lesions on breast skin, cancer cells. **Cooper ligaments** invasive breast cancer: skin puckering
Lobular carcinoma in situ	Signet cells, ER + PR +	
Invasive ductal carcinoma	MOST COMMON and most invasive Rock hard mass with sharp margins. Immobile. Starburst pattern	May present as inflammatory - Peau d'orange from blocked lymphatics, dimpling, nipple retraction
Invasive lobular carcinoma	Cells in a row "indians in a row" E-cadherin inactivation, ER/ PR, signet ring cells	
Medullary carcinoma	Fleshy, cellular with lymphocytic infiltrates	

tamoxifen	**ER+ antagonist in breast,** **agonist in endometrium** - Prevents gynecomastia **Agonist at bone**	
Raloxifene	**Estrogen agonist in bone.** **Antagonist in breast** + tamoxifen **Antagonist in endometrium**	Osteoporosis Venous thromboembolism
anastrozole	Inhibits estrogen aromatase, increased osteoporosis.	
Gynecomastia	Puberty, cirrhosis, testicular tumors, klinefelter syndrome, Spironolactone, THC, chronic alcohol, marijuana, cimetidine, ketoconazole, digoxin	
Macrolides	50S inhibitors	Atypical pneumonia (mycoplasma)
Pituitary adenoma	Lactotrophs most common	
Serotonin syndrome	ANS instability, agitation, delirium, startle. NMS hyperactivity	OD of SSRIs
Hypertensive crisis	Tyramine excess + MAO inhibitor → sympathetic overactivation, cardiac arrhythmias, stroke, tachycardia.	
Malignant hyperthermia	Inhaled anesthetics (succinylcholine) causes severe muscle contractions. + ryanodine genetic mutation. Rhabdomyolysis, hyperthermia, tachycardia, rigidity. Hyperkalemia	
Neuroleptic malignant syndrome	Days- weeks. Increase dopamine blockage from antipsychotics. Myoglobinuria, fever, encephalopathy, increase CK, LEAD pipe rigidity, ANS instability	Acute dystonia

<table>
<tr><td>Rotor syndrome</td><td>Altered transport of bilirubin glucuronides into bile canaliculi
Chronic nonhemolytic hyperbilirubinemia</td><td></td></tr>
<tr><td>Brown sequard syndrome</td><td>Hemisection of spinal cord.
Contralateral P and T, crude touch 2-3 segments below.
Ipsilateral loss of MVP
Ipsilateral spastic paralysis, hyperreflexia UMN signs</td><td>F U Brown sequard </td></tr>
<tr><td>ST depression</td><td>Non-transmural MI, Angina</td><td>STEMI: transmural MI</td></tr>
<tr><td>peptidoglycan</td><td>Gram positive, crystal violet, purple</td><td></td></tr>
<tr><td>Lipoteichoic acids</td><td>Gram negative.</td><td>LPS in gram negatives stimulate the immune system. Septic shock</td></tr>
<tr><td>Acute phase reactants</td><td>IL1, IL6, TNFalpha</td><td></td></tr>
<tr><td>Encapsulated bugs</td><td>Even some pretty nasty killers have shiny bodies
E coli, Strep pneumonia, Pseudomonas, Neisseria, Klebsiella, H flu, Salmonella, Group B Strep
cryptococcus= india ink, fungus</td><td>Asplenics
Vaccines against strep pneumo, H flue, N. meningitidis</td></tr>
<tr><td>nucleolus</td><td>rRNA synthesis, basal level of transcription in basophilic body..
RNA polymerase I is most prevalent. RIBOSOMES</td><td>RNA Polymerase II: mRNA
RNA polymerase III: tRNA</td></tr>
<tr><td>Coronary steal</td><td>Vasodilators redistribute blood flow from ischemic to nonischemic areas of myocardium, worsens ischemia</td><td>Adenosine, dipyridamole</td></tr>
<tr><td>Pulmonary fibrosis</td><td>Increased traction, decreased lung compliance</td><td></td></tr>
<tr><td>Tachyphylaxis</td><td colspan="2">Nasal spray decongestants with declined effects → rebound rhinorrhea due to negative feedback. Stop medication
<table><tr><th colspan="2">Example mechanisms of tachyphylaxis</th></tr><tr><td>Adrenergic agonists</td><td>Receptor inactivation & internalization by arrestins</td></tr><tr><td>Indirect sympathomimetics</td><td>Depletion of catecholamines from nerve terminals</td></tr><tr><td>Nitrates</td><td>Depletion of reduced thiols decreases mtALDH activity & NO production</td></tr><tr><td>Desmopressin (vWD)</td><td>Depletion of vWF from endothelial storage sites</td></tr><tr><td>Barbiturates</td><td>Induction of CYP450 enzymes</td></tr></table></td></tr>
<tr><td>Gallstones</td><td colspan="2">Cholesterol → cholesterol 7-alpha hydroxylase → bile
Beta-glucuronidase: bacteria and liver cells</td></tr>
</table>

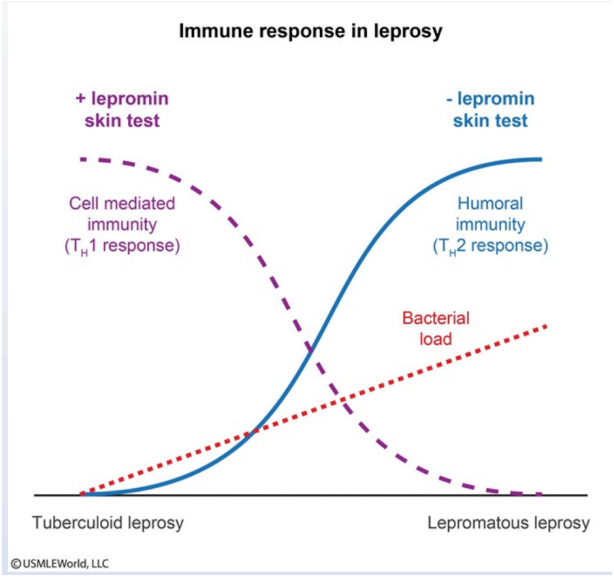
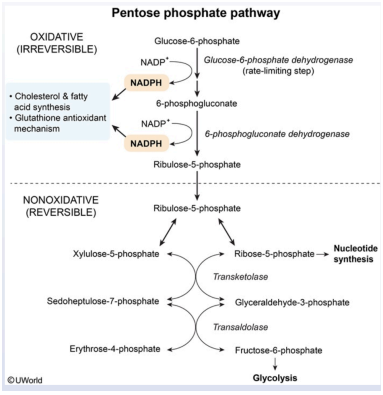
	formation. Inhibited by fibrates. Increased cholesterol excretion.	in infected bile deconjugate bilirubin, form pigmented gallstones.
Efferent arterioles	ACE inhibitors decrease angiotensin II ⇒ dilated efferent, decreased GFR ACE= AgII Contracts Efferents	
Mesothelioma	Spindle cells, cytokeratin + calretinin + Peripheral fibrosis of lungs Long slender microvilli, tonofilaments	Unilateral pleural thickening
Corynebacterium diphtheriae	Toxin inactivates EF2 → decreased **ADP ribosylation** ~ pseudomonas exotoxin A	Gray pseudomembranes Bull neck
Shigella	Cleave rRNA at adenine base in 60s ribosomal subunit, inhibit protein synthesis	
Hemolytic uremic syndrome	Hemolytic anemia, thrombocytopenia, acute renal failure post EHEC infection	
ETEC	Heat labile → increase cAMP (Bacillus anthracis, vibrio) Heat stable → increase cGMP ~ yersinia enterocolitica	Diarrhea
Bacterial growth	Log phase/ exponential: dividing, Abx susceptibility Stationary phase: slowed metabolism, Spores, nutrient depletion Death phase: lacks nutrients	
Beta hemolysis	Group A strep S. pyogenes (bacitracin sensitive) Group B strep	
Alpha hemolysis	Strep pneumonia= gram positive DC, capsule Viridans strep (green), oral cavity	
Staph aureus	Potuck, mayo, potato salad → enterotoxins Large golden colonies, beta-hemolytic	Protein A: disrupts phagocytosis, binds Ig Colonizes the nares. Soft tissue abscesses
Bacillus cereus	fried/ reheated rice, preformed enterotoxins	
RhoGam	RhD negative mother, Rh+ father and neonate 1st pregnancy = sensitization. RhoGam prevents hemolytic disease in the next Rh+ child and IgG anti-D and prevents immunization.	Hemolytic disease of the newborn Rh prophylaxis: bleeding, invasive procedures, **28 weeks gestation**, 72 hours AFTER delivery
Unilateral gaze paralysis	Ipsilateral PPRF, contralateral FEF Ipsiliateral MLF affects respective eye	
Dupuytren contracture	Inherited. 4th and 5th cannot extend. Old white men. Cord-like band on palm	Progressive fibrosis of the superficial palmar fascia. Fascial thickening, nodules, proliferating

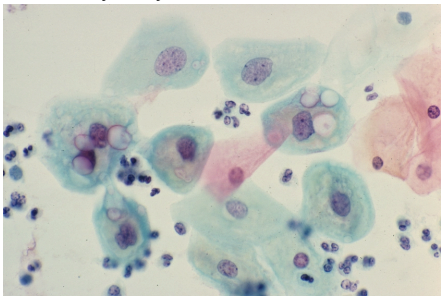
		fibroblasts and disordered type III collagen → loss of finger extension
Microglial cells	Mesoderm. CNS macrophages. Spindle shaped neurons	
Somatostatinoma	Delta cell tumor, secrete somatostatin and inhibit most everything. Gastrin → Hcl → pepsinogen to pepsin conversion	
Chromosome 15	Prader willi, angelman, marfan ***Prader-Willi*** *→ Maternal gene silenced (imprinted), Paternal allele deleted or mutated* ***Angelman*** *→ Paternal UBE3A gene silenced (imprinted); Maternal allele deleted or mutated*	
Rheumatic fever	JONES: joints/ polymyalgia rheumatica, pancarditis, aschoff nodules, erythema marginatum, sydenham chorea (face and limbs)	Acute rheumatic fever from group A strep: Ab cross-react with host tissue → sydenham chorea of face, and arms/ legs, erythema marginatum. Anti-M, anti-N-abD glucosamine)
Neonatal sepsis	GBS, E coli, listeria monocytogenes	
Strep Bovis	Screen for colon cancer	
Clostridium difficile	Toxin A (enterotoxin) binds to brush border Toxin B (cytotoxin)	Diffuse water diarrhea, toxic megacolon, colon perforation. Clindamycin use. Stool toxin assay. Metronidazole, **Tx: ORAL Vancomycin**
Anthrax	Alimentary tract, cutaneous, inhalation D-ala Medusa head	Papule → ulcer, eschar Tx:ciprofloxacin, doxycycline , protein synthesis inhibitors
Wound healing	PMNs= 24 hours, macrophages, epithelial cells= 1-3 days, granulation tissue= 3 days	
Waterhouse friderichsen syndrome	B/L adrenal hemorrhage from N. meningitidis	
Legionnaire disease	Silver stain, charcoal buffered yeast extract, iron, cystine	
Hot tub folliculitis	Pseudomonas	Also burn wound infection
H pylori	Urea breath test, urease, serology, stool antigen , **directly causes Gastric ulcers**, gastric adenocarcinoma, Gastric lymphoma CAMO - **Increased gastric production causes duodenal**	Triple: PPI, clarithromycin, metronidazole Quadruple: Triple + bismuth Clarithromycin + Statin can cause myopathy

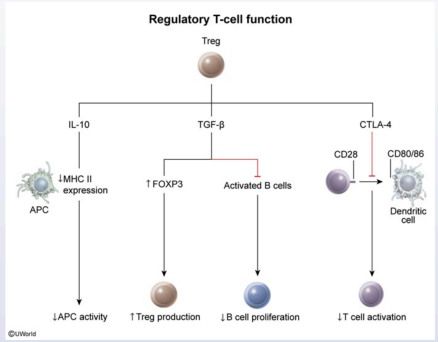
	ulcers	
Salmonella	Salmon covered rash Raw chicken, eggs, reptiles, turtles	Can also cause endocarditis, mycotic aneurysms, osteomyelitis in sickle cell, reactive arthritis
Yersinia	Bloody diarrhea, **pseudoappendicitis** Bubonic plague. Buboes (inflamed LN)	Prairie dogs
Proteus	Staghorn struvite stones, urease producing, alkalinizes urine	
Cardiac tamponade	Sudden enlargement of cardiac silhouette **Becks triad: hypotension, distant heart sounds, JVD** **Pulsus paradoxus**	RA small
Christmas tree deformity	Vascular occlusion in utero of bowels, intestinal stenosis and atresia	
TCA overdose	Inhibition of NE, 5HT reuptake, antagonist of GABA-a, Antagonist H1, alpha 1, muscarinic Ach, cardiac fast Na channels **3 C's: cardiotoxicity, CNS toxicity, antiCholinergic symptoms**	Obtundation, seizures, AntiAch toxicity, wide QRS, prolonged PR and QT intervals, bundle branch blocks TTx: sodium bicarbonate
Atrial fibrillation	Tx: verapamil (if COPD, asthma, etc.) Sotalol (beta blocker/ K+ blocker) worsens asthma	
Galactorrhea	1st gen antipsychotics: **haloperidol, fluphenazine** 2nd gen antipsychotics: **risperidone** TCA: **clomipramine** Antiemetic: **metoclopramide (5HT4 agonist, inhibits D2)** Untreated hypothyroidism	Reduce dose Dopamine antagonists (dopamine inhibits lactotrophs in anterior pituitary)
68-95-99.7 rule	1 SD= 68% 2 SD= 95% 3 SD= 99.7%	
Smallpox	**ds DNA**, complex capsid symmetry. R**eplicates in cytoplasm** Poxviridae: molluscum, monkeypox - umbilicated	Bioterrorism Rash that erupts synchronously, starts in mouth and spreads to face/ arms/ legs

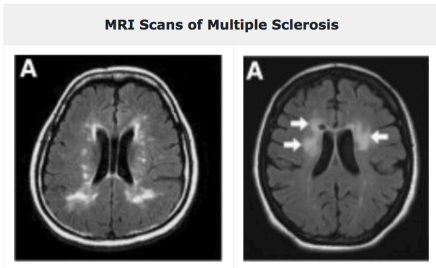
hypermagnesemia	Hyporeflexia, paralysis, hypotension, bradycardia, NV, flushing, renal insufficiency, respiratory suppression, somnolence/ coma	
Pompe disease	Alpha 1,4 glucosidase	
Von Girke	Glucose-6-phosphatase	Hypoglycemic seizures, hyperuricemia, hepatomegaly, lactic acidemia, high TRIGS
Lyme disease	Borrelia. Doxycycline (30s, non-pregnant), amoxicillin (pregnant), transpeptidase)	
picornavirus	Coxsackie	
paramyxoviridae	ssRNA. **Measles (rubeola)**. Cough coryza conjunctivitis , koplik spots prodrome → maculopapular rash from face down	3 C's
rubeola vs roseola		Rubella = german measles - Rash from face to extremities - Blueberry muffin rash - 3 day fever
Type 2 error	Reject the null hypothesis. Increase sample size	
Leptospira	Question mark shaped flagella spirochete 1st phase: malaise, HA → 2nd phase: hyponatremia, renal failure, liver failure, meningitis, pulmonary hemorrhage. Weil's disease. Dx: serology.	**Animal urine= leptospira, hantavirus** Gram negative, motile, coiled aerobic Conjunctival suffusion , nonpruritic skin rash **Hawaii**
Syphilis	1. Painless ulcer chancre 2. Disseminated infection. Rash on PALMS and SOLES, **condyloma lata (**white, flat smooth lesion) 3. Latent > 12 months 4. Tertiary: **GUMMAs**, aortitis via the vasa vasorum 5. Neurosyphilis: argyll-robertson pupil, tabes dorsalis	**Congenital syphilis:** snuffles, bossing/ bulge forehead, saddle nose, hutchison notched teeth, saber bowed tibia Tx: Penicillin or Doxycycline Jarisch-Herxheimer reaction → massive destruction of bigs, transient inflammatory response
Rashes on hands and feet	Kawasaki, secondary syphilis, coxsackie A, rocky mountain spotted fever	Drive Kawasaki CARS with your hands and feet.
VDRL false positive	viruses , drugs, rheumatic fever, Lupus/ leprosy Pregnancy	Dx: non-treponemal → treponemal → microscopy
Lyme disease	1. Erythema migrans, flu 2. Early disseminated, B/L facial nerve palsy, AV node	

	block 3. Monoarthritis, polyarthritis, encephalopathy	
Bartonella	Bacillary angiomatosis, stellate granuloma, cat scratch disease	
Cocaine OD	Never use beta blockers: severe hypertension, unopposed alpha 1 activation, blockade of Beta 2 vasodilation	**Cardiovascular effects of cocaine intoxication** **Physiologic effects**: • Sympathetic stimulation ◦ Hypertension & tachycardia ◦ Coronary vasoconstriction **Clinical manifestations**: • Myocardial ischemia or infarction • Aortic dissection • Neurologic ischemia or stroke **Treatment**: • Benzodiazepines & nitroglycerin • Beta blockers contraindicated
Tuberculosis	1. Hilar LN + ghon focus= ghon complex 2. Latent 3. Reactivation → apical caseous, cavitary lesion , hemoptysis 4. AIDS: Pott's disease, miliary TB	Sputum culture x 3 + AFB Lowenstein-jensen agar PCR, fluid and tissue samples Latent: PPD test
PPD test	Positive with current, past infection or BCG vaccine, non-TB mycobacterium infection INFy release assay more sensitive- quantiferon gold, T-spot	False negative: immunosuppressed, AIDS, wrong test An induration of 5 or more millimeters is considered positive in: HIV-infected persons A recent contact of a person with TB disease Persons with fibrotic changes on chest radiograph consistent with prior TB Patients with organ transplants Persons who are immunosuppressed for other reasons (e.g. taking the equivalent of > 15 mg/day of prednisone for 1 month or longer, taking TNF-a antagonists) An induration of 10 or more millimeters is considered positive in: Recent immigrants (< 5 years) from high-prevalence countries Injection drug users Residents and employees of high-risk congregate settings Mycobacteriology laboratory personnel Persons with clinical conditions that place them at high risk Children < 4 years of age Infants, children, and adolescents exposed to adults in high risk categories
MAC	TB in AIDS Tx: azithromycin	

Leprosy		tuberculoid= Th1, low bacterial load - IL2, IFNy, IL12 - Hypopigmented lesions, loss of sensation lepromatous= Th2, high bacterial load - Disseminated, AFB in tissues - IL4, 5, 10 - Nodular, coalescing lesions - Leonine facies
Dapsone	Hansen's disease, pneumocystis jiroveci	G6PD hemolysis
G6PD	Spleen purges Nasty Inclusions from damaged cells Sulfonamides, primaquine, nitrofurantoin, Isoniazid, fava beans, dapson, chloroquine Pentose phosphate pathway	PABA analog (sulfonamides) 
Methemoglobin	Methylene blue, Vit C	
Ehrlichiosis	Monocytes mulberry inclusion Lone star tick	
Anaplasma	Ixodes scapularis tick. Granulocytes with morulae	Maine. Tx. doxycycline

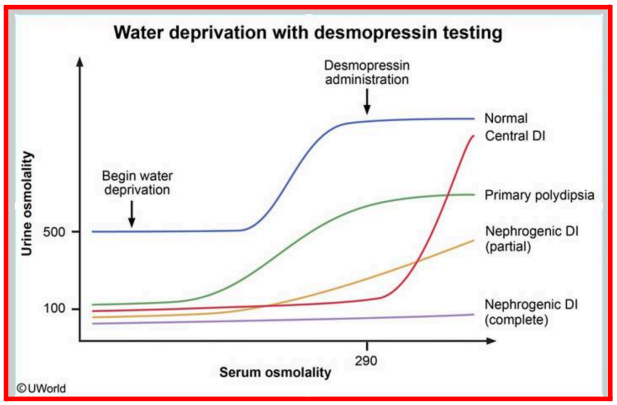
Chlamydia	Types A-C= trachoma **Types D-K**= PID, STD, everything else. Staccato cough in kids Types L1-3= lymphogranuloma venereum, proctitis	Reticulate body= replicate in cell by fission Elementary body = infectious 
Mycoplasma pneumonia	Common cause of pneumonia. Atypical. Walking pneumonia. Interstitial infiltrates, low-grade fever. Cold agglutinins IgM	Tx: macrolides, doxycycline, fluoroquinolones
Q fever	Coxiella pasteurella	
Narcolepsy	Treatment modafinil, orexin antagonist. stimulants	
Tumor suppressors	Loss of function, 2 hit hypothesis. BRCA, APC, TP53, RB, WT1, VHL	
Relative risk	> 1 increased risk, < 1 decreased risk	95%= p value < 0.05
Metyrapone stimulation test	HPA axis integrity. Blocks cortisol synthesis by inhibiting 11-Hydroxylase in zona fasciculata. Causes increased ACTH secretion.	Decrease cortisol synthesis, increase ACTH
Lateral epicondylitis	Tennis elbow- altered wrist extension	Medial epicondylitis: golf, overuse of wrist flexors
PVT	Paroxysmal supraventricular tachycardia= episodic arrhythmia **at or above the AV node**. AV nodal reentrant tachycardia in young. Slow and fast pathway, short RP.	Narrow QRS, no P waves
Major depressive disorder	> 2 weeks and > 5 symptoms SIGECAPS	
MecA gene	PBP 2a low affinity for beta-lactams esp in the presence of **oxacillin, methicillin, cephalosporins...resistant to most beta-lactam medications** ● Vancomycin inhibits integration of peptidoglycan subunits	MRSA needs a non-beta lactam drug

1st pharyngeal arch	Muscles: M & T, nerves: V2, V3	
adenosine	K+ efflux, hyperpolarization. Stops heart for 15 seconds.	Impending sense of doom
FOXP3	IPEC syndrome: autoimmune syndromes. Male infant with diabetes, eczema, high immunoglobulin and autoimmunity	Treg dysfunction 
T cell cytokines	Th1: IL-2, IFNy Th2: IL-4, 5, 6, IL-10	IL-10 inhibits Th1 IFNy inhibits Th2
B cell markers	CD19, 20, 21, IgM, IgD MHC II, B7, CD40	T cell: TCR, CD3, CD4/ 8, CD40L, CD28
RAG proteins	Recognize V, D, J dna sequences, rearrangement	
Activates Gs	Vibrio cholera, ETEC heat labile toxin	
Bacterial adenylate cyclase	Bacillus anthracis (no G protein)	
Live attenuated vaccines	Attention! Please vaccinate young infants with MMR Regularly. Polio, varicella, yellow fever, intranasal influence, measles, mumps, rubella, rotavirus CELLULAR and HUMORAL response	Avoid in immunocompromised HIV if CD4 > 200 can get vaccine
Inactivated / Killed vaccines	IM influenza, hep A, rabies, injected Polio HUMORAL immunity	Egg based: influenza, yellow fever, MMR
AL amyloidosis	Multiple myeloma	
AA amyloidosis	Inflammatory disease, RA - Native proteins (chronic inflammation) → amorphous pink material, apple-green birefringence → proteinuria	Congo red stain, apple green birefringence. Pink eosinophilic plaques in tissue
Calcitonin	Medullary thyroid CA	
APP	Beta amyloid, alzheimer	
B2 microglobulin	Dialysis associated	

Pyloric stenosis	Loss of H+ → **metabolic alkalosis , hypochloremic** (vomit it up) H/K: **hypokalemia** out of serum Retention of HCO3 → high Hypoventilation → increased CO2	Pylorus hypertrophied, olive mass in young male, slow peristaltic wave Projectile vomiting, nonbilious 2-6 weeks. Most common in 1st born males.
Multiple sclerosis	**Interferon-beta** is immunomodulator, causes flu-like symptoms, symptomatic treatment based on neurologic deficit. Oligodendrocytes, white matter. **Charcot triad**: scanning speech, intention tremor, nystagmus Internuclear ophthalmoplegia - Abducting eye has nystagmus, adducting eye cannot adduct, normal convergence Spastic bladder due to UMN lesion in spinal cord (loss of descending inhibitor control)--> hypertonia, low volume	JAK=STATE CSF shows oligoclonal bands, periventricular and perivenular plaques white matter lesions , **demyelinating plaques** 
Guillain barre	**Campylobacter jejuni**. Ascending motor weakness (sensory spared). Tx: plasmapheresis	
N3 sleep	Bedwetting, sleep walking, night terrors Delta	REM= NightMares Beta waves
Blots	Northern: mRNA Western: protein Southern: DNA Southwestern: DNA binding proteins, oligonucleotide	
FISH and karyotype	FISH: deletions / additions in DNA Karyotype: large chromosome abnormalities	Restriction fragment length polymorphisms: single nucleotide changes in DNA
Primary hyperaldosteronism	High ANP, high Aldosterone ANP maintains serum Na via “sodium escape” Hypokalemia, no edema, hypermagnesemia, metabolic alkalosis	Decrease K and H reabsorption Low Renin, Low AgII
SMA	Vitelline arteries SMA syndrome can occur with spinal surgery	
Sirolimus	Binds and inhibits mTOR, inhibits T cell proliferation in response to IL2	
MPGN	Tram tracks, mesangial proliferation on LM. Type I: Hep B, Hep C Type 2: C3 nephritic factor	

	Type 3: C3, C4 subepithelial deposits	
ABSENCE Seizures	Petite mal. Space out. Tx: ethosuximide, blocks T type Calcium channels. SJS can occur	SJS: carbamazepine, lamotrigine, phenobarbital, ethosuximide, allopurinol, sulfa, penicillin, oncology drugs, oxicam NSAIDS
Medicare	**A= hospital stays, nursing facilities, hospice** **B= fees, outpatient, supplies, testing** C= bundling of ABD and private health insurance D= drugs	HMO keeps costs LOW
Thiazolidinediones TZD	Decreases insulin resistance/ increasing insulin sensitivity via PPAR-y Increased fat mass, increased fatty acid oxidation, increased FFA into fat cells	Upregulates GLUT4 Increased adiponectin (insulin response cytokine for adipocytes, stimulates fatty acid oxidation
Fibrates	Binds PPAR-alpha to lower TRIG Tx of hypertriglyceridemia. Enhances lipoprotein lipases, hydrolysis of VLDL, fatty acid uptake, increases conversion into trigs.	Mutation in PPAR leads to metabolic syndrome
Diabetes drugs that cause weight loss	GLP-1 (exenatide), SGLT2 inhibitors (flozin), Metformin (Biguanide) Diabetic gastroparesis: tx with macrolide to antagonize motilin receptor	Weight gain with insulin, sulfonylureas, meglitinides, glitazones
Familial dysbetalipoproteinemia (type 3)	Xanthomas, CAD, PVD, AR ApoE3, E4 (chylomicrons, VLDLs)	Palmar xanthomas, premature atherosclerosis
Familial hypercholesterolemia (2A)	**B100 and LDL receptor**	**Early onset atherosclerosis, corneal arcus, CAD, tendon xanthomas**
Familial chylomicronemia	AR defective lipoprotein lipase with increased synthesis of chylomicrons. **ApoC2** deficiency	Acute **pancreatitis**, mily lipemia retinalis, creamy supernatant
Familial abetalipoproteinemia	AR, **B48 defect** ⇒ **fat malabsorption,** failure to thrive, ADEK deficiency . acanthocytes	Steatorrhea, malabsorption, failure to thrive, ataxia
Familial hyperlipidemia type 1	**Lipoprotein lipase deficiency** - hyperlipidemia of high triglycerides	Pancreatitis and **eruptive xanthomas**
C3 deficiency	Encapsulated microbial infections , RTI, pyogenic sinus infections. Type III HS, glomerulonephritis from Ag;Ab complexes	
C1 esterase inhibitor	Hereditary angioedema: swelling of face and tongue Quincke's edema, airway obstruction. Bradykinin, allergy, drug response.	Vs. anaphylaxis is type 1 hypersensitivity with multiorgan failure, urticaria and angioedema

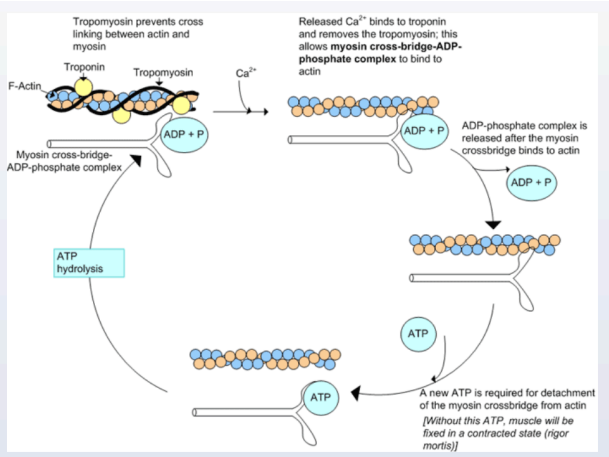
C5b-9	No MAC. increase neisseria infections	
PNH	Paroxysmal nocturnal hemoglobinuria: dark urine in morning. At night complement activation due to no DAF? CD55 or CD59.	Hemosiderinuria, decrease haptoglobin, dark urine
Eosinophilia	CANADA-P Collagen vascular disease/ polyarteritis nodosa + churg strauss; Atopic disease; neoplasm (CML); Adrenal insufficiency; Drugs (NSAID, penicillin, cephalosporins); acute interstitial nephritis, parasites	Wiskott aldrich has elevated IgE
cytokines	**Hot T-bone stEAk"** IL1= fever, 2= T cells, 3= bone, 4= IgE, IgG, IL-5= IgA	
Th1	IL-2, IL-3, IFNy (macrophages)	Th2: Il3, 4, 5, 10
Accumulation effect	Exposure to a risk factor or risk reducer over prolonged periods before clinical effect is detected	
Lead-time bias	Study compares disease survival and erroneously concludes that earlier detection prolongs survival	
Type I vs Type 2 muscle fibers	1: One Slow Red Ox Mitochondria & Myoglobin (endurance) 2: Two fast white sugar (fatigue	
Insulin	Fed state → glycolysis → + PFK2 to form F2,6BP ⇒ + PFK1 → F16BP Inhibits gluconeogenesis and glycogenolysis Activated glycogen synthase	PFK1 is rate-limiting step in glycolysis Most potent stimulator of F2,6BP
Lac operon	CAP → promoter → operator LacZ: enzyme B-glucosidase, LacY: Lactose abs LacA **TATA box is upstream the promoter region→ unwinding DNA into 2 strands**	High glucose: no lactose, no transcription→ repressor bound to operator Lactose present: lactose binds repressor, releases it from operator → Lac genes transcribed
Vertebral artery	Left, branches from subclavian artery Right branches from brachiocephalic	
Interferons	Alpha and beta= secreted from human cells, suppresses viral replication and stops protein synthesis. gamma= secreted by T cells and NK cells, Th1 differentiation, MHC II, macrophage	
Nephrogenic diabetes insipidus	V2 mutation. No change in urine osmolality with water deprivation or desmopressin administration	Tx: diuretics (HCTZ), **amiloride** (lithium induced, blocks Enac)), water and salt restriction

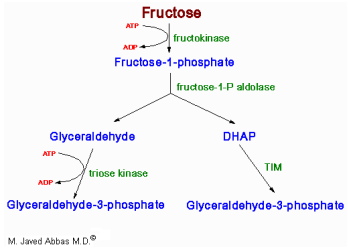
		
Diabetic neuropathy	Pain management: gabapentin, TCA<, duloxetine, capsaicin Sodium channels, blocked NMDA receptors, alter pain signal SNRIs alter central transmission of pain by increasing NE in central synapses	
Cyanosis that does not improve with O2	SHUNT	
Immunosuppressants	Cyclosporine, tacrolimus: IL-2 inhibitors via calcineurin Sirolimus: mTOR inhibitor, IL-2 decreased Azathioprine: 6-mercaptopurine, BM suppression Mycophenolate: IMP dehydrogenase, inhibits guanine	
Bruton agammaglobulinemia	TRK B cell def, X-linked, Bacterial infections in infant	
SCID	ADA deficiency. Severe infections, fatal viral infections, PCP; chronic diarrhea, failure to thrive. No thymic shadow ~ Digeorge.	
Ataxia telangiectasia	IgA deficiency and T cell deficiency, sinus and lung infections. Ataxia, Telangiectasia, Tracking eye difficulties, Sensitive to X Ray. high risk of lymphoma and ALL, high AFP (ATAXIA)	High AFP after birth.
Wiskott-Aldrich syndrome	WAITER: WA, immunodeficiency, small thrombocytopenia, eczema, pyogenic infections X-linked. High IgA	
CGD	X-linked, low NADPH oxidase Staph aureus and aspergillus	Decreased respiratory burst
Chediak higashi	LYST gene defect. Large Cytoplasmic granules. Silver hair, recurrent infections, neurologic	PAIN; partial albinism, infection, neuro disorders

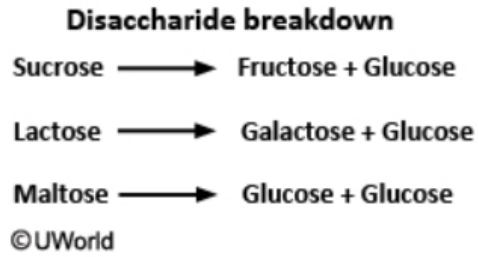
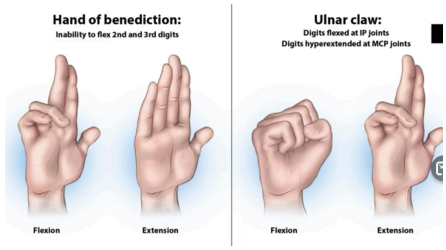
<table>
<tr><td>Hyper IgE syndrome (job)</td><td>Mutation in STAT3 → Th17 impaired, poor PMN recruitment
Eczema, cold abscesses, coarse facial features.
2 rows of teeth on top and bottom.</td><td>High IgE and eos</td></tr>
<tr><td>Sturge-weber syndrome</td><td>Port-wine stain, V1, V2, somatic mocaism of GNAQ gene → glaucoma, seizures, hemiparesis, intellectual disability, capillary neoplasm</td><td></td></tr>
<tr><td>Trigeminal neuralgia</td><td>Tic douloureux. V3 trigeminal hyperalgesia</td><td>Carbamazepine, phenytoin, gabapentin, topiramate (inducers, decrease OCP)</td></tr>
<tr><td>Sodium blocking seizure Rx</td><td>phenytoin , carbamazepine, lamotrigine, topiramate, valproic acid</td><td>Decreased neuron action potential</td></tr>
<tr><td>Increase GABA seizure Rx</td><td>Gabapentin, phenobarbital, valproic acid, benzos</td><td>Decreased neuron excitability</td></tr>
<tr><td>T-type calcium channel blockers seizure Rx</td><td>Gabapentin, ethosuximide (thalamic), phenytoin (high dose)</td><td></td></tr>
<tr><td>Phenytoin</td><td>Phenytoin Has Given MDS frustration: peripheral neuropathy, Hirsutism, gingival hyperplasia, megaloblastic anemia (low folate abs), drug-induced lupus , SJS, fetal hydantoin syndrome</td><td>Fetal hydantoin syndrome: cleft lip, congenital heart disease, intellectual disability. Midfacial underdevelopment, hypoplasia.
Valproic acid: neural tube defects</td></tr>
<tr><td>Teratogenic seizure meds</td><td>Phenytoin, carbamazepine, valproic acid (NTD)</td><td><table><tr><th colspan="2">Teratogenic medications</th></tr><tr><th>Drug</th><th>Adverse effects</th></tr><tr><td>Phenytoin</td><td>Neural tube defects, microcephaly, orofacial clefts, dysmorphic facial features, distal digit/nail hypoplasia</td></tr><tr><td>Lithium</td><td>Ebstein anomaly, nephrogenic diabetes insipidus, hypothyroidism</td></tr><tr><td>Valproate</td><td>Neural tube defects</td></tr><tr><td>Isotretinoin</td><td>Microcephaly, thymic hypoplasia, small ears, hydrocephalus</td></tr><tr><td>Methotrexate</td><td>Limb & craniofacial abnormalities, neural tube defects, abortion</td></tr><tr><td>ACE inhibitors</td><td>Renal dysgenesis, oligohydramnios</td></tr><tr><td>Warfarin</td><td>Nasal hypoplasia, stippled epiphysis</td></tr></table></td></tr>
<tr><td>SJS syndrome causing drugs</td><td>Steve Jobs made APPLE PCs: allopurinol, phenytoin, phenobarbital, lamotrigine, ethosuximide, penicillin, carbamazepine, sulfonamide</td><td></td></tr>
<tr><td>Drugs that cause Agranulocytosis</td><td>Carbamazepine, clozapine, colchicine, PTU and methimazole</td><td></td></tr>
</table>

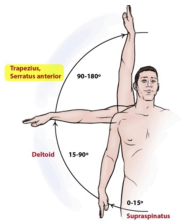
Hepatotoxic antiepileptics	Valproic acid, carbamazepine	
Status epilepticus	Tx: benzo #1, phenytoin #2	
Seizures in missionary	Neurocysticercosis - Nonenhancing cysts - Degenerating cysts - Nonviable cysts that are calcified	
Anterior horn cell	Polio, Lou gerhig, West nile, werdnig-hoffman disease Spinal muscular atrophy: AR, infant flaccid paralysis	LMN signs: atrophy, fasciculations, weakness, flaccid paralysis
ALS	Lou Gehrig disease (ALS): anterior and lateral = UMN and LMN disease. Respiratory failure: muscle weakness, decreased vital capacity, ineffective clearance/ cough. Bulbar muscle weakness.	Riluzole decrease glutamate
Ventricular fibrillation and tachycardia	PCR and cardioversion	
Tremor	Resting: occurs at rest Intention: occurs with movement, cerebellar Essential: all the time	Tx with beta blocker Some self medicate with alcohol
Hemiballismus	Lesion to subthalamic nuclei	
Parkinson's disease	Hypokinesia, bradykinesia, akinesia Postural instability, shuffling gait, pill-rolling tremor, cogwheel rigidity, mask-like facies. Lewy body, alpha synuclein. Tx: BALSA Levodopa + carbidopa → crosses BBB Selegiline (MAO-B inhibitor) TOlcapone (COMT inhibitor) Amantadine (increase DOPA release) Bromocriptine (dopamine agonist) Antimuscarinics (benztropine)	SNPC MPTP → MPP → destroys Dopamine cells in SNPC Deep brain stimulation
Basal ganglia	GPi: inhibits movement Subthalamic nucleus: inhibits movement Substantia nigra pars compacta: movement increased	
Bladder exstrophy	Bladder, ventral urethra (epispadias), genitalia through abdominal wall	Cloacal exstrophy is bladder extrosphy + GI herniation , more severe abnormalities of pelvis
Glycogen storage disease	1. Von Gierke: G6P mutation ⇒ hypoglycemia, lactic acidemia, hyperTrig, hyperuricemia, hepatomegaly. Seizures, jewish. 2. **Pompe**: alpha 1,4 glucosidase→ hypotonia,	

	cardiomyopathy. Failure to thrive. **<u>Lysosomal</u>** glycogen breakdown defect. 3. Cori disease: amylo 1,6 glucosidase. Mild hypoglycemia,failure to thrive, hepatomegaly.	
Adenovirus	**dsDNA, non enveloped=** swimming pool conjunctivitis	Self-limited upper respiratory infection
HSV	**dsDNA, enveloped** Tx of primary infection: week long course of acyclovir Tx to prevent recurrence: daily valacylovir	Vesicular lesions HSV gingivostomatitis
Rotavirus	dsRNA segment, non-enveloped	Vaccine-preventable. Profuse, watery diarrhea
Reovirus	dsRNA segmented= daycares, watery diarrhea	
parvovirus	ssDNA, non-enveloped= 5th disease	
Paramyxoviridae	parainfluenza/ croup, RSV, measles, mumps ssRNA, non segmented, enveloped	
Picornavirus, calicivirus	HAV, Norovirus SsRNA, non-enveloped	
Thyroid storm	Acute onset of hyperthyroidism in setting of illness, stress, iodine contrast, thyroid surgery	
Crush injury	Hyperkalemia from cells, rhabdomyolysis. Tx: calcium gluconate (cardioprotective), insulin and dextrose (K uptake into cells, prevent hypoglycemia), albuterol (K into cell), HCO_3,	Peaked T waves → wide QRS, no P wave → sinusoidal EKG, ventricular fibrillation (pulseless)
Ivabradine	CHF management. Inhibits funny channels in SA node, used if patient has sinus rhythm	
Staph infections	Most common cause of osteomyelitis, scalded skin syndrome	
Strep infections	Most common cause of meningitis Post-strep glomerulonephritis **Serious newborn infections GBS, pneumonia** Rheumatic fever	GBS: intrapartum penicillin
Sarcomere	H zone and I bands decrease with contraction A band= constant dark region	Dihydropyridine receptor and Ryanodine receptor open SER in depolarization 1a afferent from muscle spindle → alpha motor neuron → muscle contraction 1b afferent → Golgi tendon organ → inhibits muscle contraction Ca binds troponin, moves tropmyosin → myosin-ADP cross-bridge → ADP removes

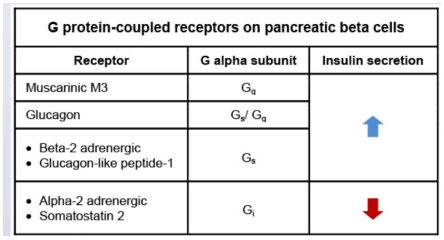
		New ATP binds to myosin, detaching myosin from actin. ATP resets myosin.
Muscle relaxants	Baclofen: GABAb in spinal cord, Back Cyclobenzaprine: CNS acting, sedating ~ TCA Metaxalone: CNS depression Carisoprodol: addictive, abused	
Cleft lip/ palate	Cleft lip: 1st palate, failed fusion of maxillary and merged medial nasal processes Cleft palate: 2nd palate, failed fusion of 2 medial nasal prominences	Holoprosencephaly: failure of medial Nasal prominence to fuse and form the intermaxillary segment. FIELD defect (one disturbance leads to multiple deformations)
HLA	HLA genes are clustered on a single chromosome. 2 HLA haplotypes inherited from parents. Mendelian genetics: ¼ same, ½ 50% identical, ¼ mismatch.	
Eating disorder	Bulimia nervosa: binge + compensatory inappropriate behavior, xs worrying about body (purge, starving) Binge-eating disorder: binge eating, no compensatory). Lack of control in eating!	Anorexia: CBT, nutrition, olanzapine. Bulimia: SSRI, CBT, nutrition. **NO bupropion** due to seizure. Binge-eating: amphetamine

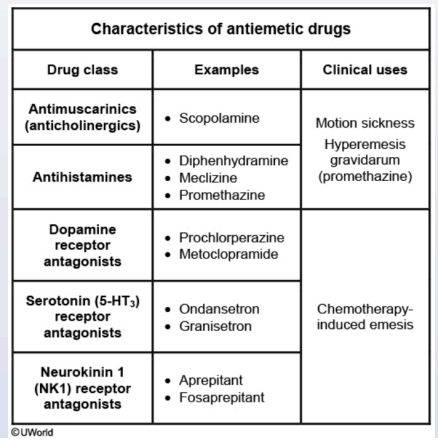
	Eating disorders **Diagnosis** / **Clinical features** / **Treatment** **Anorexia nervosa**: • **BMI <18.5 kg/m^2** • Intense fear of weight gain • Distorted views of body weight & shape / • Cognitive-behavioral therapy • Nutritional rehabilitation • **Olanzapine** if no response to above **Bulimia nervosa**: • Recurrent episodes of binge eating • Binge eating & **inappropriate compensatory behavior** to prevent weight gain • Excess worrying about body shape & weight / • Cognitive-behavioral therapy • Nutritional rehabilitation • **SSRI (fluoxetine)**, often in combination with above **Binge-eating disorder**: • Recurrent episodes of binge eating • **No inappropriate compensatory behaviors** • Lack of control during eating / • Cognitive-behavioral therapy • Behavioral weight loss therapy • SSRI • Lisdexamfetamine	
Fructose / sucrose metabolism	Fruits are Filled with Fructose. They are God Damn Guicy  Dont eat sucrose	Fructokinase deficiency: benign. High reducing sugars, fructosuria/ emia. + copper reducing test. → hexokinase takes over. **Aldolase B**: high F1P (toxic), hypoglycemia if you eat juice, honey, fruit. “Here you are Fruct Int-irely”

		
Enterococcus	Hypertonic 6.5% saline and bile	
Radial nerve	BEEST: brachioradialis, Extensors, supinator, Triceps Arm and forearm extension Posterior arm and dorsum of hand	EXTENDS C7 Saturday night palsy, wrist drop
Ulnar nerve - Klumpke's palsy	Wrist flexors, **hypothenar**, **3-4 interosseous, addUctor pollic**is Sensory to medial hand Fine motor hand movements Gunyon canal: distal ulnar nerve entrapment	Ulnar claw (4-5 fingers chronically flexed) - Cannot ABduct or ADDuct digits Peripheral neuropathy at posterior medial epicondyle- loss of sensation 4-5 digits AP (cubital tunnel syndrome)
Median nerve	Pronators, flexors of forearm, **thumb flexion** **Lateral 1-2 lumbricals, thenar muscles** Lateral palm and 3 digits **Opponens pollicis, Abductor pollicis brevis, flexor pollicis brevis** 	Ape hand (cannot abduct thumb) Hand of benediction - cannot flex 2-3 digits Carpal tunnel syndrome (flexor retinaculum) - worst at night or working
Musculocutaneous	Brachialis, biceps. Flex forearm, supination. Lateral forearm sensation	
Axillary nerve	Deloid, teres minor, axillary nerve, LH of triceps	Surgical neck fracture

<table>
<tr><td></td><td>
</td><td>Posterior circumflex</td></tr>
<tr><td>Long thoracic</td><td>Serratus anterior. Winged scapula. C5-7</td><td></td></tr>
<tr><td>Superior gluteal nerve</td><td>Hip abduction. Gluteus minimus, mediius, and tensor fascia lata</td><td>Trendelenburg. Hip drops on contralateral side,</td></tr>
<tr><td>Sciatic nerve</td><td>Branches to tibial + common fibular and
Tibial: plantar flexion
Tibialis posterior: inversion of foot
Sural nerve: calve sensation
Common fibular nerve (fibular head): dorsiflexion and eversion → foot drop
Deep fibular nerve: tibialis anterior, dorsiflexion</td><td>Spinal stenosis, spondylolisthesis</td></tr>
<tr><td>Bilateral bells palsy</td><td>Guillain barre, lyme disease</td><td>Unilateral: stroke, sarcoidosis</td></tr>
<tr><td></td><td colspan="2"><table>
<tr><th>Class</th><th>Example</th><th>↑ Insulin secretion</th><th>↑ Insulin sensitivity</th><th>↓ Glucose production</th><th>↓ Glucose absorption</th><th>Weight</th><th>Hypoglycemia</th></tr>
<tr><td>Insulin</td><td>Insulin</td><td></td><td></td><td></td><td></td><td>↑</td><td>++</td></tr>
<tr><td>Sulfonylureas</td><td>Glyburide</td><td>++</td><td>+</td><td>+</td><td></td><td>↑</td><td>++</td></tr>
<tr><td>Meglitinides</td><td>Nateglinide</td><td>++</td><td>+</td><td>+</td><td></td><td>↑</td><td>++</td></tr>
<tr><td>Biguanides</td><td>Metformin</td><td></td><td>+</td><td>++</td><td></td><td></td><td>None</td></tr>
<tr><td>Glitazones (thiazolidinediones)</td><td>Pioglitazone</td><td></td><td>++</td><td>+/-</td><td></td><td>↑↓</td><td>+</td></tr>
<tr><td>α-glucosidase inhibitors</td><td>Acarbose</td><td></td><td></td><td></td><td>++</td><td></td><td>None</td></tr>
<tr><td>GLP-1 mimetics (incretin mimetics)</td><td>Exenatide</td><td>++</td><td></td><td>+</td><td></td><td>↓</td><td>+</td></tr>
<tr><td>Amylin analog</td><td>Pramlintide</td><td>+</td><td></td><td>+</td><td></td><td></td><td>+</td></tr>
</table></td></tr>
<tr><td>T1DM insulin</td><td>Rapid insulins do not LAG
Regular and short
Intermediate is not particularly Hasty (nph)
God Damn 24 hours is a long time</td><td></td></tr>
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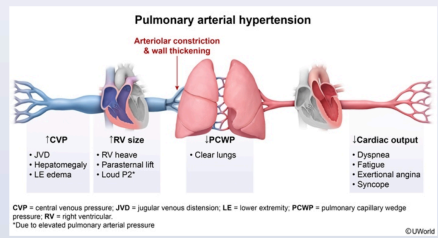
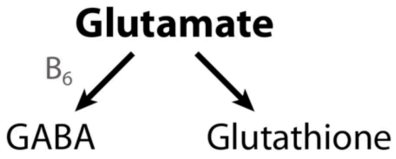
<table>
<tr><td>Metformin</td><td>Lactic acidosis in renal insufficiency, B12 deficiency
METabolic acidosis
Decreases liver gluconeogenesis
<table><tr><th colspan="2">Metformin</th></tr><tr><td>Mechanism of action</td><td>• Inhibits mitochondrial glycerophosphate dehydrogenase & complex I
• Upregulates AMP-activated protein kinase</td></tr><tr><td>Metabolic effects</td><td>• ↓ Hepatic glucose production
• ↓ Intestinal glucose absorption
• ↑ Peripheral glucose uptake/utilization
• ↓ Lipogenesis</td></tr><tr><td>Pharmacokinetics</td><td>• Renal clearance
• No significant metabolites</td></tr><tr><td>Adverse effects</td><td>• Diarrhea
• Lactic acidosis
• Vitamin B_{12} deficiency</td></tr><tr><td>Precautions/ contraindications</td><td>• Renal insufficiency (check serum creatinine)
• Hepatic insufficiency
• Congestive heart failure</td></tr></table></td><td>Weight loss
Lactic acidosis is RARE
1st line treatment
Avoid in renal disease- obtain serum creatinine before therapy initiation</td></tr>
<tr><td>Sulfonylureas
- Glyburide
- Glimepiride
- Glipizide</td><td>Depolarizes the Beta cell by closing K+ channel independent of insulin intake.
“IDE” take your sulfonylureas
Long duration of action, high incidence of hypoglycemia</td><td>Weight gain and sulfa reactions (less with 2nd gen)</td></tr>
<tr><td>DPP4 inhibitors
- Gliptin</td><td>Potentiate GLP1 (insulin release and decrease glucagon), increase glucose-dependent insulin release
Less DDP4, more promotion of GLP1
“Liptin makes you PP4 more times”</td><td>UTI and RTI
Best used in patients with organ failure</td></tr>
<tr><td>GLP1 agonist
- Tide</td><td>Increase insulin release, lowers glucose
Suppresses glucagon secretion, delays gastric emptying
Reduces apoptosis of human islets
GULP tide pods
Injectable</td><td>PANCREATITIS</td></tr>
<tr><td>SGLT2 inhibitors</td><td>Acts in kidneys to increase glucose excretion
FLOWzin in the Urine</td><td>UTI, yeast infections, glucosuria
Avoid in patients with renal failure</td></tr>
<tr><td>Thiazolidinediones
- Glitazone</td><td>PPAR-gamma nuclear factor, increase insulin SENSITIVITY
Bring GLITTA to the PPAR-ty</td><td>Heart failure, risk of fracture</td></tr>
</table>

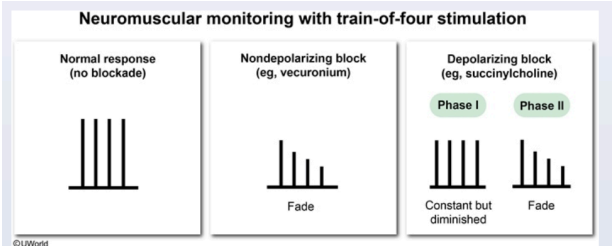
Insulin secretion	**PNS: M3 increases insulin secretion** **SNS:** - B2= increases insulin secretion - **a2= inhibits insulin secretion (epinephrine)**	
Angle closure glaucoma	Narrowed angle of anterior chamber. Emergency! Eye pain, colored halos, rainbows, tunnel vision. Red, teary, angry. HARD eye	Laser iridotomy Eye drops: timolol, apraclonidine (**alpha**, beta agonists) , diuretics = acetazolamide, mannitol, pilocarpine (**cholinergic** agonist) #1 PGf2a, B blockers, a-agonist
Open angle glaucoma	Common, bilateral,. Asymptomatic, elevated IOP → blindness	Tonometry, Cup: disc ratio. 1:2 ratio Ciliary bodies high in Beta receptors
Cataracts	Bilateral. Painless decrease in vision, driving at night/ glare, near-sightedness	Diabetes: sorbitol build up, oversaturates the polyol pathway Glucose → Sorbitol → fructose
Eye medications	Miosis: pilocarpine, cholinergic agonists, convex lens, ciliary muscle contraction. Aqueous humor/ ciliary body:decreased by timolol and nonselective beta blockers, acetazolamide Decreased IOP: PGF2a (latanoprost)	
Cherry red spot on retina	Central retinal artery occlusion Tay-sachs, Niemann-Pick disease, lysosomal storage dz	
FEF and PPRF lesions	Frontal eye fields: lesion deviates toward lesion PPRF: eyes deviate away from lesion Superior colliculus: upward gaze (parinaud)	Scanning eye movements
Emphysema	Hypoxemia, high CO2, retain HCO3 to balance Chronic respiratory acidosis with metabolic alkalosis	

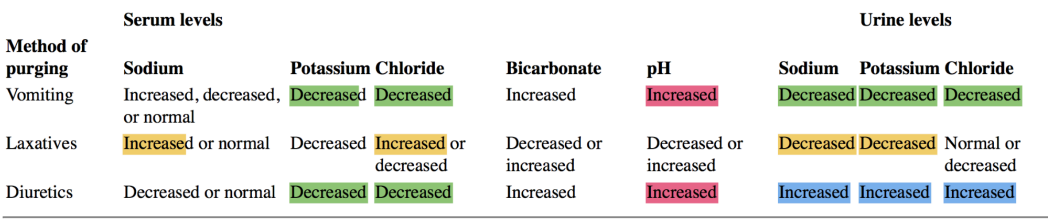
Nausea 5HT3	GI upset → serotonin release on vagal and spinal afferent nerves. Odansetron antagonizes 5TH3 Chemotherapy induced emesis: - Dopamine antagonists - 5HT3 antagonists (ondansetron) - Neurokinin 1 receptor antagonists (aprepitant) - Prevents substance P release	
Portal hypertension	Congestion of liver and spleen Varices, cough ground blood Serum-ascites albumin gradient: serum - ascites albumin. > 1.1= portal hypertension < 1.1= cancer, nephrotic Left gastric and azygous: esophageal varices Paraumbilical and superficial epigastric= caput medusa Superior rectal and inferior rectal= rectal varices	Varices bleeding tx: Somatostatin and octreotide inhibit glucagon and VIP that induce splanchnic vasodilation , reduce portal blood flow. Tx: diuretic, Beta blocker, Vit K, lactulose
Carotid massage **- Carotid sinus sense pressure**	Massage baroreceptors in carotid, which sense high pressure → INCREASE firing -> **increase AV refractory period,** Decrease SA node firing. Stimulates parasympathetic CNX. Cushing's reflex (increase ICP): elevated BP, reflex bradycardia, respiratory depression	Decreases HR/ bradycardia Carotid sinus: solitary nucleus CN IX Aortic arch: solitary nucleus CNX **Peripheral chemoreceptors (carotid BODY): hypoxia, hypercapnia, acidosis.** Central chemoreceptors: CO2, pH.
Tracheoesophageal fistula	Primitive foregut failure to separate trachea and esophagus. Polyhydramnios. Baby that coughs, drools and gets cyanosis with feeding	Stomach bubble, cannot pass nasogastric tube
Sepsis	Fever, tachycardia, tachypnea, leukocytosis + source of infection	Lactic acidosis: shunting pyruvate to lactate
Spinal stenosis	Degenerative spine- osteophytes, thickened ligamentum flavum, disc herniation → numbness, paresthesias, weakness	
Pulmonary embolism	Increased dead space ventilation, V/Q mismatch, hypoxemia	Mechanical ventilation: Low tidal volume, high RR
DNA replication	5 → 3 direction Leading strand: continuous	**DNA polymerase 3: 3-5 exonuclease proofreading on both strands, 5-3'**

<table>
<tr><td></td><td>Lagging strand: discontinuous, okazaki fragments, RNA primers.
<table><tr><th colspan="2">Proteins & their function in prokaryotic DNA replication</th></tr><tr><td>Helicase</td><td>Unwinding of double helix</td></tr><tr><td>Topoisomerase II (DNA gyrase)</td><td>Removal of supercoils</td></tr><tr><td>Single-stranded DNA-binding protein</td><td>Stabilization of unwound template strands</td></tr><tr><td>Primase (RNA polymerase)</td><td>Synthesis of RNA primer</td></tr><tr><td>DNA polymerase III</td><td>5' to 3' DNA synthesis & 3' to 5' exonuclease ("proofreading") activity</td></tr><tr><td>DNA polymerase I</td><td>Same as DNA polymerase III
Also removes RNA primer (5' to 3' exonuclease activity) & replaces it with DNA</td></tr><tr><td>DNA ligase</td><td>Joining of Okazaki fragments (lagging strand)</td></tr></table>©UWorld</td><td>DNAsynthesis
5-3 exonuclease on both strands
DNA polymerase 1: same as DNA Pol III, also removes RNA primer 5-3’ exonuclease activity and replaces it with DNA</td></tr>
<tr><td>RED MAN SYNDROME</td><td>Vancomycin → nonallergic IgE mast cell activation at rapid infusion</td><td>Weber to affected ear.
Rinne: conductive B>A. Sensorineural A>B, weber localizes to normal ear.</td></tr>
<tr><td>Acute otitis media</td><td>Strep pneumonia, H flu, moraxella
Mastoiditis</td><td>AO externa/ swimmer's ear: pseudomonas, S. aureus</td></tr>
<tr><td>Meniere's disease</td><td>Endolymphatic hydrops. Imbalance due to fluid and electrolyte changes → intermittent vertiigo, tinnitus, hearing loss.</td><td></td></tr>
<tr><td>BPPV</td><td>Dislodged otoliths. Dx dix-hallpike maneuver, epley maneuver</td><td></td></tr>
<tr><td>Sleep</td><td>awake= Beta (open eyes) → alpha (closed eyes= relAx)
N1= theta, light
N2= spindles and K complex, BRUXISM (twooth)
N3= delta, sleep walk, night terrors (not AOx3), bedwetting
REM=alpha dreaming, Ach and NE, paralysis, erection. Beta waves. PPRF activity. Nightmares, Narcolepsy</td><td>N3 and REM decrease with age
Increased REM latency in age.
Benzos and Imipramine decrease N3

Depression: decreased N3, high REM, decreased REM latency
Narcolepsy: daytime sleepiness, cataplexy with laughing. Schedule naps, stimulants</td></tr>
<tr><td>Insomnia treatment</td><td>Melatonin, antihistamines, antidepressants, benzos.
Zolpidem, Zaleplon, Eszopiclone, Ramelteon
Orexin (narcolepsy)</td><td>Cholinergic side effects</td></tr>
<tr><td>Restless leg syndrome</td><td>Replace iron</td><td></td></tr>
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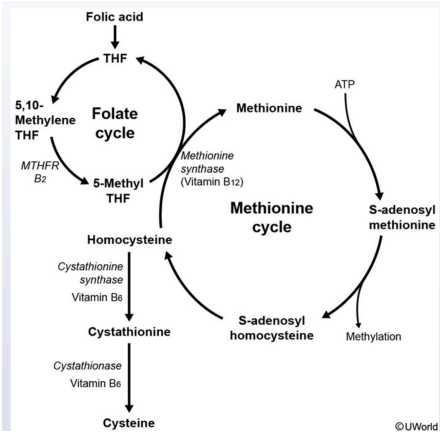
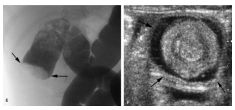
	Pramipexole, ropinirole, gabapentin	
Obstructive sleep apnea	Obese, depression, insulin resistance, pulmonary hypertension Increased risk of car crash. Polysomnography: > 5 OSA/ arousals per hour Pulmonary hypertension → arteriolosclerosis, medial hypertrophy, intimal fibrosis, plexiform fibrosis (**RVH**)= cor pulmonale - **Loud S2** **Remodeling of small/ medium arteries → endothelial dysfunction → increase vasoconstriction (endothelin, TXA2), decrease vasodilators and prostacyclin**	Snoring and breathing cessation. Tx: CPAP, weight loss 
Inhaled anesthetic	Cross BBB. lipophilic, low blood soluble⇒ more rapid onset NO: rapid induction, rapid recovery. **Halothane**: Big daddy! Slow induction, Hepatotoxicity Flurane: most used Isoflurane: slower induction, recovery **Propfol**: Fall asleep→ long-term sedation, highly lipophilic GABA agonist, hypotension/ **vasodilation** and increased Trigs and Lipase. **Etomidate**: GABA agonist, **hemodynamically neutral , inhibits cortisol synthesis/ adrenal suppression** **Ketamine**: NMDA antagonist, analgesic and anesthetic. Preserves respiratory drive. Best for asthmatics	potency= 1/ MAC Minimum alveolar concentration: dose to stop movement in 50% of people Hypotensive patients best given etomidate (hemodynamically neutral) and ketamine (improves hemodynamics) **Fulminant liver hepatitis ⇒ Shrunken Liver** - **Acute loss of coag factors ⇒ prolonged PTT** - **Elevated AST**
IV anesthetics	Induce unconsciousness, no analgesia **Propfol**: increase GABA, induction rapid and rapid recovery. High TRIG content (**pancreatitis**) **Ketamine**: **NMDA antagonist**. Analgesia, conscious sedation, induction. Dissociative anesthetic, hallucinations. Increase cerebral BF. Barbiturates: thiopental Benzos: midazolam	BEN likes it more frequently BARB likes it to last longer (BARS stay open)
Barbiturates	~ Benzos. Phenobarbital, thiopental GABA Cl channel increases duration of opening (CL goes in). Enzyme induction → crigler- najjar syndrome . Type 1 improves with phenobarbital Thiopental used to decrease brain flow, BRAIN surgery	Sedation, CNS depression, sluggish, ataxia, double vision 
Benzos	- PAM, LAM	EtOh withdrawal, seizures, insomnia,

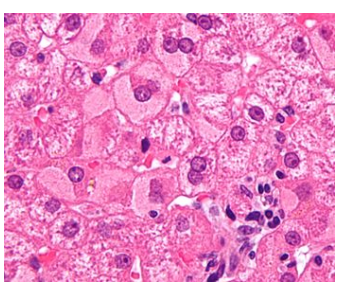
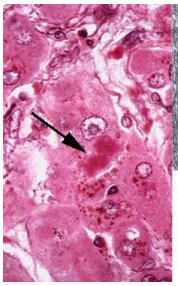
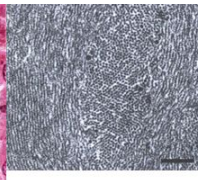
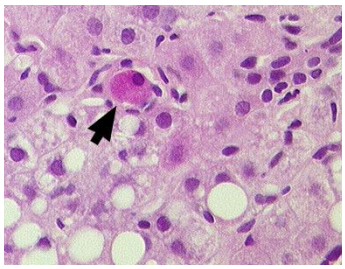
<table>
<tr><td></td><td>Midazolam: sedation, amnesia
Antidote: flumazenil (lowers seizure threshold)</td><td>decrease n3 sleep stage
Don't mix with barbs and EtOH</td></tr>
<tr><td>Opioids</td><td>Mu: B-endorphin
Delta: enkephalin
Kappa: dynorphin
fentanyl= no histamine release</td><td>Opioids can make you itchy</td></tr>
<tr><td>NMS blocking agents</td><td>Depolarizing: succinylcholine (Nicotinic antagonist, causes depolarization and fasciculations).
Non-depolarizing (~curare): Curium, onium
Competitive Nicotinic ACh receptor
Baclofen: GABAb, acts in spinal cord.
Dantrolene: acts of RYR receptors in SR and prevents release of calcium

</td><td>Respiratory suppression
Antidote: neostigmine
Succinylcholine: malignant hyperthermia in RYR1 gene mutation
Tx: dantrolene (prevents Ca release from SER)isom</td></tr>
<tr><td>Antidotes</td><td>Common toxidromes & antidotes
<table><tr><th>Drug class</th><th>Clinical features</th><th>Antidote</th></tr><tr><td>Anticholinergic agents</td><td>• Agitated delirium with sympathetic hyperactivity
• Mydriasis, dry skin/mucous membranes, urinary retention</td><td>• Physostigmine</td></tr><tr><td>Benzodiazepines (eg, lorazepam)</td><td>• Sedation with normal vital signs
• Slurred speech, ataxia</td><td>• Flumazenil</td></tr><tr><td>Opioids (eg, oxycodone)</td><td>• Sedation with respiratory suppression
• Miosis, decreased bowel sounds</td><td>• Naloxone</td></tr><tr><td>Serotonergic agents (eg, SSRIs/SNRIs, TCAs, MAOIs)</td><td>• Serotonin syndrome: altered mental status, mydriasis, sympathetic hyperactivity, hyperreflexia/clonus</td><td>• Cyproheptadine</td></tr></table></td><td></td></tr>
<tr><td>Local anesthetic</td><td>Lidocaine, procaine, cocaine- Na+ channel blockers.
Do not work in dead, infected tissue. Small diameter A-delta fibers more responsive (sensory fibers)</td><td>Local vasoconstrictor with epinephrine- lasts longer. Avoid in end-organs</td></tr>
<tr><td>ototoxicity</td><td>Loop diuretics (furosemide) < ethacrynic acid (EARS)</td><td>Use for CHF, edema, hypercalcemia, hyperkalemia, hypertension</td></tr>
</table>

Viral encephalitis	Flavivirus ssRNA: St. louis, west nile virus Togavirus ssRNA: western equine Arenavirus: Lassa fever Bunyaviridae: ssRNA circular= hantavirus, california, La crosse	West nile virus: birds, transmitted by mosquitoes. Asymptomatic, but can cause influenza like illness, neuroinvasive disease with meningitis, encephalitis, flaccid paralysis
Mercury poisoning	CNS and renal failure: tremor, gingivostomatitis, peripheral neuropathy, acrodynia, pneumonitis, acute ATN	Chelation: dimercaprol, penicillamine, succimer, unithiol
Anorexia nervosa	Low BMI, fear of becoming fat, distorted body image Osteoporosis, amenorrhea, hair loss, parotid hypertrophy (binge/ purge), bradycardia, arrhythmias	Low BMI, skeleton
	Electrolyte Levels Usually Associated with Purging 	
Bulimia nervosa	Recurrent binge eating, preoccupied with body image. Maintain body weight. No starvation	Normal BMI
Prostate cancer	Androgen antagonists: finasteride GnRH analog: Buserelin in continuous manner, down regulates GnRH → LH drop, trop testosteron. 17-alpha hydroxylase inhibitors (abiraterone) blocks androgen synthesis in adrenals	GnRH analogs temporarily activate GnRH receptors, surge in androgens. Bicalutamide is androgen receptor inhibitor
Filtration fraction	FF= GFR/ RPF GFR= U x V/ P (creatinine, inulin) RPF= U x V/ P (PAH)	
Malrotation of midgut	Herniates through umbilical rings 270 decrees. Volvulus, appendix in upper abdomen	
Abdominal wall defects	Ompalocele- has a peritoneum covering, amnion. Gastroschisis- extruding viscera, right lateral umbilicus.	
Gastric peptides	Parietal: gastric acid, Intrinsic factor Chief cells: pepsin Mucosal cells: bicarb + Prostaglandins	NSAIDS increase ulcers B12+ IF absorbed at terminal ileum, pernicious anemia.
Gastrin	G cells in antrum→ acid secretion, motility, gastric mucosa. Stimulated by phenylalanine, tryptophan, calcium	H2 blockers decrease PG inhibit gastric acid

	Serum levels					Urine levels		
Method of purging	**Sodium**	**Potassium**	**Chloride**	**Bicarbonate**	**pH**	**Sodium**	**Potassium**	**Chloride**
Vomiting	Increased, decreased, or normal	Decreased	Decreased	Increased	Increased	Decreased	Decreased	Decreased
Laxatives	Increased or normal	Decreased	Increased or decreased	Decreased or increased	Decreased or increased	Decreased	Decreased	Normal or decreased
Diuretics	Decreased or normal	Decreased	Decreased	Increased	Increased	Increased	Increased	Increased

	Vagus nerve stimulates parietal cells (suppressed by gastric acid), and G cells to make gastrin (GIP) Gastrin causes parietal cells to make more acid Gastrin stimulates ECL cells to secrete histamine Activate secretion: histamine, Ach, gastrin Inhibit: PG< secretin, GIP, somatostatin	Somatostatin decrease CCKb M3 - Atropine, antimuscarinics PG and somatostatin receptors
Parietal cells	H/K ATPase	PPIs inhibit
Brain abscess	Ring enhancing lesion = abscess - Bacteria infection from direct spread	toxoplasmosis= multiple brain enhancing lesions
Brain death	24 hours monitor, 2 different neuro exams. Remove from ventilator	Irreversible cause
Acidosis	Hyperkalemia - H/K moves K out of cells	alkalosis= hypokalemia - H/K moves K into cells
Xeroderma pigmentosum	Skin cancer in young. DNA nucleotide excision repair ENDONUCLEASE cannot remove **DNA pyrimidine dimers**	HNPCC/ lynch syndrome due to DNA MMR and microsatellite instability, 3-5 exonuclease proofreading dysfunction
Lynch syndrome	Young person with colon cancer, and numerous other cancer. Due to abnormal **DNA mismatch repair.** Due to MSH2 and MLH1 genes → MutS and MutL homologs	
Transient ischemic attack	< 24 hours symptoms, normal CT. Hyperlipidemia and antiplatelet tx	
Fatty acid synthesis	Needs citrate (Cynthesis) Carnitine is essential for transport of fatty acids thru mitochondrial membrane	Requires NADPH
Beta-oxidation	Occurs in **mitochondria** malonyl-CoA inhibits carnitine acyltransferase, thus inhibiting beta oxidation	Very long chain fatty acids
Eccentric hypertrophy	Eccentric= thinning, volume overload. Sarcomeres added in series. concentric= thickening, pressure overload. Sarcomeres added in parallel	

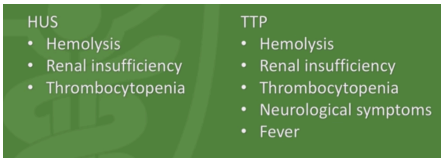
homocysteine	H + Ch3= **methionine** H + transsulfuration = cystathionine Increased risk for thrombotic events and endothelial damage	
Vegan	**Vit B12, Vit D and calcium deficiency = SUPPLEMENT** Other nutritional deficiencies possible Folic acid, magnesium, niacin, etc all found in veggies	Low Calcium → osteoporosis Low Vitamin D Cobalamin (B12)
Prokinetic drugs	Increase Ach (bethanechol, neostigmine) Increase 5HT4 (metoclopramide) Decrease D2 Macroldees (erythromycin)	
Obligate aerobes	Nagging pests must breathe Nocardia, pseudomonas, mycobacterium TB, bacillus	
Duodenum	Iron absorption (decreased in antacids, gastric bypass) Folate (duodenum, jejunum > ileum); goats milk B12 + IF = ileum	Celiac disease: 3 autoantibodies (anti tissue transglutaminase, endomysial, gliadin peptide), blunted microvilli. Gluten free diet. HLADQ2, 8. T cell lymphoma, GI and breast cancer. Lactase deficiency: bloat, cramp, diarrhea. Tropical sprue: infectious, improves with Abx
Whipple disease	Hyperpigmentation, cardiac, neuro, arthralgias T. whipplei. Tx: penicillin, ampicillin, tetracycline for years.	PAS+ macrophages in lamina propria
Intussusception	Most common in children. Adenovirus, meckel diverticulum, currant jelly stools. Telescoping, bulls-eye finding on US	
Small bowel obstruction	ABC: adhesion >> bulge/ hernias > cancer	Formula fed NICU: necrotizing enterocolitis
Bowel ileus	Decrease peristalsis: low blood flow to gut	Meconium ileus: first black poop not passed in cystic fibrosis, hirschsprung disease

<table>
<tr><td>Hemorrhoids</td><td>Above: painless bleeding (mesoderm)- superior rectal from IMA, vein.
Below: painful (ectoderm)- inferior rectal artery, pudendal artery. Somatic innervation.</td><td></td></tr>
<tr><td>Conversion disorder</td><td>La belle indifférence. Acute stress → neurologic symptoms, females, aware but not worried</td><td>Somatic symptoms disorder: bodily complaints with anxiety about symptoms.</td></tr>
<tr><td>ARDS</td><td>B/L opacities, SOB, crackles a few days after illness/ hospitalization. Diffuse alveolar injury
Inflammation, ROS → swelling and inflammatory mediators/ pulmonary edema → cell damage → diffuse alveolar damage
<table><tr><th colspan="2">Acute respiratory distress syndrome</th></tr><tr><td>Risk factors</td><td>• Sepsis, pneumonia
• Trauma
• Pancreatitis</td></tr><tr><td>Pathophysiology</td><td>• Cytokine release, endothelial activation
• Neutrophil recruitment & degranulation in lung
• ↑ Capillary permeability, alveolar fluid accumulation
• Formation of hyaline membrane</td></tr><tr><td>Clinical features</td><td>• Hypoxia
• Bilateral pulmonary infiltrates
• Normal pulmonary capillary wedge pressure (6-12 mm Hg)</td></tr></table></td><td>Shock, infection, pancreatitis, OD, sepsis, trauma, uremia</td></tr>
<tr><td>Cardiogenic pulmonary edema</td><td>Decompensated heart failure, increase PCWP ~ ARDS. different history of heart failure</td><td></td></tr>
<tr><td>Hepatitis</td><td>HepA food, IVDA, water. Self-limited.
HepB bloodborne. Fulminant liver failure.
HepC is chronic, bloodborne.
HepD occurs with HepB (HbsAg must coat the HepD antigen before it can infect hepatocytes)
HepE most common worldwide. Death in pregnant</td><td>HAV= councilman bodies
HBV= ground glass pink cells
HCV= lymphocytes and macrovesicular steatosis
Mallory bodies= alcohol induced</td></tr>
<tr><td></td><td colspan="2">  
MALLORY BODY (ALCOHOLIC HYALINE) AS SEEN IN THE LIGHT AND ELECTRON MICROSCOPES; IT IS COMPOSED OF INTERMEDIATE FILAMENTS. </td></tr>
<tr><td>Warfarin and heparin</td><td>Warfarin: PT (prothrombin II, V, VII, X)</td><td>INR used to assess warfarin therapy.</td></tr>
</table>

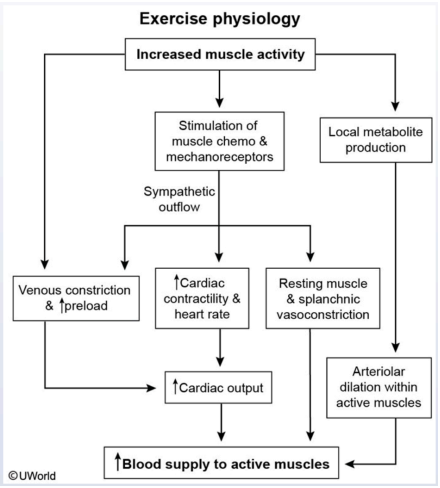
	Heparin: PTT, decrease Xa and thrombin	sub-therapy= not enough drug
Acute cholangitis	Fever, jaundice, RUQ pain. Stone in a biliary tree. GI microne can get into gall bladder E coli > klebsiella	
Primary biliary cholangitis	Middle aged woman with jaundice, RUQ pain, elevated liver and gallbladder enzymes Autoimmune + AMA, increased IgM, decreased ADEK	Xanthelasmas
Cholecystitis	Inflammation, worse with eating.	
Duodenal ulcer	Relieved with eating. H pylori. Nocturnal pain Urea breath test. Complication is hemorrhage	young
Gastric ulcer	Worse with eating Endoscopy > 55 bc risk of gastric cancer	Elderly
Colon cancer	Villous polyps most evil.	KRAS, APC → p53, DCC Microsatellite DNA mismatch repair
APC	Chromosomal instability → loss of APC tumor suppressor gene K-ras oncogene mutation → growth P53 (G-> S), DCC Microsatellite instability pathway (DNA mismatch repair)	Sporadic or familial
Proteus sp. stones	Struvite, ammonium magnesium phosphate. Staghorn calculi	
Diverticulitis	Metronidazole (below diaphragm) + fluoroquinolone, TMP-SMX	
Crohn disease	**Transmural** inflammation, skips, mouth thru colon, spares rectum. Cobblestone, creeping fat, fissures, fistulas Arthritis, IBD, HLA-B27, erythema nodosum , ankylosing spondylitis Th1	Barium swallow → string sign Noncaseating granulomas Tx:**sulfasalazine/** 5-ASA, azathioprine, TNF inhibitors
Ulcerative colitis	**Partial thickness** inflammation, autoimmune, lead pipe. Bloody diarrhea, HIGH risk of colon cancer Pyoderma gangrenosum. Primary sclerosing cholangitis Th2	Crypt abscess and ulcerations Tx: **sulfasalazine**, 6-MP, **sulfasalazine**

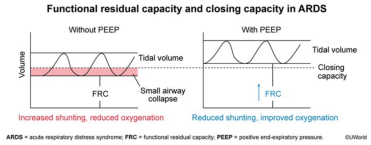
		Crohn disease	Ulcerative colitis
	Involvement	• Anywhere mouth to anus (mostly ileum & colon) • Perianal disease with rectal sparing • Skip lesions	• Rectum (always) & colon • Continuous lesions
	Microscopy	• Noncaseating granulomas	• No granulomas
	Gross findings	• Transmural inflammation • Linear mucosal ulcerations • Cobblestoning, creeping fat	• Mucosal & submucosal inflammation • Pseudopolyps
	Clinical manifestations	• Abdominal pain (often RLQ) • Watery diarrhea (bloody if colitis)	• Abdominal pain (varying locations) • Bloody diarrhea
	Intestinal complications	• Fistulae, abscesses • Strictures (bowel obstruction)	• Toxic megacolon
Chlamydia	Pneumonia (parrots), walking pneumonia, eye infection, PID, urethritis, conjunctivitis, lymphogranuloma venereum	Macrolides and tetracyclines	
Pancreas	Secretes zymogens (trypsin, elastase, peptidases) Trypsin is autolytic Amylase Rate limiting carbohydrate digestion: oligosaccharide hydrolases on brush border.	CCK → GB contraction and pancreatic enzyme secretion Vagus: digest Secretin: Bicarb	
SGLT	Sodium dependent glucose transporter: glucose into gut GLUT5: fructose		
Pancreatitis	Gallstones and alcohol, neoplasm at head, NNRTIs for HIV, sulfa drugs, ERCP, high TRIGS, MUMPS, trauma or abdominal surgery, scorpion sting, idiopathic Chronic: alcohol abuse	Trousseau syndrome: hypercoagulability, venous thrombosis, migratory thrombophlebitis	
DNA replication in eukaryotes vs prokaryotes	Euk: multiple origins of replication, larger genes, liner Pork: circular, one origin of replication. DNA polymerases are similar in function with proofreading.		
Odds ratio	Case contrOl. What are the odds of X if exposed		

Relative risk	Cohort study, risk if getting disease X in exposed/ unexposed	
Hormone receptors	Nuclear: steroids, thyroid, from adrenals G-protein coupled receptors: ACTH, ADH, epi, glucagon TRK: insulin, growth hormone	
Wilson's disease	Copper accumulation in liver, brain, cornea (keyser-fleischer) HCC, PCT fanconi's syndrome, dementia, hemolytic anemia, basal ganglia degeneration, parkinsonism AR copper transport, low ceruloplasmin	Penicillamine (copper penny)
Hemochromatosis	Cirrhosis, DM, skin bronzing , dilated CHF, testicular atrophy HCC Iron studies: high ferritin, transferrin, low TIBC	AR in HFE gene, hepcidin decreased, increased iron uptake Excessive transfusions, deferoxamine
Hepatitis A	ssRNA virus, non enveloped food/ water, international travel mexico. Acute hepatitis that is self limited.	
Hepatitis E	Fecal oral, contaminated water. SE asia. Lethal in pregnant women.	
Hepatitis B	dsDNA, hepadnavirus. Bloodborne. Perinatal, sexual IVDA. neonates get worse diseases. Tx: tenofovir. Pregnant (lamivudine), give baby HepB vaccine at birth	HbsAg= active disease HbcAg= history of infection HbeAg= active infection, high transmission
HepC	HCC high, US every 6 months. Essential mixed cryoglobulinemia, MPGN	
Autoimmune hepatitis	Tpe 1: anti-smooth muscle , ANA Type 2: anti-liver kidney microsomal ab	
Surrogate	surrogate is spouse > adult child > parent > sibling > grandparent.	
Bile	Bile salt (Na + bile acid/ cholesterol) + bilirubin 7-alpha hydroxylase is rate limiting step in synthesis	Lipid digestion, copper excretion, bactericidal
Unconjugated hyperbilirubinemia	Increase bilirubin production: hemolysis, sickle disease, hematoma breakdown. Impaired bilirubin uptake: hepatitis, drugs *rifampin Decreased UDP-GT	
Conjugated hyperbilirubinemia	Impaired transport: dubin-johnson, roto Biliary damage: hepatitis, cirrhosis, livier failure Intrahepatic biliary obstruction: PBS, PSC, estrogen/ chlorpromazine, arsenic	
Infectious mononucleosis	**Cytotoxic CD8 T cells**, reactive atypical lymphocytes, scalloped edges. Downey cells.	Heterophile Ab that agglutinates in presence of horse serum.

	EBV: fever, pharyngitis, adenopathy, splenomegaly, severe fatigue B cells infected	- CMV fails to agglutinate. Presents similarly to EBV
Type II error	No significant relationship between 2 groups, when a relationship exists. High type error rate strengthens the argument that there is an effect. Low type error= authors correctly rejected the alternative hypothesis.	Power = 1 - B Precision is p value
Type I error	Data says a relationship exists, when one does not. False positive. States the null hypothesis is rejected.	
Anthrax	government/ mail worker. Bacillus anthracis spore forming rod.	Tx: 60 days ciprofloxacin, 3 doses of vaccination
Systemic mycoses	Histoplasmosis: tongue ulcers Blastomycosis: SCC verrucous skin lesions Coccidioidomycosis: erythema nodosum, nodules Paracocc: ~ blastomycosis	
Idiopathic thrombocytopenic purpura (ITP)	viral/ autoimmune/ malignancy → **anti GpIIb/ IIIa Ab** → loss of platelets → BM compensated by making more.	Glanzmann thrombasthenia: defective platelet plug.
vWf deficiency	Abnormal ristocetin assay (vwf binds gp1b) Normal platelet count	Bernard soulier syndrome: deficiency of GP1b receptors: thrombocytopenia, enlarged platelets, bleeding. Abnormal ristocetin, normal plasma does NOT correct
TTP/ HUS	ADAMTS12 deficiency → **large vWF multimers** → widespread **thrombosis** and **thrombocytopenia** = thrombocytopenia + MAHA + kidney injury + fever & CNS defects. (severe) HUS: EHEC bloody diarrhea → triad (milder form) **FAT RN: Fever, anemia, thrombocytopenia, renal failure, neurological symptoms**	
Migraine abortive Tx	NSAIDS, acetaminophen Triptans, Ergot	Triptains are 5HT1b/ 1d agonists→ vasoconstriction, inhibits trigeminal activation, decrease vasoactive peptide release
Migraine prophylaxis Tx	Beta blockers (propranolol, metoprolol, timolol), TCA amitriptyline Anticonvulsants valproate	TCA overdose: QT prolongation, lower seizure threshold, Anticholinergic effects, sedative
Tetanus	Accumulation of intracellular calcium → extended cross bridging, disabled muscle relaxation	C. tetani invades via metalloprotease exotoxin ---> migrates retrograde to central inhibitor neurons → prevents release of

		Glycine and GABA → disinhibited motor neurons
Coronary blood flow	Lowest during isovolumetric contraction	
Opioid effects and toxicity	Respiratory depression, hypotension, NV, constipation, muisiis, biliary colic, prolactin release, inhibited LH release, increased ICP, emesis, tolerance, withdrawal, dependence, addiction	
prevention	Primary: stop disease from occuring Secondary: early detection Tertiary: reduce morbidity of acquired disease	
Vitamin D synthesis	D3 (cholecalciferol) → liver to become calcidiol (25-hydroxy) → kidneys to 1,25 OHD by alpha-1-hydroxylase Function: - Increased dietary absorption of calcium and phosphate - Increased bone turnover	7-dehydrocholesterol → cholesterol / pre-VitD
DeQuervain tenosynovitis	Overuse injury, pain with ulnar deviation and thumb tucked in (finkelstein test)	All Peanut Lovers Eat Peanut Butter (abductor pollicis longus, extensor pollicis brevis)
PTSD	Paroxetine and sertraline **> 1 month** - Acute stress disorder is like PTSD but > 3 days and < 1 month	
Physiologic dead space	Vd= TV x Pa- Pe/ PaCo2	
FRC	Volume of lungs after normal expiration - High compliance: older, emphysema - Low compliance: young, fibrosis	
Vascular resistance	P= QxR R= viscosity x length / radius ^4	bronchoconstriction/ PNS bronchodilation/ SNS Pulmonary hypertension: cor pulmonale
Hb dissociation curve	Right: CADET→ CO2, acidosis, increase 2,3 DPG, exercise, high temperature Left: HbF	Methemoglobin: cyanide poisoning → nitrite, thiosulfate → MetHbg - Caused by nitrates, **antimalarials**, lidocaine, **dapsone**, **metoclopramide** - Tx: methylene blue, Vitamin C
Carboxyhemoglobin	Carbon monoxide → left shift, high affinity for O2 Pulse ox normal	
A-a gradient	High FiO2, shunting, V/Q mismatch, age, fibrosis	10-12 is normal

	Causes of hypoxemia **Examples** / **A-a gradient** **Reduced PiO_2**: High altitude — Normal **Hypoventilation**: CNS depression, morbid obesity — Normal **Diffusion limitation**: Emphysema, ILD — Increased **V/Q mismatch***: Pulmonary embolism, pneumonia — Increased	
V/Q	Very low: low ventilation, high perfusion: Shunt, airway obstruction (pulmonary edema, cancer), O2 ineffective High V/Q: blood flow obstruction, increased physiologic dead space	
Changes in exercise	Increase O2 uptake, increase CO2 production Increase RR, decrease pH Increase venous CO2 content (no change in arterial) V/Q in apex and base more uniform Increase pulmonary blood flow due to CO Decreased total systemic vascular resistance (muscle vasodilation) > rise in MAP	
SIADH	ADH from brain or lung tumor (small cell) → increased water/ Na reabsorption → low serum/ sodium osmolality and high urine Na due to BNP High volume → decreased RAAS, increased BNP/ ANP → subclinical hypervolemia with excretion of Na	**Euvolemic**, No JVD, edema or crackles. Causes by head trauma, tumor, carbamazepine (increase ADH secretion), NSAIDS, SSRI, pneumoniia
High altitude mountain sickness	Lower barometric pressure / PO2→ increased ventilation → **respiratory alkalosis** → **decreased HCO3 reabsorption, increase H+ reabsorption → metabolic acidosis** Acetazolamide increases speed of HCO3 removal Increase EPO, Hct, 2,3 BPG, more mitochondria Compensatory metabolic acidosis (**excrete HCO3).** ACute: -2 days after rapid ascent to high altitude: Headache, fatigue, acute cerebral edema, acute hypoxia-induced vasodilation, Pulmonary edema (vasoconstriction)	PH= HCO3/ CO2 Tx: acetazolamide Hgb increases about 5 Hct increases 20-25% Goal: maintain O2 delivery - Peripheral chemoreceptors sense low O2 → hyperventilation - Loss of CO2, shift curve left to increase O2 uptake

	Physiologic responses to high altitude **Lungs**: • Hypoxic vasoconstriction → ↑ PVR & PAP; • ↑ minute ventilation → ↑ PaO_2 & ↓ $PaCO_2$ **Kidneys**: • ↑ erythropoietin production; • ↑ HCO_3^- excretion (compensatory metabolic acidosis); • Aldosterone suppression with diuresis & ↓ plasma volume **Blood**: • ↑ 2,3-biphosphoglycerate → ↑ O_2 unloading in tissues; • Upregulation of HIF → erythropoiesis & angiogenesis; • ↑ hemoglobin concentration (O_2-carrying capacity) **Heart**: • ↑ heart rate & slightly ↑ cardiac output **Brain**: • Vasodilation with ↑ cerebral blood flow	- Hypoxic pulmonary vasoconstriction , increased PVR - Increased SNS → increase HR and CO 1-2 days: increased HCO3 excretion, decreased blood pH - Suppressed aldosterone activity, decreased body volume loss - Low plasma volume increase Hct
Zero-gravity changes	Decreased blood volume, RBC mass, work on muscles, CO, loss of calcium and phosphate, decreased bone mass	
Nitrogen narcosis	N2 into neurons → decreased neuronal excitability Jovial, careless, drowsy, decreased strength and coordination if below sea level for too long	
Decompression sickness	BENDS: breath problem, extremity Joint and muscle pain, dizzy, neurological changes, death The chokes: pulmonary embolism	Slowly go to the surface, ascension, N2 gases to the dissolved state to be exhaled. Hyperbaric O2 therapy
Hyperbaric O2 therapy	Decompression sickness, arterial gas emboli, CO poisoning Gas gangrene (clostridia), osteomyelitis	
PEEP	Mechanical ventilation with PEEP keeps alveoli open, preventing atelectasis → openin collapsed alveoli, reduce intrapulmonary shunting, increase FRC back to normal	
Obstructive - Asthma	Low FEV1/ FVC < 80%, increased RV, FRC, TLC Bronchodilator response, **methacholine response**	Inflated lung that traps air
Pulsus paradoxus	Abnormal drop in systolic pressure during inspiration, RV pushes against LV leading to low CO Pulseless cardiac activity= cardiac tamponade - **LV rupture of free wall**	Cardiac tamponade, asthma, pulmonary embolism
Chronic bronchitis	> 3 months for 2 consecutive years. Due to chronic irritation	cyanosis= blue bloater
Emphysema	Centriacinar: respiratory bronchioles, Upper lobes. Smoking. Panacinar: (intrahepatocte accumulation)f respiratory bronchiole + alveolar ducts and alveoli. Alpha 1 antitrypsin deficiency	Pink puffer, not cyanotic

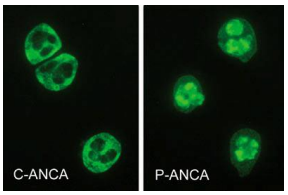
cyproheptadine	Serotonin syndrome Appetite stimulation	
promethazine	Nausea, vomiting	
hydroxyzine	Sedation, itching	
meclizine	Vertigo	
Asthma medications Omalizumab: IgE AA→ LK: Zileuton Inhibits mast cells: cromolyn Blocks LK receptors: montelukast	**What asthma medication fits each of the following statements?** • Preventative inhaled treatment of choice for mild persistent asthma **Inhaled corticosteroid** • Inhaled treatment of choice for acute exacerbations **Short-acting beta agonist** • Narrow therapeutic index, drug of last resort **Theophylline** • Blocks conversion of arachidonic acid to leukotriene **Zileuton** • Inhibits mast cell release of mediators, used for prophylaxis only **Cromolyn** • Inhaled treatment that blocks muscarinic receptors **Ipratropium, Tiotropium** • Inhaled long-acting β_2-agonist **Formoterol, Salmeterol** • Blocks leukotriene receptors **Zafirlukast and Montelukast**	
asbestosis	Increased risk of bronchogenic carcinoma > mesothelioma Affects lower lobes	Ferruginous bodies stain with prussian blue from iron content
sarcoidosis	ACE increase, gammaglobulinemia, rheumatoid factor, uveitis, erythema nodosum, BL hilar lymph, noncaseating granulomas, Vit D increase, high calcium **TH1 and IFNy, macrophages**	Tx: glucocorticoids
Granulomatosis with polyangiitis	C-ANCA, wegener's granulomatosis Necrotizing granulomas of lung and upper airway, vasculitis, focal necrotizing glomerulonephritis	
Vascultides	Takayasu: granulomatous, arterial narrowing large arty Polyarteritis nodosa: neecrotizing medium arteries Thromboangiitis obliterans (buerger disease): segmental medium and small arteries and veins	
Cancer	Men: most common prostate Women: most common breast Most common overall= skin cancer Leading cause of cancer death: lung cancer Osteoblastic= sclerotic osteolytic= lucent	Lung mets to: brain, bone, liver, adrenals Mets from elsewhere: breast, colon, prostate, bladder Epithelial tumors spread by lymphatics Mesenchymal tumors spread hematogenously **Cachexia**: TNF and cytokines increase basal metabolic rate
Lung cancer	Adenocarcinoma: MET, ALK, RET, KRAS, EGFR, ROS	Peripheral, non-smokers, women

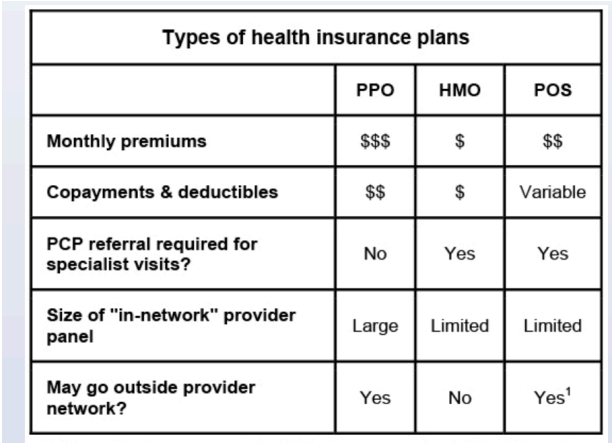
	(MARKER)	
Liver metastasis	Cancer sometimes penetrates benign liver - Colon, stomach, pancreas, breast, lung	
Brain metastasis	Lots of Bad Stuff Kills Glia - Lung cancer - Breast - Skin/ melanoma - Kidney / RCC - GI/ colon	Headache, focal deficiits, cognitive, seizurez
Bone metastasis	Permanently relocated tumors that like bone - Prostate , renal, testes, thyroid, lung, breast	
Psammoma bodies	Papillary thyroid cancer, serous papillary cystadenocarcinoma, malignant mesothelioma, meningioma	
Polycythemia	Pheochromocytoma, RCC, hepatocellular, hemangioblastoma, uterine fibroid	
Small cell carcinoma	P53, myc, Rb. Smoking **Paraneoplastic syndrome** ACTH→ cushing syndrome ADH → SIADH (lung or brain tumor) Lambert-Eaton syndrome→ improves wiith use Cerebellar degeneration	Central, non-smokers
Pneumonia	Community acquired: gram positive Atypical: legionella, mycoplasma, chlamydophila Ventilator: aspiration, anaerobes HAP: MRSA, pseudomonas	Lobar infiltrate (typical), interstitial (atypical, bilateral(
tRNA	Modified bases, CCA sequence at 3' end recognition sequence by proteins. D loop = proper aminoacyl tRNA synthesis Anticodon loop= complementary mRNA T loop= binding to tRNA to ribosomes	Aminoacyl tRNA synthetase: matches amino acid to tRNA
Neonatal pharmacokinetics	Increased body water → larger Vd and lower plasma concentration Decreased clearance of drugs → high drug concentration Decreased RBF, GFR → higher drug concentration Decrease plasma proteins → increased free levels	
Enlarged lymph node	Benign: pleomorphism, mitoses, nuclear changes. Malignant: one single cell population	
ACTH	Cushings: ACTH pituitary suppressed by high-dose dexamethasone	

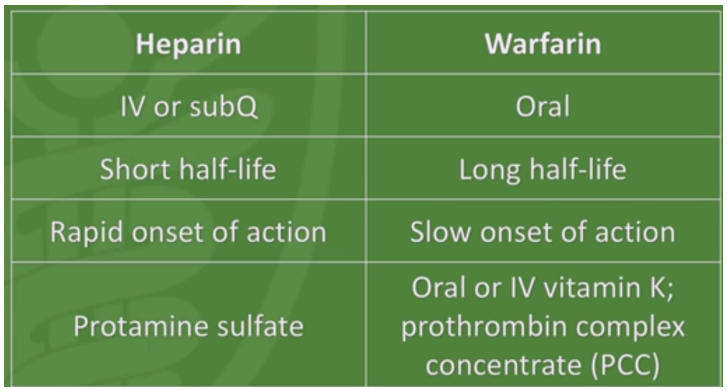
<table>
<tr><td></td><td>Ectopic ACTH tumor: not suppressed by high dose dexamethasone
Normal: low-dose dexamethasone suppresses</td><td></td></tr>
<tr><td></td><td colspan="2">
<table>
<tr><th colspan="5">Etiologies of Hypercortisolism</th></tr>
<tr><th>Condition</th><th>Cushing Syndrome (Adrenal Adenoma)</th><th>Cushing Disease (Pituitary ACTH-Secreting Adenoma)</th><th>Iatrogenic (Exogenous)</th><th>Paraneoplastic ACTH Secretion</th></tr>
<tr><td>Low-Dose Dexamethasone Suppression Test</td><td>↑ Cortisol</td><td>↑ Cortisol</td><td>↑ Cortisol</td><td>↑ Cortisol</td></tr>
<tr><td>High-Dose Dexamethasone Suppression Test</td><td>↑ Cortisol</td><td>↓ Cortisol</td><td>↑ Cortisol</td><td>↑ Cortisol</td></tr>
<tr><td>ACTH Levels</td><td>Suppressed</td><td>Increased</td><td>Suppressed</td><td>Increased</td></tr>
<tr><td>Adrenal Glands Findings</td><td>Unilateral adenoma</td><td>Bilateral hyperplasia</td><td>Bilateral atrophy</td><td>Bilateral hyperplasia</td></tr>
<tr><td>Notes</td><td>Adrenal cortex adenoma found in zona fasciculata</td><td>May cause bilateral hemianopsia</td><td>History of excess cortisol intake</td><td>Image abdomen and pelvis to find source</td></tr>
<tr><td>Treatment</td><td>Adrenalectomy</td><td>Transsphenoidal resection</td><td>Minimize steroids</td><td>Treat underlying cancer</td></tr>
</table>
</td></tr>
<tr><td>ANP</td><td>Vasodilator, water and sodium diuresis
Increases GFR
AgII causes constriction and water/ sodium reabsorption.
Neprilysin prevents the breakdown of ANP/ BNP. ARBs used in combination to block AgII</td><td>ANP and BNP act on NPRA receptor → increases cGMP, vasodilation of SMC

Neprilysin: Metalloproteinase that prolongs that action of endogenous polypeptides
- Sacubitril inhibits neprilhsin</td></tr>
<tr><td>Hypertension in pregnancy</td><td>Hypetensive Moms love Nifedipine: Hydralazine, methyldopa, labetalol, nifedipine</td><td></td></tr>
<tr><td>Preload and afterload</td><td>Hydralazine: reduce afterload
Nitrates: reduce preload (venodilation)
ACEi/ ARBS: reduce afterload and preload</td><td></td></tr>
<tr><td>Heart failure antihypertensives</td><td>ACE inhibitors, ARBS, Beta blockers (CMB), Diuretics, aldosterone antagonists (improve survival), diuretics</td><td></td></tr>
<tr><td>UMN</td><td>Hyperreflexia, spastic paralysis, increased muscle tone, clasp-knife rigidity, pyramidal weakness (LE flexors, UE extensors), pronator drift</td><td>LMN: weakness, paralysis, hypotonia and atrophy, absent DTRm fasciculations (denervation to muscle)</td></tr>
<tr><td>Hypertrophic cardiomyopathy</td><td>Myofibrillar disarray, fibrosis, concentric hypertrophy
S4, outflow tract obstruction (IV septum and mitral valve).
Valsalva increases, increase afterload makes it quieter
Young athlete dies suddenly → diastolic dysfunction</td><td>Sudden death in young
Beta blockers and verapamil, exercise restriction is tx</td></tr>
</table>

Endocarditis	Septic or aseptic vegetative gunk. **Osler**= painful on palms **Janeway** lesions= painless lesions, soles **Roth spots**= rare retinal hemorrhages Complications: embolic complications, regurgitation/ stenosis, ruptured chordae, suppurative pericarditis Acute= large vegetations, Staph, normal valve subacute= small, strep, diseased valves HACEK: culture negative endocarditis= H flu, actinobacillus, cardiobacterium, eikenella, kingella)	Blood culture, ECHO (TEE) tricuspid= IV drug users Mitral - Staph aureus > Strep viridans or epidermidis, enterococci Culture negative endocarditis: coxiella, bartonella, brucella (intracellular) Sterile: Libman- sacks vegetations on both sides of valve Marantic: metastatic cancer, platelet fibrin aggregates
Strep pyogenes (GAS) infections	Autoimmune type II rheumatic Scarlet fever (toxin) Post=strep (type III) Strep Toxic shock syndrome	
Pulsus paradoxus	**Cardiac tamponade**, decreased systolic BP > 10 on inspiration - Seen with asthma, croup, OSA, COPD, rarely **pericarditis** - Electrical alternans	Decreased LV capacity
Kussmaul sign	Constrictive pericarditis, JVD with inspiration - Pericarditis has a large heart due to pericardial effusions	Decreased RV capacity
Familial dyslipidemia	**1 LP, 2 LD, b adds V, 3 is E, 4 gets more** Type 1: LPL deficiency, high Trigs → pancreatitis. Xanthomas, no atherosclerosis Type 2: LDL deficiency, high LDL → tendon xanthoma (2 legs), MI at young age Type 2B: same, but high VLDL Type 3: apoE deficiency, decreased remnant uptake Type 4: makes too much VLDL, Trig → pancreatitis	Apolipoproteins high yield - Activates LCAT: A1 - Chylomicron secretion: B48 - Mediates VLDL secretion: B100 - Cofactor lipoprotein lipase: CII - Remnant uptake: E
Abetalipoproteinemia	**MTP** mutation → deficiency of B-100 and B-48 → Decreased chylomicron absorption and liver lipoprotein synthesis - Steatorrhea, fatty enterocytes, ADEK deficiency, night blindness, ataxia. - Tx: Vit E	Rate limiting enzymes - Fatty acid synthesis: acetyl carboxylase - Beta oxidation: carnitine acyltransferase 1 - Ketone synthesis: HMG coA synthase - Cholesterol synthesis: HMG coA reductase

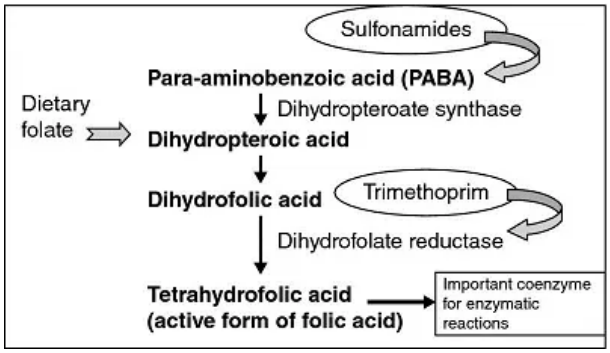
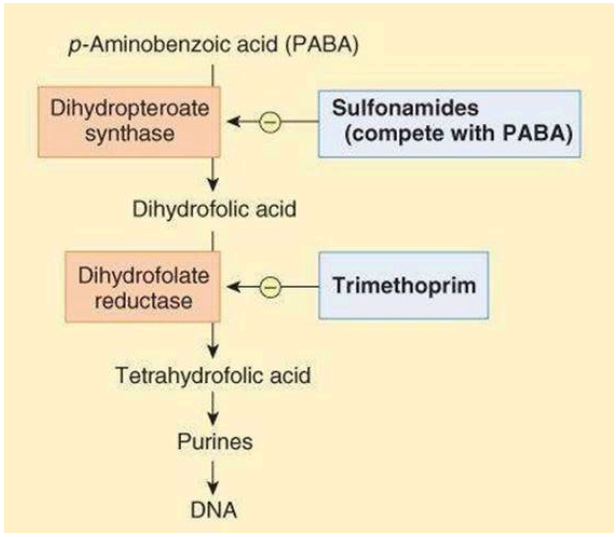
ANCA	p-ANCA: mpo C-anca, pr3-anca (cytoplasmic)	
Dressler syndrome	Weeks post-MI with fever, chest pain, friction rub	
STI treatment	Azithromycin or doxycycline: chlamydia Ciprofloxacin: E coli, klebsiella Ceftriaxone: gonorrhea Penicillin G: syphilis Urethritis STI: assume chlamydia coinfection, **ceftriaxone + doxycycline +/- metronidazole (trich)**	**Gonorrhea (assume chlamydia): third generation cephalosporin + tetracycline**
Gallbladder cancer	Cholangiocarcinoma: fibrotic disease of bile ducts (PSC), opisthorchis sinesis liver fluke White lined gallbladder, think porcelain, chronic cholecystitis, increase risk of adenocarcinoma	
Pancreatic secretion	Stimulated by Ach (vagus nerve), CCK, secretin GIP increases insulin releasee	
Vaccines	< 6 yo: DTaP, Hep B, rotavirus, poliovirus, HiP, MMR, Varicella, HepA 17-17: HPV, meningococcal, Tdap, influenza Adult: Tdap, pneumococcal, varicella, influenza, zoster	
Reportable disease	STDs: HIV, chalydia, gonrorhea, syphilis HepA, B, C MMR, DP Salmonella, shigella TB	
Health care	HMO: PCP is the gatekeeper, specialists are in network. Cheap, stay in network. PPO: you can see whichever specialist you want . More expensive, can go out of network,	Medicare: elderly > 65 and children with disabilities Medicaid: **disabled** and **destitute** , LOW INCOME CHIP: assists parents paying for child's healthcare

		
Lactic acid	hypoxia/ infection Think Lactate When you cant make respiration: Testes, Lens, WBC, Cornea, Medulla, RBC	LDH Vitamin **B3** cofactor
Oxaloacetate	Pyruvate → pyruvate carboxylase + Vit B1, 2, 3, 5, lipoic acid	Alpha ketoglutarate uses the same coenzymes in TCA cycle
Stable angina	Aspirin or clopidogrel	
Unstable angina		
Thromboembolic events	Warfarin (chronic anticoagulation) Apixaban LMWH (enoxaparin, fondaparinux) : indirect thrombin inhibitors that bind AT and convert it to inactivator of thrombin and factor Xa Eptifibatide is 2b/3a inhibit Thrombolytics: activate plasmin to degrade fibrin. Early STEMI < 1 hour, acute stroke. Avoid in active bleeding, surgery, severe HTN. - Reversal: Aminocaproic acid	Warfarin (PT): inhibits epoxide reductase, y-carboxylation of VitK-dependent 2, 7, 9, 10, C and S factors. Extrinsic pathway= PT/ INR following. - Teratogenic: epiphysis, nasal hypoplasia - Transient hypercoagulable bc protein C first inhibits → VII (short t ½) theen II (long t ½) Heparin (PTT): increases antithrombin - HIT: increased risk with UFH > LMWH. - Tx: stop heparin, initiate direct thrombin inhibitors - Preferred immediate anticoagulant

Warfarin vs. heparin		
PVD, claudication	Cilostazol (PDE inhibitor)	
GVHD	When **donor T cells attack** host MHC antigens. ⇒ systemic inflammatory reaction and organ failure	Acute and chronic graft rejection occur when host T and B cells attack donor tissue
Transfusion reaction	Acute reaction: fever, chills, hemoglobinuria (minutes to hours) Type II hypersensitivity	
Vitamin B12 deficiency	Megaloblastic anemia and posterior column, subacute combined degeneration.	**Increase MMA, increased homocysteine and methyl-THF** Imapired myelin and DNA synthesis
Vitamin B2 riboflavin deficiency	Erythrocyte glutathione reductase activity and NADPH as cofactors to reduce disulfide bonds. Normocytic anemia, cheilosis, stomatitis, glossitis	Required by vegetarians - B12 and iron deficiency (esp if menstruating or growing child) - Calcium and Vit D deficiency - High folic acid and thiamine
Vitamin B1 thiamine	Transketolase in hexose-monophosphate pathway.	Wernicke-korsakoff and beriberi syndrome
Medical records	Physician is owner, patient has right to see records	
Informed consent	Schloendorff v society of NY hospital	
Patient self-determination act	Upon admission, patient needs to have an advanced directive, inform patients, add it to medical records	
Renal tubular acidosis	Acetazolamide: PCT, type 2 Toluene, ifosfamide: DCT, type 1 Aldosterone: collecting duct, type 4	
Amoxicillin, ampicillin	HEELPSS: H flu, E coli, Enterococci, Listeria , Proteus, Salmonella, Shigella	Extended spectrum penicillinase sensitive penicillins BACTERIAL LYSIS in hypotonic solutions

<table>
<tr><td>vancomycin</td><td>D-ala inhibitor.
Resistance: D-aa→ Lac</td><td>NOT: nephrotoxicity, ototoxicity, thrombophlebitis.
Red man syndrome: non-specific mast cell degranulation. Slow down infusion</td></tr>
<tr><td>Pseudomonas infection</td><td>Cell wal inhibitors: cefepime, aztreonam, carbapenem, ticarcillin</td><td></td></tr>
<tr><td>Ribosome inhibitors</td><td colspan="2">Buy AT 30, CELL at 50
- Aminoglycoside, tetracycline
- Chloramphenicol, clindamycin, erythromycin/ macrolides, Linezolid
<table><tr><th>Bacteriostatic
(reversible stoppage)</th><th>Bactericidal
(irreversible killing)</th></tr><tr><td>chloramphenicol</td><td>aminoglycosides</td></tr><tr><td>clindamycin</td><td>cephalosporins</td></tr><tr><td>erythromycin</td><td>fluoroquinolones</td></tr><tr><td>sulfamethoxazole</td><td>metronidazole</td></tr><tr><td>tetracyclines</td><td>penicillin</td></tr><tr><td>trimethoprim</td><td>vancomycin</td></tr></table></td></tr>
<tr><td>Tetracycline</td><td>VACUUM the Bedroom: vibrio, Acne, Chlamydia, Ureaplasma, Mycoplasma, Tularemia, Helicobacter, Borrelia, Rickettsia
30s inhibitor</td><td>Don't take with milk, antacids, iron, calcium, Magnesium
GI distress , teeth discoloration, inhibits bone</td></tr>
<tr><td>Aminoglycosides
- GNATS
- Gentamicin
- Neomycin
- Amikacin
- Tobramycin
- Streptomycin</td><td>Prevents formation of initiation complex, need O2
Severe gram negative rod infections
30s inhibitor</td><td>NOT: nephrotoxicity, ototoxicity, teratogenic</td></tr>
<tr><td>Macrolides
- ACE
- Azithrmomycin
- Clarithromycin
- Erythromycin</td><td>Blocks translocation, binds 23s rRNA of 50S, bacteriostatic
PUS: atypical pneumonia, URI, STD</td><td>Prolong QT interval</td></tr>
<tr><td>Gray baby syndrome</td><td>Chloramphenicol in neonates → toxic metabolites. Ashen gray skin, cyanosis . Tx phenobarbital to rev up UDP enzyme in liver</td><td></td></tr>
<tr><td>photosensitivity</td><td>Sulfonamides, amiodarone, tetracyclines</td><td></td></tr>
</table>

Molar pregnancy	Complete: xx, xy..looks completely normal, right? jk(2 sperm in empty egg)(1 sperm duplicates) Partial: PARTS of fetus.XXX, XXY, XYY (2 sperm, 1 egg)	
Drug intoxication	**PCP: violent, nystagmus- NMDA antagonist** Cocaine: paranoia, hyperactive, mania	
Thiazides	**Hypokalemia** and metabolic alkalosis, hyponatremia, **hypercalcemia** Block NaCl symporter in DCT,, enhance Na, Cl and wter excretion. Treats hypertension Loop diuretics treat volume overload heart failure	hypokalemia= muscle cramps Vs Furosemide/ loop diuretics causes hypocalcemia **Diuretics** HYPER Calcemia (Thiazides) HYPO Calcemia (Loops) *"Loops lose"* *Worsened Gout/Hyperuricemia (Thiazides)* *Ototoxicity (Loops)*
Catheter bugs	E coli>>>> Pseudomonas: non-lactose fermenting, oxidase positive Klebsiella: lactose fermenting Staph saprophyticus, proteus mirabilis, candida	Ventilator associated pneumonia: Pseudomonas, MRSA. Central line infections: staph epidermidis
Sulfa allergies	Sulfa Pills Frequently Cause terrible allergy symptoms - Sulfasalazine, probenecid, furosemide, celecoxib, Thiazides, TMP-SMX, acetazolamide, sulfonylureas	SJS syndrome: Steve Jobs made APPLE PCs: - Allopurinol, phenytoin, phenobarbital, lamotrigine, ethosuximide, penicillin, carbamazepine, sulfonamide
TMP-SMX	**UTI**, Pneumocystis jirovecii id CD < 200 - TMP, Methotrexate, pyrimethamine inhibit DHF reductase	Megaloblastic anemia, leukopenia

	 	
UTI drugs	TMP-SMX, fluoroquinolones, nitrofurantoin	Recurrent UTI prophylaxis: - TMP-SMX - Nitrofurantoin - Amoxicillin - Cephalexin
Metronidazole	**GET GAP on the Metro:** - Giardia, Entamoeba histolytica, trichomonas, gardnerella, Anaerobic bacteria, Pylori	
Meningococcal prophylaxis	Ciprofloxacin, **rifampin**, ceftriaxone	
H flu meningitis	Rifampin prophylaxis	

STD prophylaxis	**Gonorrhea: ceftriaxone (3rd gen cephalosporin) and fluoroquinolone** Syphilis: penicillin G	
AIDS prophylaxis < 200	Pneumocystis jirovecii: TMP-SMX > Pentamidine, dapsone	
Endocarditis	Penicillin, amoxicillin, cephalexin Clindamycin, erythromycin	Viridans strep
Neonatal - maternal infection	GBS: ampicillin Gonococcal/ chlamydial: erythromycin	
teratogens	Clarithromycin (embryonic) Sulfonamides (kernicterus) Aminoglycosides (ototoxicity) Fluoroquinolones (cartilage damage, avoid in pregnant women and children) Metronidazole (mutagenesis 1st trimester) Tetracyclines (discolored teeth, inhibited bone growth) Ribavirin + griseofulvin(teratogenic) Chloramphenicol (gray baby syndrome)	ACE inhibitors and ARBS highly teratogenic
Meningitis	Gram-positive diplococci: strep pneumo Gram-positive diplococci: N. meningitidis Gram negative coccobacilli: H flu Gram positive rods: Listeria	Ceftriaxone, ampicillin, vancomycin
Bioterrorism	**Anthrax**: cutaneous black eschar, or pulmonary. Bacillus spores, hemorrhagic mediastinitis. Tx: **ciprofloxacin**, doxycycline, vaccine, Raxibacumab Smallpox Yersinia Filovirus: ebola, marburg	
Smallpox	Variola virus→ respiratory droplets → 2 weeks, rash of mouth and face→ vesicles over body and extremities	Umbilicated papules
STDs	**Gardnerella** vaginalis: thin, gray, fishy, clue cells- **metronidazole** **Trichomonas**: pear, flagellated protozoa. Yellow, fishy, strawberry cervicitis- **metronidazole** **Gonorrhea**: PID, urethritis, cervicitis, epididymitis, gonococcal arthritis- ceftriaxone Chlamydia D-K: cervicitis, urethritis, PID, prostatitis, conjunctivitis- doxycycline Actinomyces from IUD: penicillin Candida: fluconazole Nocardia: TMP-SMX	Reiter syndrome: uveitis, arthritis, urethritis (reactive arthritis, chlamydia #1)
Genital lesions	Condylomata accuminata: HPV	PID: neisseria, chlamydia, polymicrobial,

	Lymphogranuloma venereum: **painless** ulcer, **painful LN** Bubbos, chlamydia L1-L3. **HSV**: **painful**, clustered vesicles on red base. **Chancroid**: H. ducreyi (do cry), **painful** ulcer and LN. GN rod school of fish. **Chancre**: **painless** genital Chancre ulcer, syphilis secondary symptoms, condyloma lata, rash on palms and soles → tabes dorsalis, AR pupil, GUMMAs Donovan bodies: **painless** granuloma inguinale, klebsiella granulomatis → elephantiasis	chandelier sign Neisseria= antigenic variation of gonococcal pili
UTI	Gram negative rods (**E coli)** > proteus, klebsiella, enterobacter, Staph saprophyticus in sexually active women) Women > men. Urine status, pregnancy, obstruction, VUR	Catheter: pseudomonas > klebsiella
Proteus mirabilis	Swarming motility, urease, UTI Struvite stones, staghorn calculus	
Cephalosporins	1- PEC - FA, PHA, PHRA 2- HENsPECK 3- serious Gram negative (community acquired pneumonia) - IME, ONE, TEN 4- **pseudomonas**, G positive, Gram negative - PI	
Rubella	Conigental: cataracts, PDA, hearing loss, blueberry rash	Vaccinate mother before pregnancy
CMV	Most common congenital disease. Sensorineural hearing loss, mother has mononucleosis symptoms	Enveloped dsDNA virus
HIV	HAART during pregnancy, zidovudine, C-section, NO breastfeeding AIDS dementia: multinucleated giant cells HIV infected Ring enhancing lesions/ abscesses: toxoplasmosis < 200 Progressive multifocal leukoencephalopathy (PML): JC virus	Macrocytic anemia: zidovudine
Syphilis	Congenital syphilis causes severe deformations: saber shins, notched teeth, saddle nose, deafness	Tx: Penicillin G (even if allergic) → desensitization
Foodborne illness	**What is the most likely cause of food poisoning given each of the following statements?** • Vomiting 1-6 hrs after eating potato salad at picnic ***Staphylococcus aureus*** • Vomiting 1-6 hrs after eating reheated rice ***Bacillus cereus*** • Vomiting and watery diarrhea on cruise **Norovirus** • Watery diarrhea 12 hrs after eating meat or poultry from cafeteria ***Clostridium perfringens***	

<table>
<tr><td></td><td colspan="2">

- Inflammatory diarrhea 1-3 days after eating undercooked meat/poultry, eggs, or produce ***Salmonella***
- Inflammatory diarrhea after eating undercooked hamburger meat, followed by acute kidney injury ***E. coli*** **O157:H7**
- Inflammatory diarrhea after eating raw seafood ***Vibrio parahaemolyticus***
- Inflammatory diarrhea followed by ascending paralysis ***Campylobacter jejuni***
- Descending paralysis after ingestion of homemade canned goods ***Clostridium botulinum***

</td></tr>
<tr><td>Osteomyelitis</td><td colspan="2">

What organism is the most likely cause of osteomyelitis given each of the following situations?

- Patient with sickle cell disease ***Salmonella***
- Patient with prosthetic device ***Staphylococcus epidermidis***
- Involvement of the vertebrae ***Mycobacterium tuberculosis***
- Following cat bite ***Pasteurella multocida***
- IV drug user ***S. aureus, Pseudomonas, Serratia, Candida***
- Diabetic with foot ulcer **Polymicrobial, *Pseudomonas*, anaerobes**
- Puncture wound to foot through sneaker ***Pseudomonas***

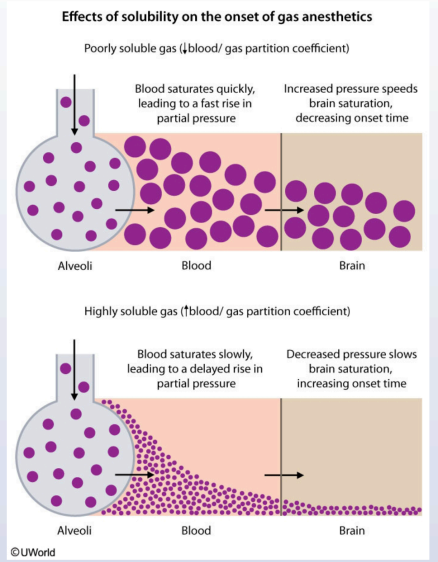
</td></tr>
<tr><td>Soft tissue tumors</td><td>Benign: lipoma
Adults most common: liposarcoma
Kids most common: rhabdomyosarcoma</td><td></td></tr>
<tr><td>Apgar Scoring</td><td>

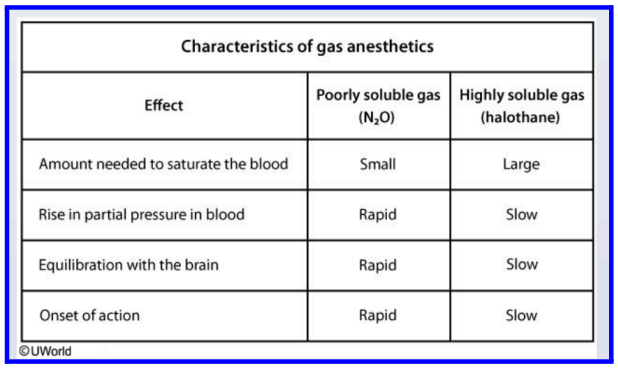
	0	1	2
Appearance	Blue	Pink Trunk	All Pink
Pulse	None	< 100 bpm	> 100 bpm
Grimace	None	Grimace	Grimace and cough
Activity	Limp	Some	Active
Respirations	None	Irregular	Regular

</td><td>Highest score: 10, 2 points per category</td></tr>
<tr><td>E coli</td><td>EIEC: fever and bloody diarrhea
EHEC: sorbitol negative, non-bloody diarrhea. HUS
EAEC: travelers diarrhea
ETEC: nonbloody diarrhea, severe dehydration</td><td>HUS: anemia, thrombocytopenia, uremia</td></tr>
<tr><td>Fly</td><td>Black fly: onchocerca volvulus, river blindness, microfilarial worms
Deer/ Chrysops fly: Loa Loa
Sand fly: Leishmania donovani
Tsetse Fly: Trypanosoma brucei, sleeping sickness</td><td>Reduvid bug/ triatomine: trypanosoma cruz
Ixodes tick: borrelia & babesia</td></tr>
</table>

<table>
<tr><td>Mosquito</td><td>Anopheles: malaria
Aedes: Dengue fever (break bone fever, severe headache, hemorrhagic fever, Tourniquet test w/ petechiae), yellow fever
Mosquito bite birds: west nile virus</td><td></td></tr>
<tr><td>Developmental milestones</td><td><table>
<tr><td>1 month</td><td>lift head, look to faces</td></tr>
<tr><td>2 months</td><td>smile responsively, follow object past midline</td></tr>
<tr><td>4 months</td><td>grasp objects, laugh and squeal responsively, roll over, begin to eat soft foods</td></tr>
<tr><td>6 months</td><td>sit with support, jabber, feed self</td></tr>
<tr><td>9 months</td><td>sit alone and begin to pull to stand</td></tr>
<tr><td>12 months</td><td>wave, have 2 words, use cup, few steps</td></tr>
<tr><td>15 months</td><td>walking, scribbling</td></tr>
<tr><td>18 months</td><td>use utensils for food, stack 2 cubes, 3+ words</td></tr>
<tr><td>24 months</td><td>remove clothing, stack 4 cubes, kick ball</td></tr>
</table></td><td></td></tr>
<tr><td>PAS stain</td><td>Whipple disease, t</td><td></td></tr>
<tr><td>Neonatal conjunctivitis</td><td><table>
<tr><td>Chemical</td><td>Nonpurulent, watery discharge. 1-2 days. Irritation.</td></tr>
<tr><td>Gonorrhea</td><td>Marked conjunctival injection, lid swelling, and purulent discharge. 2-5 days. Corneal involvement may cause blindness. May disseminate.</td></tr>
<tr><td>Chlamydia</td><td>Most common etiology. Mild to severe hyperemia, thick mucopurulent discharge; may be bloody. 5-14 days.</td></tr>
<tr><td>HSV</td><td>Conjunctival injection, nonpurulent discharge. Keratitis. Vesicular skin lesions. Disseminated infection. Days to weeks.</td></tr>
</table></td></tr>
<tr><td>Torches infections</td><td>Intracranial calcifications, hydrocephalus, chorioretinitis: Toxo
Cataracts, deafness, PDA, blueberry rash= rubella
Hearing loss, seizures, chorioretinitis, periventricular calcification= CMV
Recurrent infections, diarrhea= HIV
meningoencephalitis= HSV-2
Hydrops fetalis, notched teeth, saddle nose, saber shins= syphilis</td></tr>
</table>

	Key features of congenital infections*
	Toxoplasmosis: • Chorioretinitis • Hydrocephalus • Diffuse intracranial calcifications
	Syphilis: • Rhinorrhea • Skeletal anomalies • Desquamating rash (palms/soles)
	Rubella: • Cataracts • Heart defects (eg, PDA) • Sensorineural hearing loss
	Cytomegalovirus: • Periventricular calcifications • Microcephaly • Sensorineural hearing loss
	Herpes simplex virus: • Vesicular/ulcerative rash
Withdrawal syndrome	**Benzodiazepine**: anxiety, tremor, insomnia, increased sympathetic activity (diaphoresis, palpitation), psychosis, seizure, death (tolerance, need gradual taper) **Opioid**: **wet**! Nausea, vomit, diarrhea, lacrimation, dilated pupils, **piloerection** (increased PNS), hyperthermia **SSRI**: rebound anxiety/ dysphoria, dizzy, headache, nausea **TCA overdose**: cardiotoxicity, antiCholinergic, CNS
Anesthesia	Liver elimination: Lung elimination: inhaled (halothane) Renal elimination: water soluble Plasma degradation : hoffman elimination, non-depolarizing NMS blocking agent Tissue redistribution: lipophilic, rapid onset and termination (propofol) Low solubility: low blood/ gas coefficient→ blood saturated quickly (nitrous oxide) and plateaus fast High solubility: high blood/ gas coefficient → blood saturated slowly, takes longer to equilibrate in the brain, need more drug to saturate.

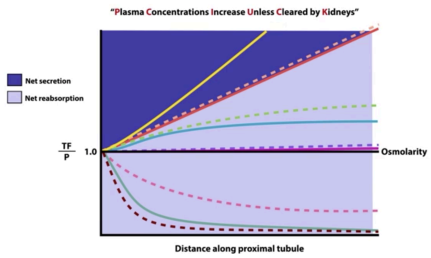


		
DNA	Cats PURRR until they GAG and cough on Fur Balls: - Purine synthesis= glycine, aspartate, glutamine, CO2, Folic acid and THF - Pyrimidine: aspartate, glutamine	**Rate limiting enzyme for purine synthesis : CPS2** **Rate limiting for pyrimidine synthesis: PRPP**
DNA drugs	Hydroxyurea: ribonucleotide reductase DHF reductase: MTX, TMP Thymidylate synthase: 5-FU IMP dehydrogenase: mycophenolate PRPP amidotransferase: 6-MP	
DNA repair	Single strand -nucleotide excision repair: xeroderma pigmentosum -mismatch repair: lynch syndrome HNPCC (s phase) -dsDNA breaks: ataxia telangiectasia, BRCA	
DNA polymerase	DNA delta and alpha: lagging strand DNA alpha: RNA primer DNA beta: repairs DNA DNA gamma: Mitochondrial DNA DNA alpha and epsilon: leading strand	RNA polymerase: 1. rRNA 2. mRNA, snRNA (mushroom toxin) 3. tRNA Prokaryote: 1 RNA polymerase, inhibited by rifampin
STOP codons		Nonsense mutations U go away, U are away, U are gone
X-linked disorders	Oblivious Female with give her boys her X-linked Disorders - Ocular albinism, fabry, wiskott-aldrich, G6PD, Hunter syndrome, Bruton agammaglobulinemia, Hemophilia A and B, Lesch Nyhan syndrome, Duchenne MD	

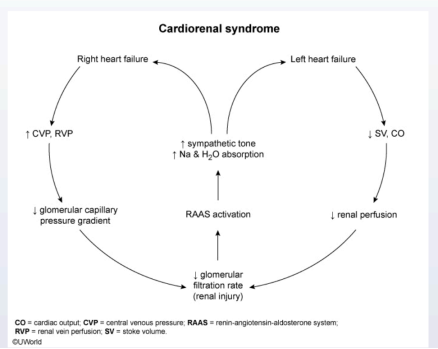
Genetic terms	• **Incomplete penetrance:** with any mode of inheritance, variation in phenotype expression
	  ○ Have Allele but does not express trait: BRCA
	  ○ # symptoms/ # with genotype
	• **Codominance**: 2 alleles, neither dominant. BOTH expressed
	  ○ ABO blood type
	• **Variable expression:** variable phenotype (tuberous sclerosis)
	  ○ Same disease, different symptoms
	  ○ Marfan, NF1
	• **Pleiotropy: 1 gene with many phenotypes (syndromes associated with single gene mutation)**
	  ○ **PKU**
	• **Locus heterogeneity**: mutations at different loci cause same phenotype
	  ○ Homocystinuria, MEN2B, Marfan cause marfanoid appearance, different genes
	• **Allelic heterogeneity**: different mutations in the same locus cause similar phenotypes (cystic fibrosis)
	• **Heteroplasmy**: mitochondrial disease due to random distribution of normal and mutated mitochondria. 1 or more types of mDNA ⇒ variable expression
	  ○ Normal and mutated
	• **Mosaicism**: cells in body have different genetic makeup
	• Imprinting:
	  ○ Prader willi: deletion of paternal gene on Ch15, maternal gene inactivated
	  ○ Angelman: deletion of maternal gene on Ch15, paternal gene inactivated
	• **Anticipation**: increased severity and decreased age of onset. Trinucleotide repeats
		FISH diagnosis
		MAMA: maternal gene, Angelman, happy Mood, Ataxia
		POP: Prader-willi, overeating and obesity, paternal gene

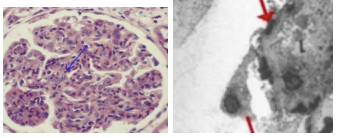
Fungal treatment	Toe fungus (onychomycosis): need oral antifungal Terbinadine (synthetic allylamine, inhibits squalene epoxidase) Amorolfine, Ciclopirox: topical antifungal Oral agents like itraconazole are net well tolerated	
Praziquantel	Schistosoma, clonorchis, paragonimiasis	
Atypical antipsychotics	Low potency: Chlorpromazine, thioridazine→ Anticholinergic High potency: Haloperidol, Trifluoperazine, Fluphenazine → EPS, tardive dyskinesia, NMS	

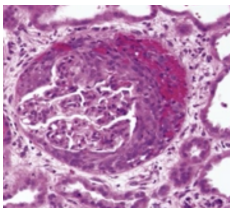
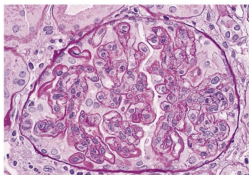
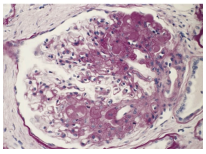
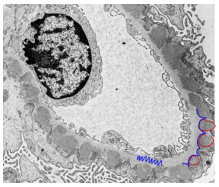
<table>
<tr><td></td><td colspan="2">What movement disorders can be seen as side effects of high-potency traditional neuroleptics?
<table>
<tr><td>Within several days</td><td>• Acute dystonia (sustained muscle contraction)
• Treat by adding an anticholinergic drug</td></tr>
<tr><td>Within the first month</td><td>• Parkinsonian symptoms (bradykinesia, akinesia)</td></tr>
<tr><td>Within the first 2 months</td><td>• Akathisia (restlessness, compulsion to move)</td></tr>
<tr><td>Several months to years</td><td>• Tardive dyskinesia (choreoathetosis of the tongue, face, neck, trunk, or limbs)</td></tr>
</table></td></tr>
<tr><td>Mania</td><td>> 1 week of manic behavior DIGFAST with either impaired function, hospitalization, or psychosis
DIG FAST: distractibility, irresponsible, grandiosity, flight of ideas, agitation/ activity, no Sleep, Talkative
Tx: Lithium, atypical antipsychotics (risperidone, aripiprazole, olanzapine), seizure meds (lamotrigine, valproic acid, carbamazepine)</td><td>Hypomania: > 4 days, no impairment, less severe symptoms
Cyclothymic: mild hypomania and depression for > 2 years, may have short periods of normal</td></tr>
<tr><td>Carbamoyl phosphate</td><td colspan="2"><table>
<tr><th></th><th>CPS I</th><th>CPS II</th></tr>
<tr><td>Location</td><td>Mitochondria</td><td>Cytosol</td></tr>
<tr><td>Pathway</td><td>Urea cycle</td><td>Pyrimidine synthesis</td></tr>
<tr><td>Nitrogen source</td><td>Ammonia</td><td>Glutamine</td></tr>
</table></td></tr>
<tr><td>Depression</td><td>5 out of 9: SIG E CAPS
Tx: SSRI (increase serotonin) 3-4 weeks to work</td><td>SSRI adverse effect: decreased libido</td></tr>
<tr><td>SSRIs</td><td>Avoid taking with SNRI, MAOs, Triptans, St. JOhns Wort, Kava Kava, Tryptophan, amphetamines</td><td></td></tr>
<tr><td>Serum Sickness</td><td>Antibody therapy contains amino acid sequences → CD4 T cells recognize → activate B cells → subsequent infusions trigger memory B cells to become plasma cells → secrete IgG → immune complexes cleared my phagocytes in spleen → overloaded system an cause serum sickness/ type III hypersensitivity reaction , arthralgia, rash, fever
Resolved 5-14 days(antitoxin, antivenom, mAB</td><td>Vs stevens-Johnson syndrome, regulatory T cells downregulate cytotoxic T cells that attack keratinocytes that display drug antigens</td></tr>
<tr><td>Illicit drug intoxication</td><td>Euphoria, grandiosity, paranoid, skin excoriations: methamphetamines
Hallucinations, paranoia, sudden cardiac death: cocaine</td><td></td></tr>
</table>

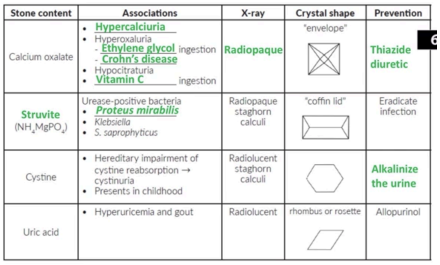
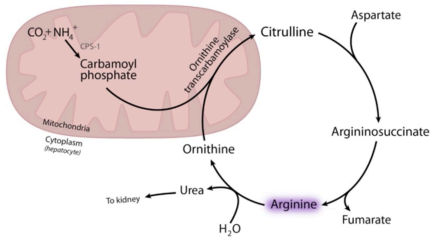
	Synthesia, flashbacks, psychosis: LSD Euphoria, delusions, red eyes, hallucination: marijuana Hallucinogenic, bruxism, serotonin syndrome, hyponatremia: MDMA Violence, homicidal, strong: PCP	
Drug dosing	Fat people: lower dose for polar, hydrophilic drugs (improves efficacy) because drug distribution is limited to ECF. If lipophilic, initial loading dose to saturate fat.	
PCT secretion/ absorption	"Plasma concentration increases unless Cleared by Kidneys" - PAH - Cr/ Inulin - Urea - Chloride - K/ Na	
Nephron	**PCT** absorbs all glucose, amino acids, fluid and electrolytes, isotonic fluid reabsorption Descending loop of Henle: impermeable to Na Thick ascending loop**: impermeable to water,** Ca and Mg reabsorbed. Na/ K/ 2Cl symporter inhibited by Loop diuretics (furosemide), Dilutes urine. Distal tubule/ collecting duct: Principal cells: reabsorb water and Na, secrete K (in presence of ADH); intercalated cells secrete H and HCO3, reabsorb K. - A cells: secrete acid - B cells: secrete HCO3	Diuretics key facts: All increase urinary NaCL (except acetazolamide) All increase urinary K (except K sparing) Acidosis - Carbonic anhydrase inhibitors, K sparing Alkalosis - Loop diuretics - Thiazides
Electrolyte abnormality	**Hyponatremia**: confusion, altered mental status, seizures, stupor, coma Hypercalcemia: stones bones, groans and psychiatric overtones Hypocalcemia: tetany, trousseau sign, chvostek sign Hypomagnesemia: tetany, torsades de pointes, V tachycardia. Hypermagnesemia: hyporeflexia Hypokalemia: prolong QT, torsades de pointes, V tach, inverted T waves, U wave Hyperkalemia: V tach, peaked T waves	

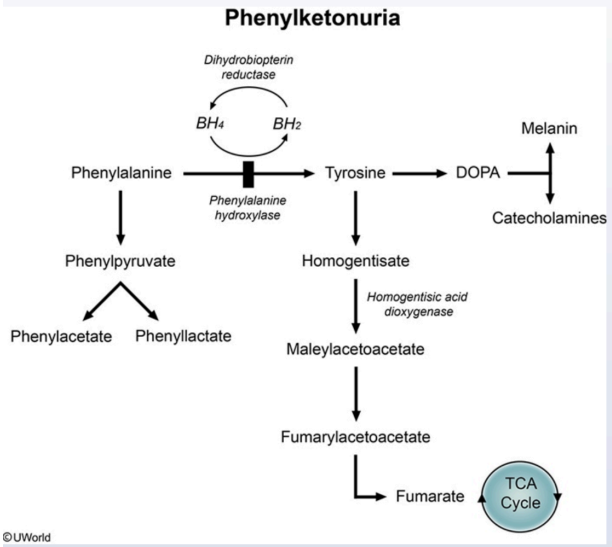
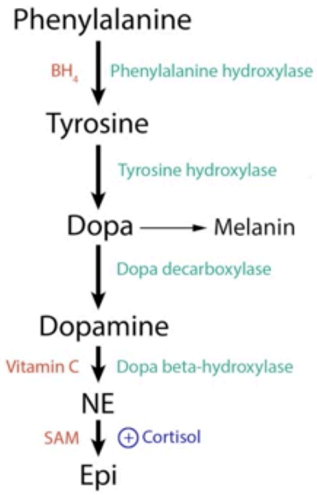
potassium	Shift out of cell → **hyperkalemia** - Low insulin, beta blockers, acidosis (H/K), digoxin, cell lysis → give IV calcium to prevent arrhythmias - ACE inhibitors, K-sparing diuretics Shift into of cell → hypokalemia - Insulin + dextrose, beta agonists, alkalosis (bicarb), cell growth - Loop diuretics, thiazides	**Symptoms of digoxin toxicity** **Cardiac**: • **Life-threateningarrhythmias** **Gastrointestinal**: • Anorexia • Nausea & vomiting • Abdominal pain **Neurologic**: • Fatigue • Confusion • Weakness • **Color vision alterations**
High anion gap metabolic acidosis	MUDPILES - Methanol, uremia, diabetic ketoacidosis, propylene glycol, iron, isoniazid, lactic acid, ethylene glycol, salicylates	
Tumor lysis syndrome	lymphoma/ leukemia rapid cell turnover → release of K, P and uric acid. Uric acid precipitates in acidic urine (collecting ducts)	

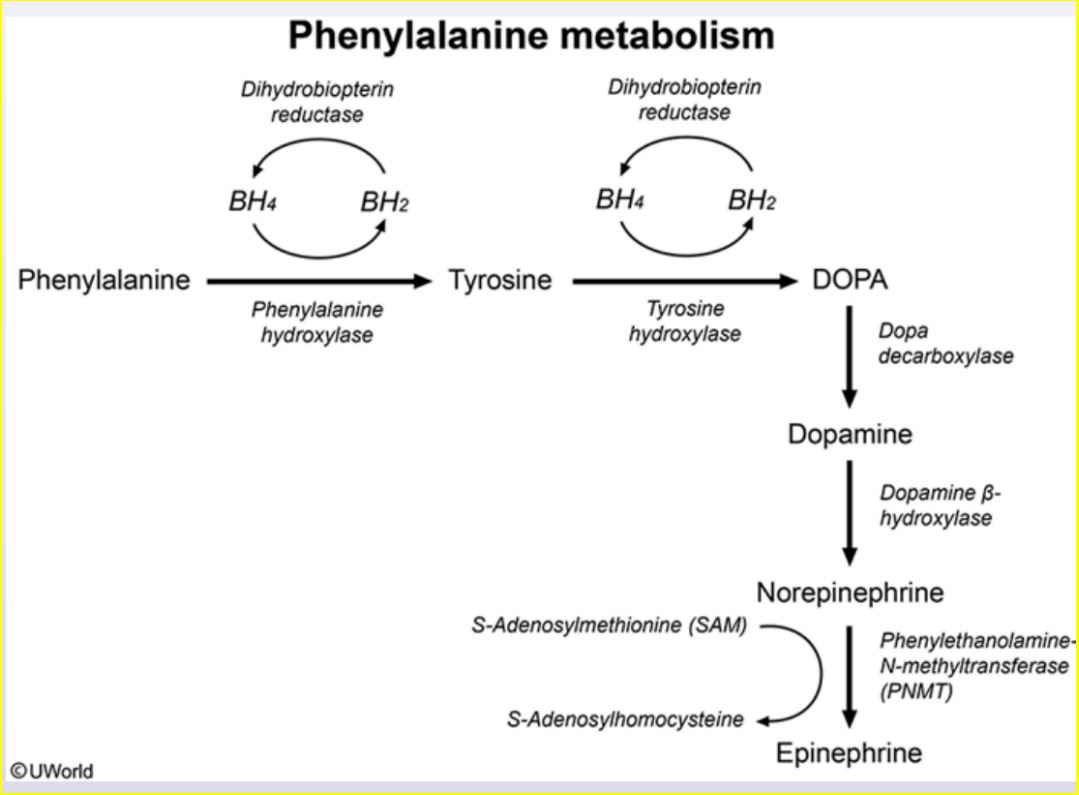
Cardiorenal system	Heart failure → renal hypoperfusion
	- Increased RAAS
	  - AG i increases Na PCT reabsorption (contraction alkalosis)
	  - Increased renal and water uptake
	  - Elevated BUN/ Cr (> 20:1) as urea is reabsorbed with sodium passively
	- ACEinhibitor→ decrease AGII → efferent arteriolar dilation
	KNOW RAAS AND ACE INHIBITORS
		

Post-strep glomerulonephritis	Group A strep (tx or not tx, URI, skin infection, etc) → 2-3 weeks with edema, tea colored urine, low C3. Hypercellular glomeruli, starry sky IF, subepithelial humps (immune complex bumps, type III) Elevated ASO, anti-DNAseB	

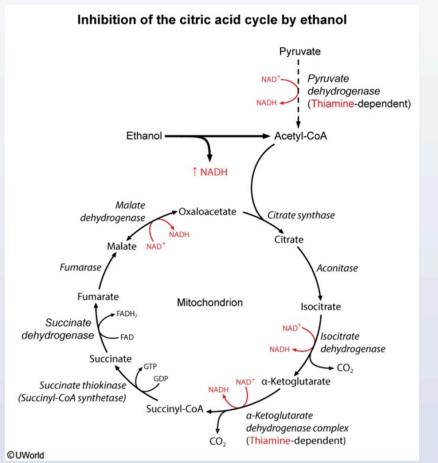
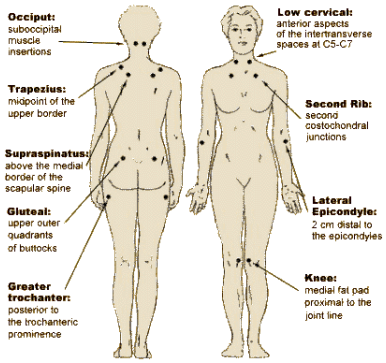
RPGN	Crescentic- very sick, very fast. - Goodpasture: GBM antibodies - Wegeners: c-ANCA/ pr3 - Microscopic polyangiitis: p-anca - SLE **FIBRIN**	
Lupus nephritis	DPGN: wire looping, IgG immune complexes deposit with C3, granular IF	
High yield kidney histology	**Linear pattern IgG deposition on IF: goodpasture** **Anti GBM Ab, hematuria, hemoptysis: goodpasture** Lumpy-bumpy **subendothelial** deposits IgG, IgM, C3: PSGN Deposits of IgA in mesangium: IgA nephropathy, HSP **Crescent: RPGN** Segmental sclerosis and hyalinosis: FSGS Negative IF: wegener/ GPA, microscopic polyangiitis **Wire Loop: Lupus nephritis** **Tram track & spiking of GBM with deposits: MPGN** **Spike and DoME= membranous glomerulonephritis** (phospholipase A2 receptor 1 progrein AutAb) Contrast-induced nephropathy: cytotoxic IV contrast to tubular cells → necrosis of PTC, muddy brown casts Granular pattern IF and diffuse **Capillary thickening**: MPGN, DPGN **Granular pattern IF and diffuse hypercellular glomeruli: Post strep GN**	
Minimal change disease	**Most common nephrotic disease in Children** with recent infection/ immunization, **podocyte effacement** **Tx: corticosteroids**	Diabetic nephopathy= diffuse thickened BM
FSGS	**Most common nephrotic disease in adults**: african american, latinos, HIV LM: segmental sclerosis and hyalinosis	
Membranous nephropathy	Thick BM, s**ubepithelial deposits/ humps** **Dome and spike appearance** Associated with HBV, HCV, many diseases	

MPGN	**Tram track appearance (**membrane proliferating, thickens/ doubles) Type 1: HBV, HCV Type 2: C3 nephritic factor Associated with hep B, hep C, lupus, subacute bacterial endocarditis	
Urinary casts	Hyaline: concentrated urine RBC cast: bleeding WBC cast: tubulointerstitial disease/ pyelonephritis Epithelial cell cast: AIN, glomerulonephritis Granular: ATN Fatty: nephrotic Waxy: end-stage renal disease	
Acute interstitial nephritis	Fever, eosinophilia, azotemia, rash NSAIDS, Abx (penicillins, sulfon, rifampin. Ciprofloxacin, cephalosporins), diuretics, PPIs, cimetidine, allopurinol	
Renal failure	High BUN/ Cr, high potassium Low calcium, low bicarbonate (metabolic acidosis)	
Renal pathology	Wilms tumor: most common in kids, WAGR complex, triphasic cell histology. Transitional cell tumor: most common in GU. smoking, aniline dyes (safranin), cyclophosphamide,naphthalene dyes RCC: most common renal tumor. Clear cell, paraneoplastic syndrome. Anemia very common.	Acute tubular necrosis (ATN): - Ischemia in 1-2 days → oliguria - Maintenance phase: hyperkalemia and metabolic acidosis 1-2 weeks. Tubular necrosis and denuded BM, casts. - Recovery: re-epithelization of tubules
Arginine	Endothelium dependent vasodilation. NO made from arginine, NADPH, O2 Broken down into creatine, urea, NO	arginase/ arginine think Urea cycle and hyperammonemia 

Phenylalanine	**Tyrosine** (decreased in PKU) - PKU cannot convert phenylalanine to tyrosine - **Tetrahydrobiopterin** Dopa (melanin) Dopamine NE and epinephrine PKU: musty smell, intellectual and growth retardation, fair skin, eczema, seizures  	

		
Maple syrup disease	Defective breakdown of branched-chain amino acids (leucine, isoleucine, valine) Transamination to alpha-keto acids Requires **thiamine**	Burnt sugar Tender loving care for Nancy - THIAMINE, lipoate, coenzyme A - FAD, NAD
Diarrhea	Metabolic acidosis (ASSidosis), low bicarb, low CO2	Vomiting causes severe **metabolic alkalosis** and volume depletion
Common mechanism of antibiotic drug resistance	Efflux pumps- active transport of Abx out of bacteria using ATP, sodium or proton electrochemical gradients. Fluoroquinolones: alter binding site DNA gyrase/ topoisomerase Penicillins, carbapenems: beta lactamases	
Reactive attachment disorder	~ depression in kids. Separation from parent can lead to withdrawn, isolation, and poor grooming	

Rate limiting enzymes	Glycolysis: PFK1 Gluconeogenesis: F 1,6 BPase Glycogeen synthesis: glycogen synthase Glycogenolysis: glycogen phosphorylase TCA cycle: isocitrate dehydrogenase Hexose monophosphate shunt: G6P dehydrogenase De novo pyrimidine synthesis: CPS-2 De novo purine synthesis: glutamine PRPP amidotransferase	
Pyruvate Dehydrogenase complex	**TLC for Nobody:** - Thiamine pyrophosphate- B1 - Lipo acid - B5 (CoA) - B3- NAD - B2- FAD, riboflavin Deficiency causes neurologic defects	**Arsenic poisoning: garlic breath, inhibited lipoic acid** Alpha-ketoglutarate dehydrogenase requires the same cofactors as PDS
Pyruvate	OAA, aceteyl- CoA, lactate, alanine	
TCA cycle	Citrate synthase Isocitrate dehydrogenase (rate limiting) Alpha-ketoglutarate dehydrogenase	NADH: malate, isocitrate, alpha-Ketoglutarate FADH2= succinate dehydrogenase ⇒ fumarate
Electron transport chain	Inhibited by MPP/ MPTP, antimycin A, rotenone, cyanide, azide, CO, H2S	Decreased ATP synthesis by increasing mitochondrial membrane permeability via thermogens, high dose aspiring, 2,4 DNP
HMP shunt	Regenerates NADPH→ **fatty acid synthesis, oxygen free radicals, protect RBCs from radicals- glutathione reduction, cyp450**	**Glutathione reductase and G6PD**
RBC enzyme disorders	Pyruvate kinase deficiency: cannot make ATP, lack of glycolysis → hemolysis G6PD deficiency (X-linked): inability to protect from oxidation injury - Protected from malaria - Used in mammary glands, liver, adrenals and RBCs	G6PD damage : Spleen Purges Nasty Inclusions from damaged cells - Sulfonamide, primaquine, nitrofurantoin (UTI), fava beans, isoniazid, dapsone, chloroquine
Classic galactosemia	Failure to thrive, jaundice, hepatomegaly, infantile cataracts (~ galactokinase deficiency), intellectual disability	Galactose-1-phosphate uridyl transferase
Acute intermittent porphyria	Accumulation of ALA and porphobilinogen (inherited PBG deaminase deficiency) combined with ALA synthase induction. Glucose or hemin inhibits ALA synthase	
Porphyria cutanea tarda	Most common porphyria (defective heme synthesis) Increased uroporphyrinogen III → decreased Coprop Severe cutaneous photosensitivity and hyperpigmentation	

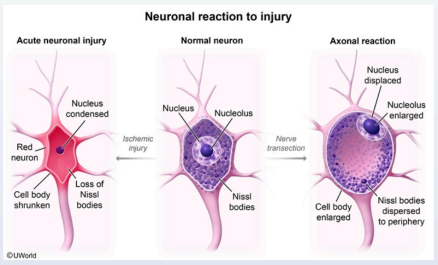
Acute alcohol ingestion without eating	NADH shunts pyruvate to lactate and oxaloacetate to malate. Can no longer perform gluconeogenesis due to ethanol metabolism Ethanol metabolism by alcohol dehydrogenase and aldehyde dehydrogenase reduces NAD+ to NADH → increased NADH/ NAD - Inhibits GNG - Inhibits conversion of malate to OAA	
Smooth muscle myosin-light chain kinase	Dihydropyridine CCB, epinephrine, PGE2, PDE3 inhibitor (milrinone) → vascular SMC relaxation → vasodilation → decrease in BP	
Polymyositis	Autoimmune, endomysial, muscle weakness Elevated CK, aldolase, ANA, anti-Jo1 Ab	
Polymyalgia rheumatica	Proximal muscle and joint pain (hips and shoulder) and stiffness. No muscle weakness (normal CK). Giant cell arteritis . WOmen > 50 Normal CK, elevated ESR/ CRP	Tx Low dose corticosteroids
fibromyalgia	More chronic and widespread MSK pain, tender points, morning stiffness, paresthesias, cognitive disturbances 	Tx exercise, TCAs muscle relaxers, SSRIs

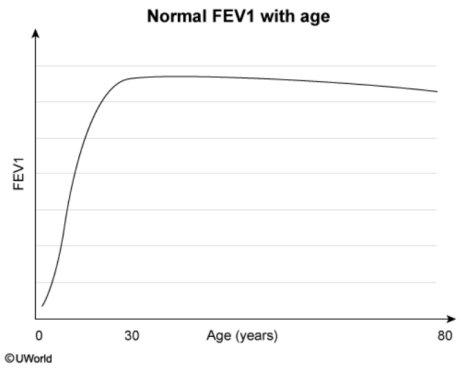
<table>
<tr><td>Fibromuscular dysplasia</td><td colspan="2">Luminal stenosis and aneurysmal dilation , loss of internal elastic lamina
String of beads
<table><tr><th colspan="2">Fibromuscular dysplasia</th></tr><tr><td>Manifestations</td><td>• Fibromuscular webs (luminal stenosis) alternating with areas of aneurysmal dilation
• Loss of the internal elastic lamina
• Most common in women, age <55</td></tr><tr><td>Presentation</td><td>• Resistant hypertension (RAS)
• CNS involvement: Headache, TIA, stroke, ruptured aneurysm</td></tr><tr><td>Diagnosis</td><td>• Angiography (CT, MRI, percutaneous)
• String-of-beads appearance (multifocal disease)</td></tr></table></td></tr>
<tr><td>Bipolar disorder

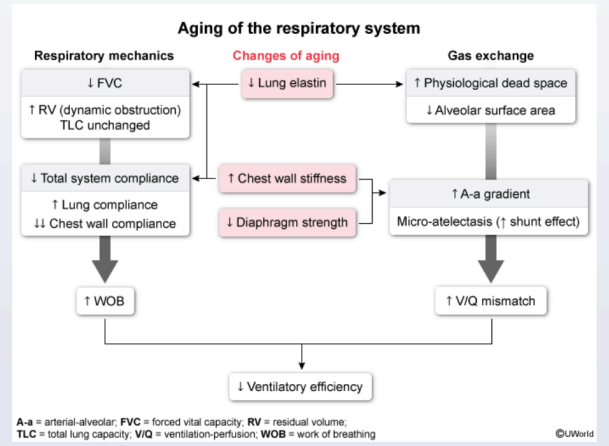
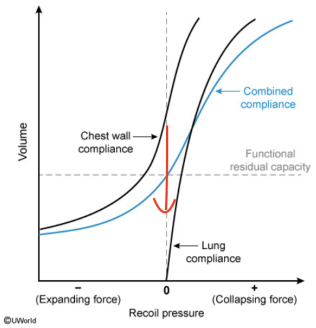
Cyclothymia- hypomania and dysthymia, not quite bipolar or MDD</td><td><table><tr><th colspan="3">Mood stabilizers in bipolar disorder</th></tr><tr><th></th><th>Indications</th><th>Adverse effects</th></tr><tr><td>Lithium</td><td>• Manic & depressive features</td><td>• Diabetes insipidus
• Hypothyroidism
• Tremor
• Ebstein anomaly (teratogenic)</td></tr><tr><td>Valproate</td><td>• Manic features</td><td>• Hepatotoxicity
• Neural tube defects (teratogenic)</td></tr><tr><td>Carbamazepine</td><td>• Manic features</td><td>• Aplastic anemia
• SIADH
• Neural tube defects (teratogenic)</td></tr><tr><td>Lamotrigine</td><td>• Depressive features</td><td>• Benign rash
• Stevens-Johnson syndrome</td></tr></table></td><td>Treat with Lithium
Manic features
- Valproate
- Carbamazepine
Depressive features: lamotrigine

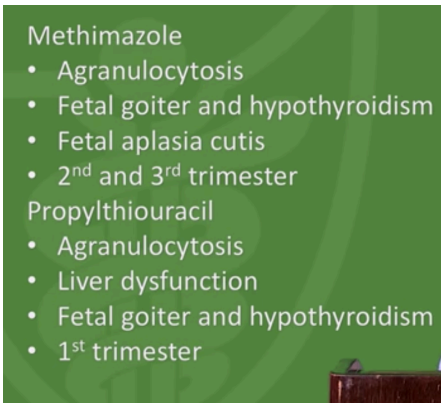
AVOID antidepressant monotherapy in bipolar maintenance due to risk of mood destabilization
<table><tr><th colspan="2">Manic episode</th></tr><tr><td>Clinical features</td><td>• ≥1 week of elevated or irritable mood & increased energy/activity
• ≥3 of the following symptoms (4 if mood is irritable only) (DIGFAST mnemonic):
○ Distractibility
○ Impulsivity/indiscretion, risky behavior
○ Grandiosity
○ Flight of ideas/racing thoughts
○ Increased activity/psychomotor agitation
○ Decreased need for sleep
○ Talkativeness/pressured speech</td></tr><tr><td>Severity</td><td>• Impaired psychosocial function
• May have psychotic features (hallucinations, delusions)
• May require hospitalization</td></tr></table></td></tr>
<tr><td>Manic episodes</td><td>Bipolar 1 is MANIA +/- depression or</td><td>Bipolar 2 is hypomania and major depressive episodes</td></tr>
</table>

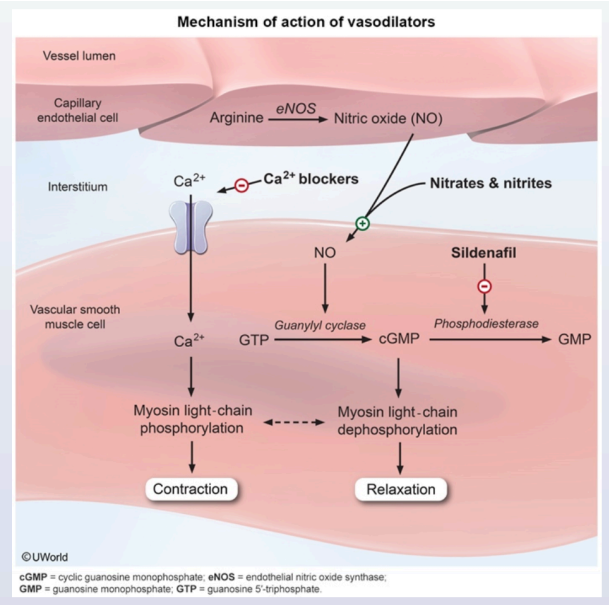
	Bipolar I Disorder Criteria: *"manic episode"* +/- depressive episode • 4 of 7 DIGFAST symptoms • at least 1 week • OR hospitalization • OR w/ psychosis **hypomania (don't have to present with depression)** *"Mania is ONE FUN week"* *"Major Depression is TWO BLUE weeks"* Tx: lithium, valproic acid, carbamazepine, olanzapine, SSRI **NEVER Give SSRI alone to a mania susceptible patient**	**Bipolar II Disorder** Criteria: *"hypomanic episode"* +/- depressive episode • 3 of 7 DIGFAST symptoms • at least 4 days • NO Manic or Psychosis *"HYPO Man3a"* *"Hypo" = 4 letters = 4 days* *3 = 3 of 7 sxs*
Budd-chiari syndrome	Hepatic vein thrombosis (centrilobular congestion and fibrosis) Vs. portal vein thrombosis (no histologic changes)	Chiari malformation 1: tonsillar herniation Chiari malformation 2: tonsil and vermis herniation
Hormone signaling	**Gs/ cAMP**= (FLAT anterior pituitary hormones): FSH, LH, ACTH, TSH, HcG - GhRH, CRH, PTH, calcitonin, glucagon, V2 Gi/ decrease cAMP Gq/ IP3-DAG: GnRH, TRH, oxytocin, vasopressin V1 (hypothalamic) Tyrosine kinases: GH, insulin, prolactin, IGF, PDGR, FGF, cytokines **Steroid** / nuclear receptors: sex hormones, glucocorticoids, aldoserone, Thyroid, Vit D cGMP: NO, ANP	
POMC	Pro-Opio-Melano-Cortin → - ACTH → cortisol - MSH → Melanin - Endorphins	**Addison's disease** leads to increased ACTH release from the anterior pituitary → increased melanin production (darkened skin), increased endogenous "morphine" natural pain relief/ analgesia in spinal cord → decreased pain signaling thru descending pathways - Commonly due to autoimmune destruction - TB in developing world
Wallerian degeneration	Body of neuron= axonal regeneration, extends to closest node of ranvier - Increase protein= PINK - Enlarged round cells, peripheral nuclei, fine granular Nissl substance (central chromatolysis)	Irreversible injury - Shrinkage of neuron body, deep pink, pyknosis, loss of Nissl

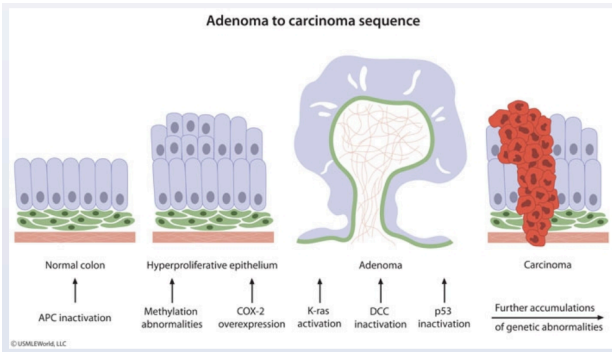
		
Adrenal steroid synthesis deficiency 1 in first digit (11B, 17a)= HTN 1 in 2nd digit= masculinization	3B-HSD - Cannot make any of the steroid hormones, salt wasting, early death 17-**a**-hydroxylase - Female unable to mature (cannot make sex hormones or cortisol) - Sodium and fluid retention → **hypertension** (increased **a**ldosterone) 21-a-hydroxylase - Cannot make cortisol, aldosterone (hypotension), electrolyte abnormalities - Increased sex hormones (**masculinization**) 11-B-hydroxylase - Decreased cortisol and aldosterone synthesis - Increase deoxycorticosterone **(weak aldosterone)** → **HTN** - Increased sex hormone (**masculinization**)	11β - hydroxylase HTN Masculinization 17α - hydroxylase HTN 21α - hydroxylase Masculinization
Exogenous steroids	Increased negative feedback to GnRH → testicular atrophy Decreased LH and FSH increased testosterone Increased aromatase activity → estradiol	
Cushing's syndrome	BAM, CUSHINGOID - Buffalo hump, amenorrhea, moon facies, crazy - Ulcers, skin changes, HTN, infection, necrosis of femoral head, glaucoma, osteoporosis, immunosuppression, diabetes	Side effects of long-term synthetic glucocorticoids use.
Cushing disease	ACTH pituitary tumor	Small cell lung cancer produces ectopic ACTH or adrenal adenoma secreting cortisol
Cushing ulcers	Stress related mucosal disease → vagal stimulation	Curling ulcers from severe trauma or burns

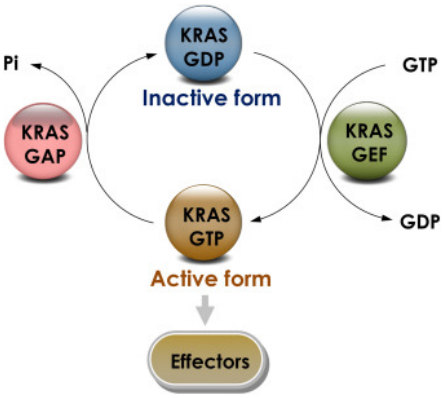
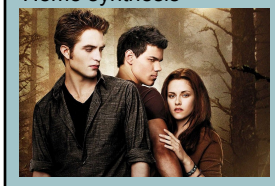
<table>
<tr><td>Dexamethasone suppression test</td><td colspan="2">
<table>
<tr><th></th><th>Low dose</th><th>High dose</th></tr>
<tr><td>Normal</td><td>↓ cortisol</td><td></td></tr>
<tr><td>ACTH-producing pituitary tumor</td><td>↑ cortisol</td><td>↓ cortisol</td></tr>
<tr><td>Ectopic ACTH production</td><td>↑ cortisol</td><td>↑ cortisol</td></tr>
<tr><td>Cortisol-producing tumor</td><td>↑ cortisol</td><td>↑ cortisol</td></tr>
</table>
Most common causes of cushing syndrome: exogenous steroid use > ectopic ACTH > cushing disease from pituitary adenoma > adrenal cortisol tumor
</td></tr>
<tr><td>EPO tumors</td><td>Pheochromocytoma, Renal cell carcinoma, hemangioblastoma, HCC</td><td></td></tr>
<tr><td>Age-related CV changes</td><td>
<table>
<tr><th colspan="2">Physiologic age-related cardiovascular changes</th></tr>
<tr><td>Aortic stiffening</td><td>• Elastin replacement with collagen
• ↑ Pulse pressure (isolated systolic HTN)</td></tr>
<tr><td>Mild concentric LVH*</td><td>• Response to cardiomyocyte dropout & ↑ afterload
• Resting EF, SV & cardiac output maintained
• ↓ Maximal cardiac output</td></tr>
<tr><td>Conduction cell degeneration</td><td>• Slightly ↓ resting heart rate
• ↓ Maximal heart rate</td></tr>
<tr><td>Reduced baroreceptor sensitivity & adrenergic responsiveness</td><td>• ↑ Orthostasis
• ↓ Heart rate & contractility response
• ↑ Circulating catecholamines</td></tr>
</table>
</td><td>Isolated systolic hypertension (increased pulse pressure)
Increased collagen deposition, decreased elastin
- Increase aortic lumen
- Decreased sympathetic tone in older age
- Reduced compliance of arteries</td></tr>
<tr><td>Age-related respiratory changes</td><td>
</td><td>Old balloon= increased compliance
Increased chest wall stiffness= decreased FRC/ total respiratory system compliance
Increased dead space
Increase A-a gradient, decline PaO2, normal PaCO2 (no hypoventilation)</td></tr>
</table>

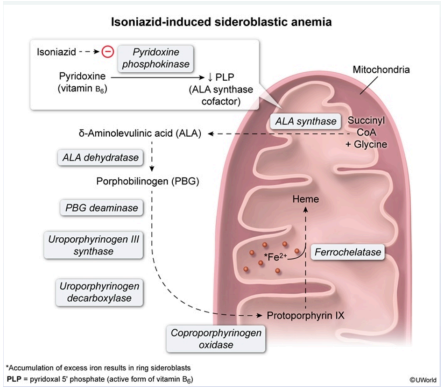
		
thyroid	3rd week gestation, endoderm Descends, pyramidal, ectopic thyroid tissue under tongue	Pregnancy increases TBG, increased T3/T4, TSH lowered
Congenital hypothyroidism	Thyroid agenesis, ectopia, hypoplasia, antithyroid (**propylthiouracil cross the PLACENTA...Levothyroxine does not**) medication or Ab from mothers, iodine deficiency in mothers. - Enlarged tongue and abdomen, impaireed growth, intellectual disability	Compare to diabetiic mother with hyperglycemia, causes hypoglycemia in the neonate due to insulin hypertrophy
Hashimotos	**Painless goite**r + **hypothyroidism** - Autoimmune destruction * hurthle cells - TSH high, free T4 and t3 low - **Anti TPO +/-** - HLA-DR5, B5, type IV Hypersensitivity - **Risk of B cell lymphoma (immune cells, lymphocytes), marginal cell lymphoma** - Hypercholesterolemia due to decreased LDL receptor expression - **Myxedema COma (**everything slows down)	Early: euthyroid Inflammation: transient hyperthyroidism for a few months Chronic: hypothyroid, scarred shrunken thyroid, resembles a LN. Polyglandular autoimmune disease Causes elevated LDL and cholesterol
Subacute granulomatous thyroiditis	**Painful goiter with granulomatous infiltration** - Viral infection trigger - Return to euthyroid	Early: hyperthyroid Late: hypothyroid
Riedel's thyroiditis	Painless, rock like goiter - fibrosis, macrophages, eosinophils	Hypothyroid or euthyroid
Graves disease	Autoimmune Anti TSH antibody → excess stimulation and secretion of T3, T4 - HLA-DR3, DR8	Radioactive iodine, increased uptake

	- Tx: methimazole (inhibits ionization of T3) - Fetal aplasia cutis (no skin on scalp) Pretibial myxedema, thyroid dermatopathy → fibroblasts deposit glycosaminoglycans	
Toxic adenoma/ multinodular goiter	Focal patches of hyperfunctioning follicular cells - Mutated TSH receptors - Hyperfunctioning, benign - Cold nodules are malignant	Increased iodine in hot nodules= NODULAR
Thyroid cancer	Good prognosis - **Papillary thyroid (RET, BRAF), orphan annie (most common) - Follicular (PAX8-PPARy) Medullary carcinoma (RET, MEN2A and 2B): high calcitonin, congo red stain TRK activation: papillary and medullary (RET)	Surgical complications - Removal of parathyroid glands: hypocalcemia, damage to recurrent laryngeal nerve
Pancreatic secretions	Secretin: increase bicarb secretion, decreases chloride secretion Pancreatic juice is an isotonic secretion (Na, K same as plasma). High bicarb and lower Cl than plasma.	
Plasmodium, malaria	Chloroquine is a treatment of choice. - African malaria is resistant, so treat with **atovaquone=proguanil** or artemisinins (eesp for P falciparum) Life-threatening malaria: Quinidine, artesunate	Diamond ring= trophozoite Ruptures cell, cyclic fever= merozoite Replicates in cells= schizont - Take entire mefloquine tx to remove hepatic schizonts Injected into host: sporozoite Banana shaped: gametocyte

<table>
<tr><td>Nitroglycerin</td><td>
</td><td>Nitrates: NO → increase GC → increase cGMP → decrease calcium, reduced MLCK phosphorylation → vascular SMC relaxation</td></tr>
<tr><td>parasite</td><td colspan="2">Ascaris lumbricoides: most common intestinal roundworm parasite in the world. Pulmonary hypersensitivity.
Ancylostoma duodenale: microcytic anemia (tx: mebendazole, albendazole)
Strongyloides: nematode
<table><tr><th colspan="2">Therapy for Different Organisms</th></tr><tr><th>Antimicrobial</th><th>Organism</th></tr><tr><td>Nifurtimox</td><td>Trypanosoma cruzi</td></tr><tr><td>Suramin and melarsoprol</td><td>Trypanosoma brucei</td></tr><tr><td>Chloroquine</td><td>Plasmodial species other than P. falciparum</td></tr><tr><td>Ivermectin</td><td>Roundworm, ectoparasites, onchocerciasis, lymphatic filariasis</td></tr><tr><td>Mebendazole</td><td>Roundworm, hookworm, whipworm, threadworm, pinworm, intestinal form of trichinosis</td></tr></table></td></tr>
<tr><td>Light's criteria pleural effusions</td><td>Light's criteria:
Ratio of pleural fluid protein/serum protein > 0.5
Ratio of pleural fluid LDH/serum LDH > 0.6
Pleural fluid LDH > 2/3 upper limit of normal of serum LDH (upper limit of normal of serum LDH = 280 U/L)</td><td>Really high protein and LDH suggests exudate</td></tr>
<tr><td>Lipodystrophy</td><td>Redistribution of fat
- Leptin deficiency
- Hiv meds (protease inhibitors)</td><td></td></tr>
</table>

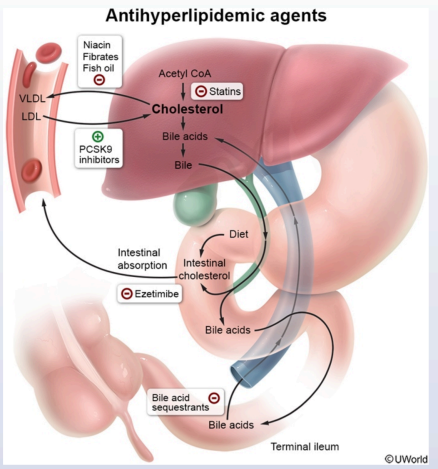
Metabolic syndrome	⅗ criteria - Wasit > 40 (men), > 35 (women) - Trigs > 150 - HDL < 40 (men), < 50 (women) - BP > 130/ 85 - Glucose > 100	Complications of obesity: PCOS, fatty liver (NASH), T2DM
Tremor	Essential tremor; family, action tremor, worsens with stress and alcohol. Parkinsonism / MPTP/ dopaminergic medications: tremor at rest, improves with action	
Coagulopathies	Hemophilia: Increased PTT - Hemophilia A= factor 8 - Hemophilia B= factor 9 Factor V leiden mutation: Va resistant to inactivation by protein C (thrombosis) Antithrombin deficiency: clots, resistance to heparin Protein C or S deficiency: cannot inactivate factors V and VIII: clots	Vitamin K: 2, 7, 9, 10, C and S - PT and PTT increased
Trendelenburg sign	Hip drop due to **superior gluteal nerve injury** (gluteus medius, minimus and tensor fascia latae). Pts lean to ipsilateral side to stabilize the pelvis	Inferior gluteal nerve innervates the gluteus maximus
Stool Ova and parasites	Parasite eggs in stool: schistosomiasis Perianal eggs: pinworm, enterobius Proglottids in stool: tapeworm, tinea, phyllo Trophozoites and cysts: giardia, entamoeba Rhabditiform larvae: strongyloides	
Adenocarcinoma sequence		**APC** (tumor suppressor, beta-catenin controls cell growth)→ **Kras** activation (resistant to anti-EGFR agents, signaling protein)→ **p53** (tumor suppressor in DNA repair, apoptosis, cell cycle) APC (hyperplasia, B-catenin accumulation) Kras (adenoma) P53 (adenocarcinoma)

		
Therapeutic hypothermia	Neuronal damage after hypoxic ischemic injury decreased with hypothermia → decreased cellular metabolism	
Osteoblasts	Cleidocranial dysplasia due to CBFA1 mutation. Defective membranous bone → frontal bossing, facial bone malformation, supernumerary teeth, absent clavicles	
Basophilic stippling	Lead poisoning (denatured ribonuclease), thalassemia, anemia chronic disease, alcohol abuse	
Target cells	THAL: thalassemia, Hgb C, asplenia, liver disease	Thalassemia: transfusion, chelation. Hemosiderin laden kupffer cells
erythropoiesis	Young Liver synthesizes Blood - Yolk sac (very early) - Liver - Spleen - Bone marrow (28 weeks)	
Heme synthesis 	ALA synthase: rate limiting step - Inhibited by isoniazid / lack of B6 ALA dehydratase - Lead poisoning **Acute intermittent porphyria (porphobilinogen deaminase)**: ab pain, port wine urine, polyneuropathy, psych, drugs (barbiturates, seizure, rifampin, metoclopramide). Red urine, peripheral neuropathy, precipitated by drugs. **Porphyria cutanea tarda (uroporphyrinogen decarboxylase)**: hyperpigmentation, hypertrichosis (hair), photosensitivity, LFTs. Tea-colored urine. (vampire, werewolves), hepatitis C, jaundice	

<table>
<tr>
<td>Iron studies</td>
<td>
<table>
<tr><th>Diagnosis</th><th>Serum iron</th><th>TIBC</th><th>Ferritin</th><th>% transferrin saturation</th></tr>
<tr><td>Iron deficiency anemia</td><td>↓</td><td>↑</td><td>↓</td><td>↓ (< 12%)</td></tr>
<tr><td>Anemia of chronic disease</td><td>↓</td><td>↓</td><td>Nl or ↑</td><td>Nl (> 18%)</td></tr>
<tr><td>Hemochromatosis</td><td>↑</td><td>↓</td><td>↑</td><td>↑</td></tr>
<tr><td>Sideroblastic anemia</td><td>↑</td><td>↓</td><td>↑</td><td>Nl or ↑</td></tr>
</table>
</td>
<td>
</td>
</tr>
<tr><td>Lambert-eaton myasthenic syndrome</td><td>autoAb against voltage-gated calcium channels → progressive muscle weakness that improves with repetitive motion</td><td></td></tr>
<tr><td>Waardenburg syndrome</td><td>Patchy depigmentation of skin, hair and irises, cochlear dysfunction.
Defect in neural crest cells melanocytes</td><td></td></tr>
<tr><td>Chelation</td><td>Drug interactions that decrease absorption of one drug
- Ionic supplements with Abx (tetracycline or fluoroquinolones) or levothyroxine</td><td></td></tr>
<tr><td>Virology</td><td>Double stranded viruses
- recombination : crossing over chromosomes→ subsequent progeny have resistance
Segmented viruses
- Reassortment: host cell coinfected with 2 segmented viruses that exchange whole genome segments. Alterations in surface antigens that are RETAINED
Phenotypic mixing
- Host cell coinfected with 2 viruses, progeny acquire traits. Genome unchanged. Subsequent progeny do NOT retain traits.</td><td></td></tr>
<tr><td>Hematologic mutations</td><td>Burkitt lymphoma = cMyc Oncogene/ transcription
BCL2 overexpression= follicular lymphoma
DNA repair enzymes: BRCA1/2= breast, ovarian cancer, lynch, xeroderma pigmentosum, fanconi anemia
Cyclin D1, G1-> S= mantle cell lymphoma
TRK= bcr-abl fusion gene, CML</td><td></td></tr>
<tr><td>Lymphoma</td><td colspan="2">Hodgkin: single group of LN, painless, rubbery. B symptoms. Reed-sternburg. Bimodal age distribution
- Nodular sclerosing: common in women= men adults. Bands of collagen and nodules.
- More Reed-sternberg worse it is</td></tr>
</table>

<table>
<tr><td></td><td>
- Lymphocyte rich: best prognosis, young males
- Lymphocyte poor: worst prognosis, high reed-sternberg cells.

Non-hodgkin: LN and other tissues.
- B cell lymphomas: elderly, most common in adults. BCL2, 6 anti-apoptotic.
- Follicular : T (14;18),
- Burkitt: c-MYC oncogene, t(8:14), EBV
- Mantle cell lymphoma: t(11;14), cyclin D, G→ S
</td></tr>
<tr><td>Leukemia</td><td>
ALL: B> T. Tdt+
AML: t(15;17), middle aged adults. Auer rods, exposure to radiation, benzene, alkylating. MPO+
<table>
<tr><th>ALL</th><th>AML</th></tr>
<tr><td>• Philadelphia chromosome may be seen (poor prognosis)
• Most common in children and young adults
• Males > females, whites > blacks
• B cell types more common than T cell
• 3 morphologic variants and 5 phenotypic variants
• Bone pain is common
• Very good prognosis in children (up to 90% remission)
• Most have the enzyme terminal deoxynucleotidyl transferase (TdT)
• PAS (+)
• Difficult to diagnose on blood smear (others can be diagnosed with smear)</td><td>• Philadelphia chromosome rarely seen
• Characteristic Auer rods
• 8 different morphological classifications
• Most are CD13/33 (+)
• Usually nonspecific esterase (+) myeloid cells
• Median age of onset is 65
• PAS (-)
• Associated with numerous risk factors</td></tr>
</table>
<table>
<tr><th>CLL</th><th>CML</th></tr>
<tr><td>• Most common adult leukemia seen in western countries
• Males > females, whites > blacks
• Elderly adults (median age of diagnosis is 70)
• 95% have B cell markers (rather than T cell)
• 10% progress to ALL
• Characteristic smudge cells
• Autoimmune hemolytic anemia
• Tends to be indolent</td><td>• May progress to AML (80%) or ALL (20%)
• Numerous basophils and PMNs are LAP (-)
• Adults ages 25-60
• Hyperplasia of all 3 cell lines (granulocytic, erythroid, and megakaryocytic) but granulocyte precursors predominate
• Philadelphia chromosome (t 9;22) is always present
• Fatigue, abdominal pain, splenomegaly, bleeding tendency</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td>Lipid lowering agents</td><td>Bile acid binding resins: cholestyramine, colestipol, colesevelam: decrease LDL, increase TRIGS and VLDL.
Ezetimibe: inhibits GI absorption of cholesterol→ lowers LDL.
Fibrates: inhibit TRIG production in liver. 1st line for hypertriglyceridemia.
Niacin: reduce TRIGS, raise HDL, decrease VLDL, decrease LDL.</td><td>
</td></tr>
<tr><td>Dissociative disorders</td><td colspan="2"><table>
<tr><th colspan="2">Dissociative disorders</th></tr>
<tr><td>Depersonalization/derealization disorder</td><td>• 1 or both:
○ Depersonalization (detachment, unreality of self)
○ Derealization (detachment, unreality of surroundings)</td></tr>
<tr><td>Dissociative amnesia</td><td>• Inability to recall personal information, usually of a traumatic or stressful nature</td></tr>
<tr><td>Dissociative identity disorder</td><td>• Fragmentation into ≥2 distinct personalities
• Discontinuity in identity & personal agency</td></tr>
</table></td></tr>
<tr><td>Immune privilege</td><td>Sequestered antigens (testes and eyes) protect organs from inflammation. When exposed,, self-antigens are seen as foreign</td><td></td></tr>
<tr><td>Rett syndrome</td><td>Regression of milestones
X-linked genetic disorder, appears around 6-18 months
Writhing hand movements
Arrested brain development</td><td></td></tr>
<tr><td>Virus structure</td><td colspan="2">Enveloped: spread via respiratory, parenterally, sexually
Non-enveloped: fecal- oral
- Reovirus, hepevirus, picornavirus, calicivirus, RNA
- “My real Heavy picture of California was ruined without an envelope”
- Replicate in cytoplasm
- Parvovirus, papillomavirus, adenovirus, polyomavirus, DNA</td></tr>
</table>

	- PapPa and Aunt Poly didn't have an envelope - Replication in nucleus	
DNA viruses	Happy Hippo Dung - Herpesvirus - Adenovirus - Parvovirus (**ssDNA**) - Papillomavirus (**circular**) - Hepadnavirus (**circular**) - Polyomavirus (**circular**) - poxvirus	Linear dsDNA Icosahedral shape Need polymerase
RNA virus	Positive sense - Retrovirus - Togavirus - Flavivirus - Coronavirus - Hepevirus - Calicivirus - picornavirus	+ Sense ssRNA + Serves as mRNA - Sense ssRNA - Needs viral transcriptase
Viral vaccines	Live attenuated: weakened virus, long lasting immunity - Smallpox, yellow fever, chickenpox, MMR, sabin polio (oral), zoster, rotavirus Killed virus (not as robust), need boosters - Flu, rabies, hepA, salk polio (injected) Subunit vaccine (specific antigens) - HepB, HPV	Yellow fever - Skin test and desensitize if egg allergy Influenza and MMR - Produce Ab to hemagglutinin antigen to prevent viral entry (inactivated) - Ab and cytotoxic T cell response (live vaccine)
Antiviral	Prophylaxis for influenza A: zanamivir, oseltamivir Chronic Hep C: ribavirin, IFNa 1st line for HSV and VZV: acyclovir, valacyclovir Inhibits DNA polymerase when phosphorylated by viral thymidine kinase - acyclovir	
HIV	CCR5, CXCR4 : gp120 (dual tropism) - **Ccr5 maraviroc** inhibits on T Cells/ macrophages Gp41: fusion and entry (**enfuvirtide**) P24 "gag" gene Gp120 and gp41 "env" (**maraviroc**) Reverse transcriptase "pol" Window period: p24 antigen and HIV Ab, Viral load, CD4 counts 1st month: negative test, asymptomatic, flu-like retroviral Latent: asymptomatic AIDS: low CD4, opportunistic infections	RNA + HIV RT ⇒ DNA → integrate into host DNA → transcription and translation with hist machinery -- package and protease processing
AIDs illness	200 - PCP (pneumocystis): interstitial pneumonia	

- **TMP-SMX or dapsone**

< 50
- MAC
  - **Azithromycin**
- Histoplasmosis
- Cryptococcus
- Cryptosporidiosis (diarrhea)
- candidiasis
- Toxoplasmosis (multiple ring enhancing)
  - < 100, **TMP-SMX or dapsone leucovorin**
  - **Active sulfadiazine**
- CNS lymphoma (1 ring enhancing)
- CMV retinitis “cheese pizza” eyes
- PML= reactivated JC virus

AIDS dementia (due to HIV)

HIV therapy

Protease inhibitors
- Prevent new virus formation
  - NEVER enter

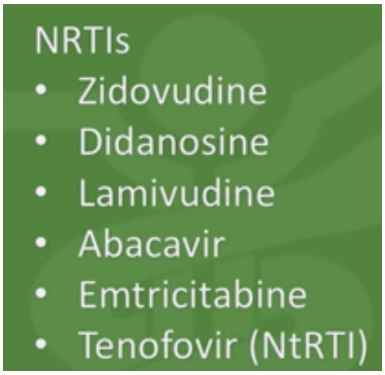
Side Effect	HIV Drug or Class
GI intolerance	Protease inhibitors
Inhibit cytochrome P450	Protease inhibitors (especially ritonavir)
Hyperlipidemia/hyperglycemia	Protease inhibitors
Lipodystrophy	Protease inhibitors
Pancreatitis	Ritonavir
Nephrolithiasis	Indinavir, atazanavir
Increased bilirubin	Atazanavir

- **Ritonavir: Pancreatitis,** nephrolithiasis, bilirubin
- Lipodystrophy
- Hyperglycemia and hyperlipidemia
- GI intolerance



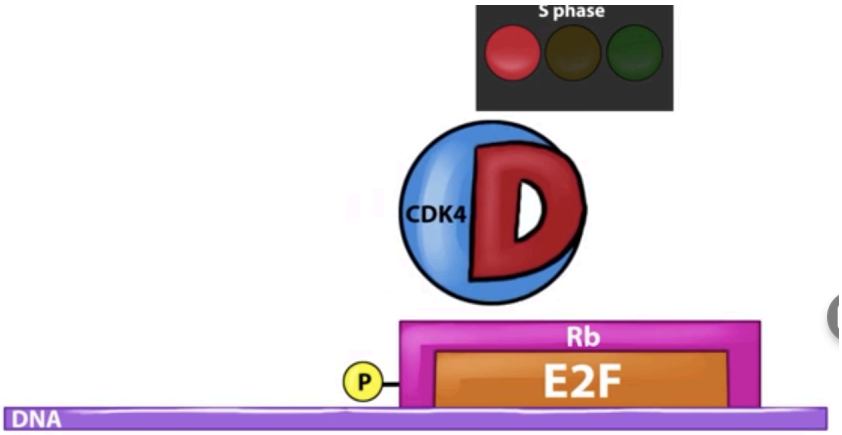


NRTI (Dine at the Restaurant, cave, favor)
- Competitive inhibitors HIV reverse transcriptase
- Nucleosides need to be phosphorylated (G, C analogs) by thymidine kinase
  - Tenofovir is a nucleoTide, no phosphorylation
- Zidovudine: HIV+ mothers and newborns, **anemia**
- Abacavir: hypersensitivity, rash, diarrhea, cough
- **Didanosine: pancreatitis, peripheral neuropathy, hepatic steatosis**
- Bone marrow suppression**, lactic acidosis**



	<table><tr><th>Side Effect</th><th>HIV Drug or Class</th></tr><tr><td>Bone marrow suppression</td><td>Zidovudine</td></tr><tr><td>Pancreatitis and peripheral neuropathy</td><td>Didanosine, zalcitabine, stavudine</td></tr><tr><td>Hepatic steatosis</td><td>Didanosine, stavudine</td></tr><tr><td>Hypersensitivity reaction</td><td>Abacavir</td></tr></table>	
	NNRTIs (Nevir Rip Del EF ET) - Non-competitive inhibitors HIV reverse transcriptase - -apine or virine <table><tr><th>Side Effect</th><th>HIV Drug or Class</th></tr><tr><td>Rash</td><td>NNRTIs</td></tr><tr><td>Neuropsychiatric symptoms: nightmares, vivid dreams, dizziness, worsening depression</td><td>Efavirenz</td></tr><tr><td>False-positive drug test to cannabinoids</td><td>Efavirenz</td></tr><tr><td>Teratogenic</td><td>Efavirenz</td></tr></table> Efavirenz has more complications	
RAS-MAPk	Ras TRK, ligand growth factor → MAPK - Active with GTP - Inactive with GDP	
Typhoid fever	Typhoid: capsular Ag Vi inhibits PMN phagocytosis → extensive intra phagocytic multiplication - Developing countries - Rose spots, fever, hepatosplenomegaly NOntyphoidal - Invasion into enterocytes, self-limited	Salmonella - Non-lactose fermenting GNR
Muscle contraction	Cardiac: L-calcium influx → activates RyR→ Ca=**troponin** SMC: L-Calcium influx → activatesRyR→ **Ca-calmodulin** Skeletal muscle : L-type Ca channel-RyR directly -- SER calcium release, mechanical coupling	
Parasites you eat - nematodes	Enterobius: pinworm, fecal-oral Pinworm/ ascaris: cough and swallow - Loffler eosinophilic pneumonitis Trichinella spiralis: periorbital edema, eat cysts in meat	Benazoles Pyrantel pamoate **EAT= meat**
Penetrate skin - Nematodes	Strongyloides: soil → lung → GI tract ancylostoma/ necator **SAND**	Ivermectin= strongyloides Benazoles Pyrantel pamoate
Cestodes = tapeworms	Taenia solium - Undercooked pork	Albenazole Praziquantel

	- Contaminated water: **cysticercosis** = swiss cheese brain Diphyllobothrium latum: raw fish, B12 deficiency Echinococcus: dog feces, cysts in liver → anaphylaxis	dexamethasone
flukes	**Schistosoma** - Freshwater snail→ **swimmers itch,** skin, lungs, mesenteric vessels, lower UTI. - Portal HTN, splenomegaly - **Squamous cell carcinoma , bladder cancer** Clonorchis - Undercooked fish - **Cholangiocarcinoma**	Praziquantel Albendazole
	Wuchereria bancrofti - Mosquito → **elephantiasis**, hydrocele - Filariasis	Diethylcarbamazine
Ectoparasites	Lice- permethrin crabs= pubic lice, sexual/ close contact → **permethrin** Scabies- lives in epidermis in crevices, webspaces Bedbugs: linear bites	
Parasite treatment	Metronidazole: giardia, entamoeba, trichomonas Chloroquine + primaquine: P vivax, P ovale Chloroquine resistant malaria: mefloquine, proguanil, quinine Praziquantel: flukes, schistosoma, clonorchis Bendazole, pyrantel pamoate: hookworm, pinworm, roundworm Chagas: benznidazole, nifurtimox Leishmania: cutaneous= sodium stibogluconate, visceral= liposomal Amph B	Primaquine: hypnozoites, prevent relapsing malaria mefloquine= for all marlaria species prevention chloroquine= rbc intracellular form
Cancer genetics	Tumor suppressor (both copies, two-hit) - RB and P53 (G1-S) → CDK4-Cyclin D, Rb mutation cannot inhibit E2F - RB: b/L retinoblastoma, osteosarcoma - Most cancers have p53 mutation → p21, progress thru cell cycle - APC, DPC, NF1, NF2, WT1, WT2	



Cancer screening

	USPSTF Recommended Screening
Breast cancer	Mammogram every 2 years from 50-75
Cervical cancer	Pap smear every 3 years from 21-65
Prostate cancer	No recommended screening
Colon cancer	Colonoscopy every 10 years from 50-75
Lung cancer	Annual chest CT with a 30-pack history of smoking from 55 to 80

Tumor markers

- Hepatocellular carcinoma – AFP
- Ovarian cancer – CA-125
- Pancreatic cancer – CA 19-9, CEA
- Melanoma – S-100
- Colon cancer – CEA

Tumor suppressors
Oncogenes

Gene	Associated Tumor	Mechanism
BCR:ABL	CML	9;22 translocation
BCL-2	Follicular and undifferentiated lymphomas	14;18 translocation
CCND1	Mantle cell lymphomas	11;14 translocation
C-Myc	Burkitt's lymphoma	8;14 translocation
L-Myc	Lung tumor	amplification
N-MYC	Neuroblastoma	amplification
ERB-B2	Breast, ovarian, and gastric carcinomas	amplification
CDK4	Melanoma	amplification
RET	Multiple endocrine neoplasia IIA and B	point mutation
C-KIT	Gastrointestinal stromal tumor (GIST)	point mutation
RAS	Colon carcinoma	point mutation

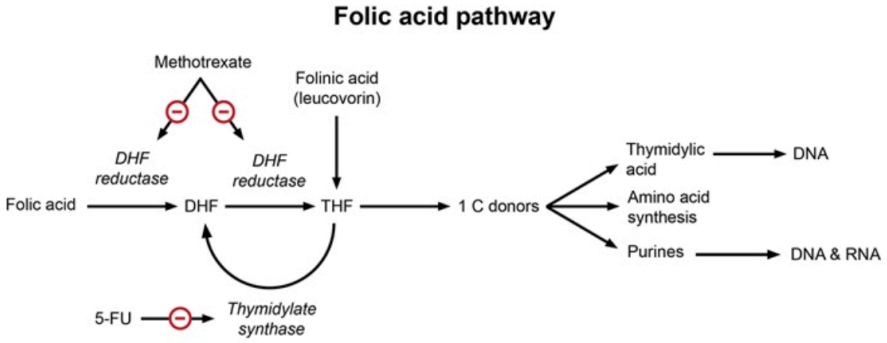
Gene	Associated Tumor
APC	Colorectal cancer (associated with FAP)
p16	Melanoma
WT1	Wilms' tumor
Rb	Retinoblastoma and osteosarcoma
BRCA2	Breast cancer
NF1	Neurofibromatosis type 1
BRCA1	Breast and ovarian cancer
TP53	Most human cancers and Li-Fraumeni syndrome
DPC	Pancreatic cancer (stands for deleted in pancreatic cancer)
DCC	Colon cancer (stands for deleted in colon cancer)
NF2	Neurofibromatosis type 2

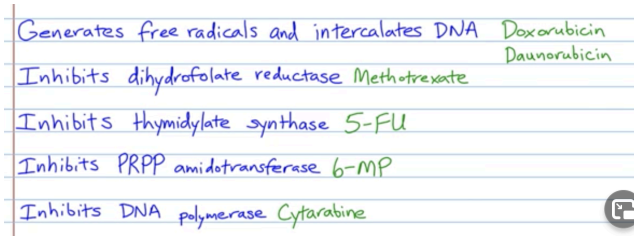
Anticancer

Methotrexate (folic acid analog, inhibits DHF reductase) : leukemia, uterine cancer, immunosuppression
- Reversed with **leucovorin / folinic acid**
  - Myelosuppression, fibrotic lung, teratogenic

5-FU (pyrimidine analog, inhibits thymidylate synthase): colon, pancreatic, PCC and Actinic keratosis
- **Reversed by uridine**

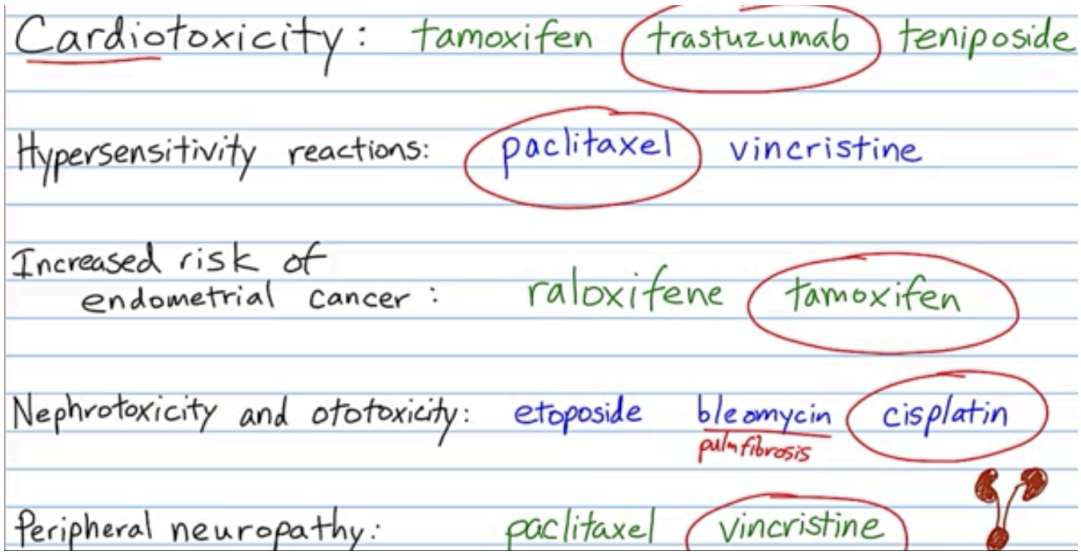
6-MP (inhibits PRPP amidotransferase): gout (metabolized by xanthine oxidase)
6-thioguanineL given with allopurinol
Cladribine: inhibits DNA Pol/ induce DNA breaks → hair cell leukemia
Cytarabine: pyrimidine analog (C,T), inhibits DNA polymerase





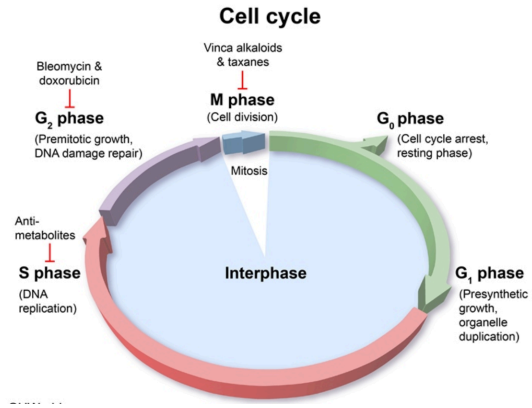
Alkylating agents	Cyclophosphamide - Hemorrhagic cystitis (due to toxic acrolein) → prevent with mesna	
Antitumor drugs	Doxorubicin, daunorubicin - Intercalate DNA, superoxide dismutase - Cardiotoxicity → treat with **Dexrazoxane** Dactinomycin - wilms, ewing, rhabdomyosarcoma - Children ACT WEiRd	
Testicular cancer	Etoposide, bleomycin, Cisplatin	
	Inhibits microtubule formation Vincristine Inhibits microtubule disassembly Paclitaxel Inhibits ribonucleotide reductase Hydroxyurea Inhibits topoisomerase I Topotecan Inhibits topoisomerase II Etoposide	

Drug	Give with...	For...
Dexrazoxane	Doxorubicin Daunorubicin	Cardiotoxicity
Leucovorin	Methotrexate	Myelosuppression
Mesna	Cyclophosphamide	Hemorrhagic cystitis
Uridine	5-FU	Myelosuppression

		
E coli	virulence/ anti-phagocytic= K capsule Septic shock= Lipid A	
Perineal body	Integrity of pelvic floor - Separates urogenital and anal triangles - Bulbospongiosus m. - External anal sphincter - Superficial and deep transverse perineal muscles - Fibers from external urethral sphincter, levator ani and muscular coat of rectum	Midline episiotomy from posterior vaginal opening → pelvic organ prolapse or dyspareunia
JVP pressure waves	**Bifid carotid pulse:** aortic regurgitation > **HOCM** Carotid bruit: atherosclerosis Cannon waves: heart block and ventricular tachycardia Slow rising, decreased volume carotid pulse: pulsus parvus et tardus: aortic stenosis	

<table>
<tr>
<td>Antibiotic resistance</td>
<td>
<table>
<tr><th colspan="2">Common antibiotic resistance mechanisms</th></tr>
<tr><td>Penicillins</td><td>• Beta-lactamase, ESBL
• Mutated PBP
• Mutated porin protein</td></tr>
<tr><td>Vancomycin</td><td>• Mutated peptidoglycan cell wall
• Impaired influx/increased efflux</td></tr>
<tr><td>Quinolones</td><td>• Mutated DNA gyrase
• Impaired influx/increased efflux</td></tr>
<tr><td>Aminoglycosides</td><td>• Aminoglycoside-modifying enzymes
• Mutated ribosomal subunit protein
• Mutated porin protein</td></tr>
<tr><td>Tetracyclines</td><td>• Impaired influx/increased efflux
• Inactivated enzyme</td></tr>
<tr><td>Rifamycins</td><td>• Mutated RNA polymerase</td></tr>
</table>
</td>
<td></td>
</tr>
<tr>
<td>Penicillin</td>
<td>Staph and other gram positive: mutate PBP and pprin
E coli: plasmid, resistance to monobactams, third generation cephalosporins → tx: carbapenem
Pseudomonas: porin mutations → penicillin and aminoglycoside resistance</td>
<td></td>
</tr>
<tr>
<td>Amphotericin B</td>
<td>TERRIBLE!
- electrolyte disturbances (hypokalemia, hypomagnesemia) → increase distal tubular membrane
- → arrhythmias</td>
<td></td>
</tr>
<tr>
<td>Digoxin</td>
<td>Improves ventricular rate control in A fib.
Decrease AV node conduction, increase vagal PNS tone
Positive inotropic in left ventricular systolic dysfunction
Increases inotropy (increase intracellular sodium and calcium)
- Decrease Na efflux, K influx
- Decrease Ca efflux (Na/Ca exchanger)
- Ca binding to troponin C
- Actin-myosin crossbridge formation
- Improved myocyte contractility</td>
<td>Hyperkalemia, life threatening arrhythmias</td>
</tr>
<tr>
<td>Vasodilators</td>
<td>DHP calcium channel blockers, nitroglycerin, ACE inhibitors</td>
<td>Avoid in HOCM</td>
</tr>
<tr>
<td>Fatty acid oxidation</td>
<td>Acyl-coA synthase
- Primary carnitine deficiency → weakness, cardiomyopathy, hypoketotic hypoglycemia, elevated TRIGS
Acyl-CoA dehydrogenase</td>
<td>Defects in beta oxidation
- Carnitine shuttle fatty acids into mitochondria
acetyl -coA carboxylase is rate limiting enzyme in fatty acid synthesis</td>
</tr>
</table>

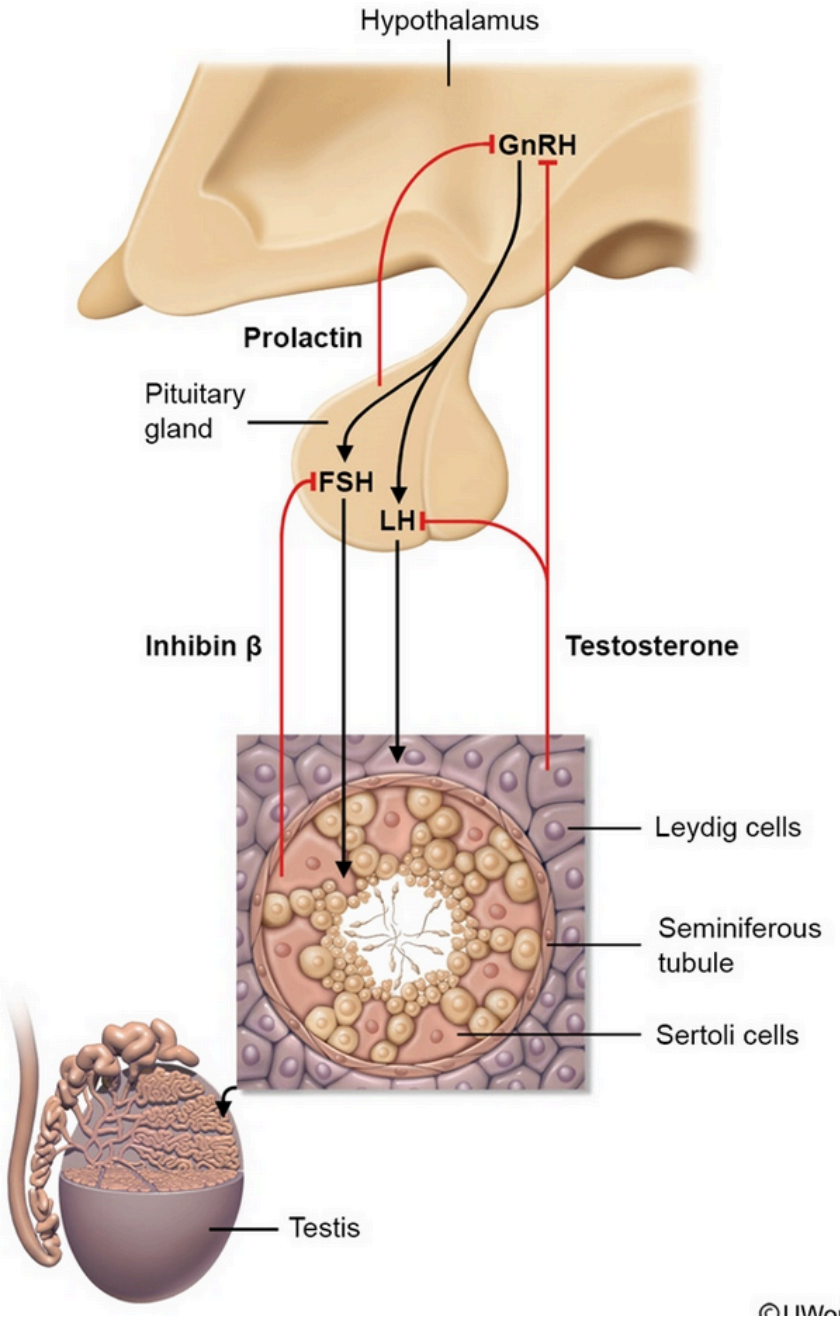
<table>
<tr><td></td><td>- MCAD deficiency → seizure, death, hypoketotic hypoglycemia</td><td></td></tr>
<tr><td>Mitochondrial pathways</td><td>Beta oxidation, TCA cycle, carboxylation of pyruvate in GNG</td><td></td></tr>
<tr><td>Cytosolic pathways</td><td>Glycolysis, fatty acid synthesis, pentose phosphate pathway</td><td></td></tr>
<tr><td>Hand foot and mouth disease</td><td>Enterovirus / coxsackie(oral ulcers and extremity rash→ myocarditis and meningitis)</td><td></td></tr>
<tr><td>PFT</td><td>
<table>
<tr><th></th><th>Obstructive</th><th>Restrictive</th><th>Mixed</th></tr>
<tr><td>FEV1:FVC</td><td>Reduced
⩽70%</td><td>Normal
>70%</td><td>Reduced
⩽70%</td></tr>
<tr><td>FEV1</td><td>Reduced
<80%</td><td>Variable</td><td>Reduced
<80%</td></tr>
<tr><td>FVC</td><td>Normal
>80%</td><td>Reduced
<80%</td><td>Reduced
<80%</td></tr>
<tr><td>TLC</td><td>Normal / Increased</td><td>Reduced
<80%</td><td>Variable</td></tr>
<tr><td>RV</td><td>Normal / Increased</td><td>Reduced</td><td>Variable</td></tr>
<tr><td>DLCO</td><td>Reduced: emphysema
Normal: asthma, chronic bronchitis</td><td>Reduced: parenchymal
Normal: chest wall / neuromuscular</td><td></td></tr>
</table>
</td><td>restrictive= obese, fibrosis
obstructive= asthma, COPD</td></tr>
</table>

Cell cycle inhibitors		Vinca alkaloids and vinblastine: arrest cells in metaphase
Calories	4 cal/g = protein or carb 9 cal/g= fat 7 cal/g= ethanol	
Membrane potential	polarization= more positive hyperpolarization= more negative	**K+ most abundant in cell** Na+ most abundant outside cell Ca and Cl outside of cell
Cell surface receptors	Polar on outside and inside Non-polar in middle: alanine, valine, leucine, isoleucine, phenylalanine, tryptophan, methionine, proline, glycine	

G protein	Transmembrane receptor → GDP → GTP
	- Gs: ATP → cAMP → PKA
	- Gi: inhibits and decreases cAMP
	- Gq: GDP⇒ GTP → phospholipase C →
	  - IP3= Ca released from endoplasmic reticulum
	  - DAG= PKC	

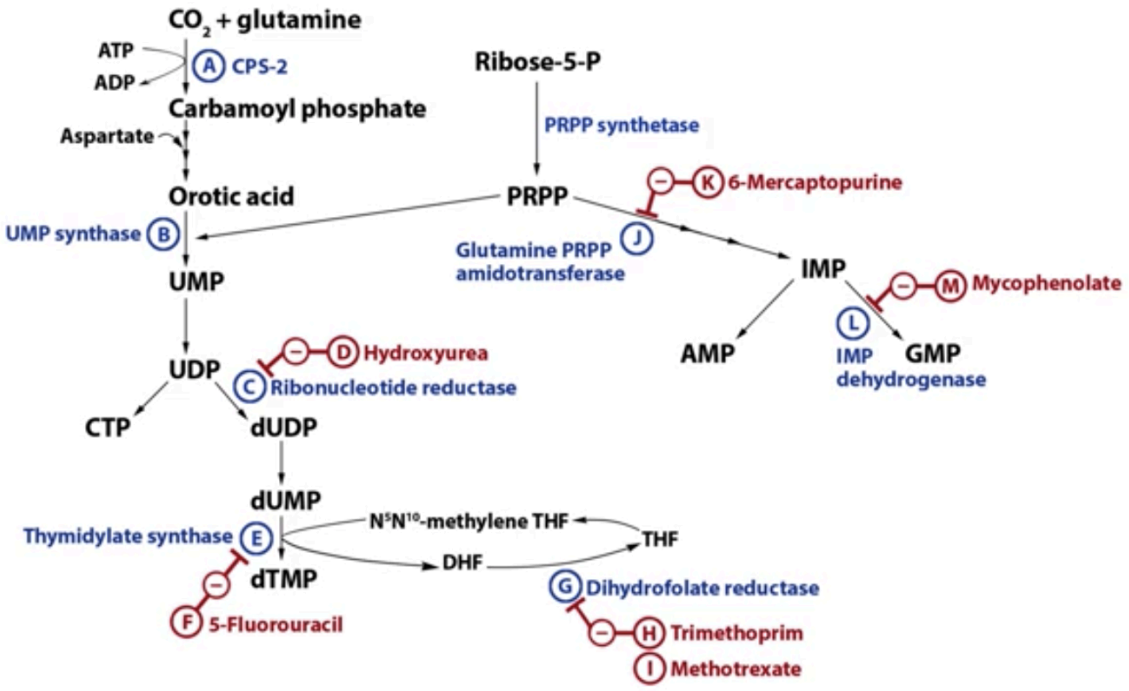
SIBO	Bacteria overgrowth causes deficiency in B12, A, D, E and iron Causes increases in K and folate	

Prolactin and gonadotropin production

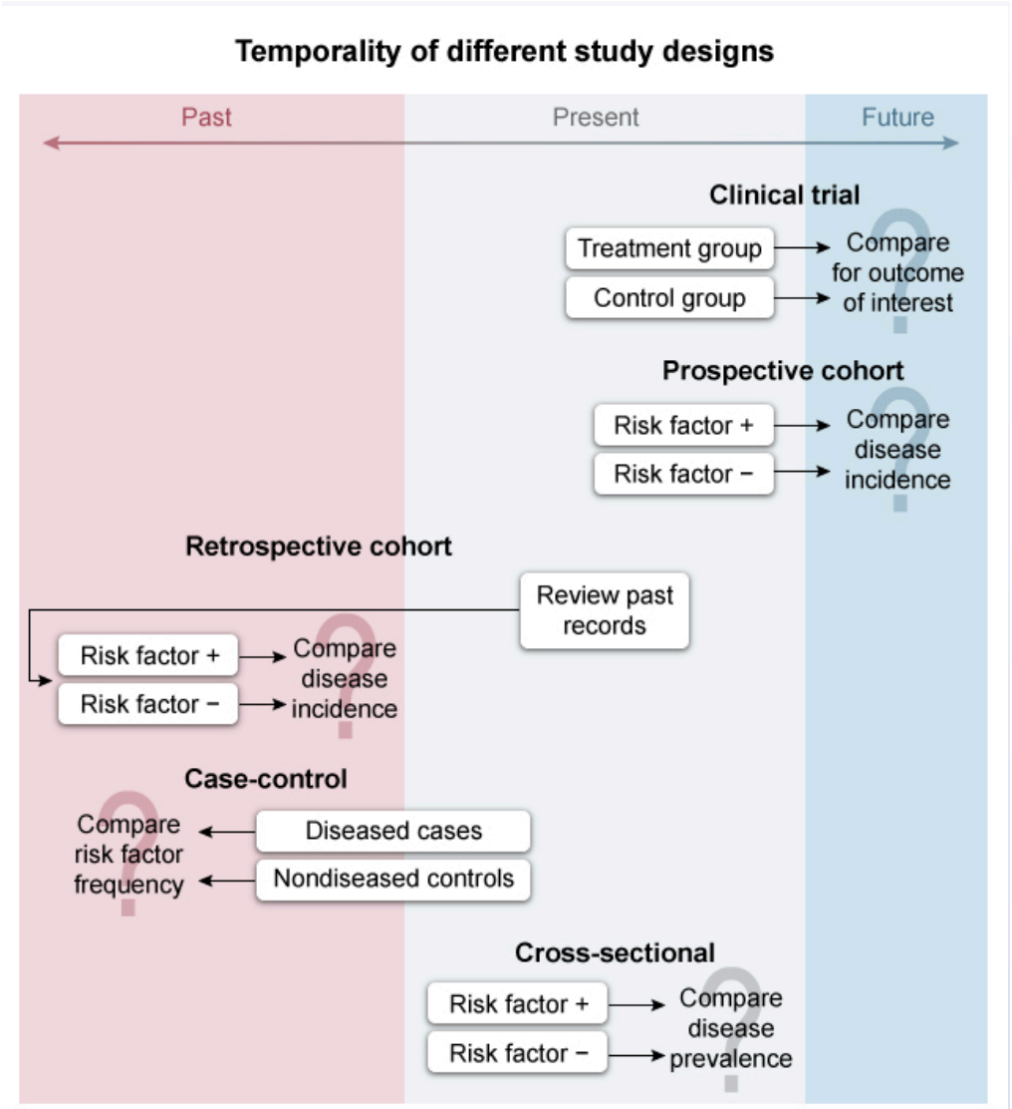


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Common causes of primary acid-base disturbance	
Metabolic acidosis	**Elevated anion gap** • Poor tissue perfusion (ie, lactic acidosis) • Diabetic ketoacidosis • Renal failure (ie, uremia) • Certain toxicities (eg, methanol, ethylene glycol) **Normal anion gap** • Severe diarrhea • Renal tubular acidosis • Excess normal saline infusion
Metabolic alkalosis	• Nasogastric suctioning or severe vomiting • Diuretic overuse • Primary hyperaldosteronism
Respiratory acidosis (hypoventilation)	• Central respiratory depression (eg, opioid overdose) • OHS, neuromuscular weakness • Chronic obstructive pulmonary disease
Respiratory alkalosis (hyperventilation)	• Acute V/Q mismatch (eg, PE, pneumonia) • Anxiety, inadequate pain control • High altitude, pregnancy


CO_2 + glutamine
ATP
ADP
A CPS-2
Carbamoyl phosphate
Aspartate
Orotic acid
UMP synthase B
UMP
UDP
D Hydroxyurea
C Ribonucleotide reductase
CTP
dUDP
dUMP
Thymidylate synthase E
N^5N^{10}-methylene THF
THF
DHF
dTMP
F 5-Fluorouracil
G Dihydrofolate reductase
H Trimethoprim
I Methotrexate
Ribose-5-P
PRPP synthetase
PRPP
K 6-Mercaptopurine
Glutamine PRPP amidotransferase
J
IMP
M Mycophenolate
L
IMP dehydrogenase
AMP
GMP

Common measures of therapeutic efficacy		
Term	**Definition**	**Calculation**
Absolute risk reduction (ARR)	Percentage indicating the actual difference in event rate between control & treatment groups	ARR = control rate – treatment rate
Relative risk reduction (RRR)	Percentage indicating relative reduction in the treatment event rate compared to the control group	RRR = ARR / control rate
Relative risk (RR)	Ratio of the probability of an event occurring in the treatment group compared to the control group	RR = treatment rate / control rate
Number needed to treat (NNT)	Number of individuals who need to be treated to prevent a negative outcome in 1 patient	NNT = 1 / ARR



		Dependent variable	
		Qualitative (categorical)	*Quantitative*
Independent variable	*Qualitative (categorical)*	Chi-square, logistic regression*	*t*-test, ANOVA, linear regression
	Quantitative	Logistic regression*	Correlation, linear regression

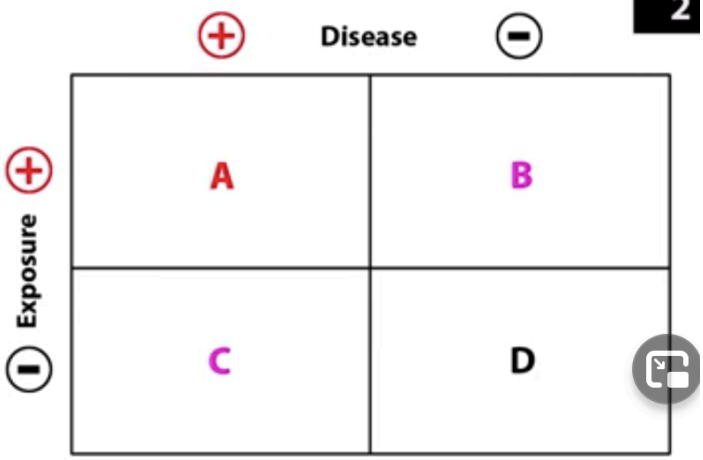
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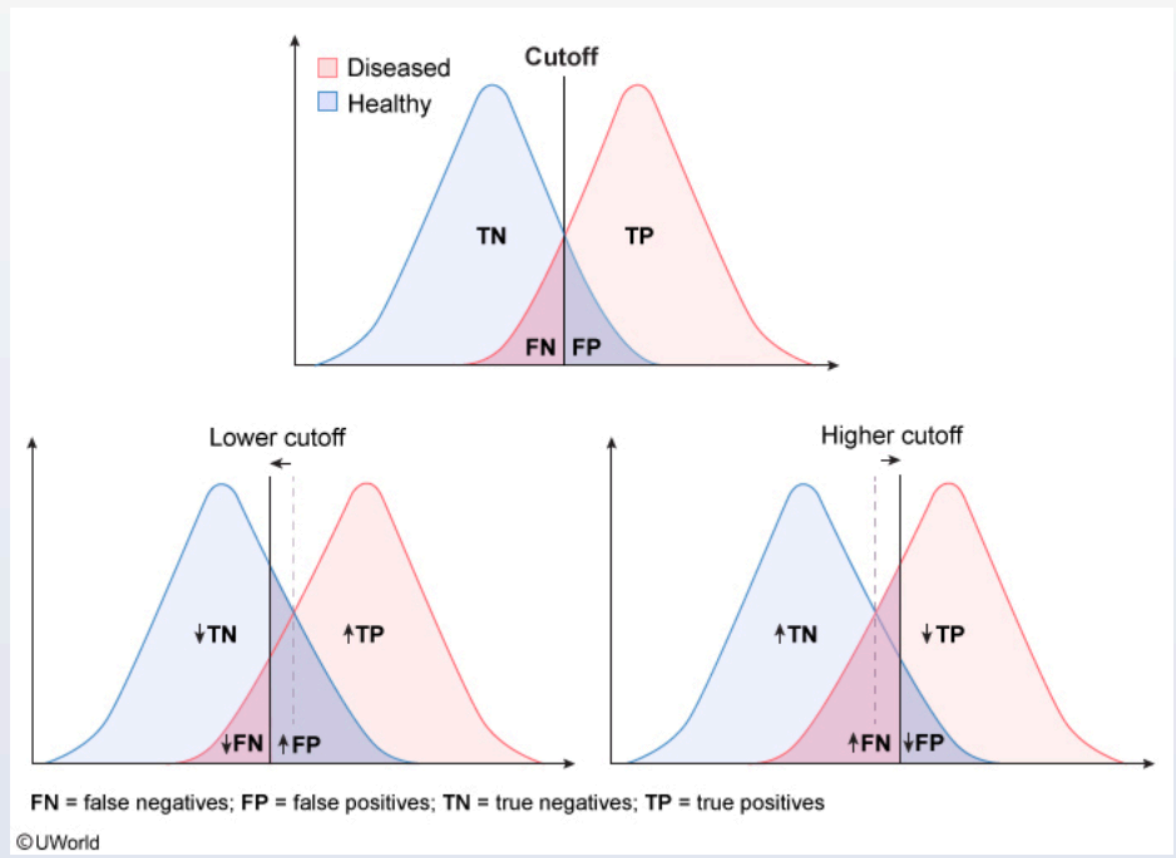
$$\text{Odds ratio} = \frac{A/B}{C/D} = \frac{A \times D}{B \times C}$$

$$\text{Relative risk} = \frac{A/(A+B)}{C/(C+D)}$$

$$\text{Attributable risk} = \frac{A}{A+B} - \frac{C}{C+D}$$

$$\text{Number needed to treat} = \frac{1}{\text{ARR}}$$





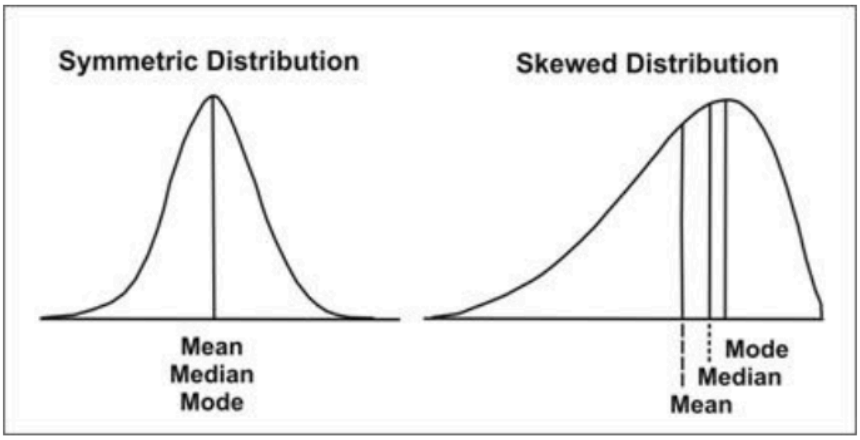
Quality Improvement Approach	Timing of Initiation of Investigation	Area of Investigation
Root cause analysis	After event occurs	Entire system
Failure mode and effects analysis	Before event occurs	Specific subset of a system
Human factors analysis and classification system	After event occurs	Human error associated with event
Plan-do-study-act	Before event occurs	Effect of new protocol on system

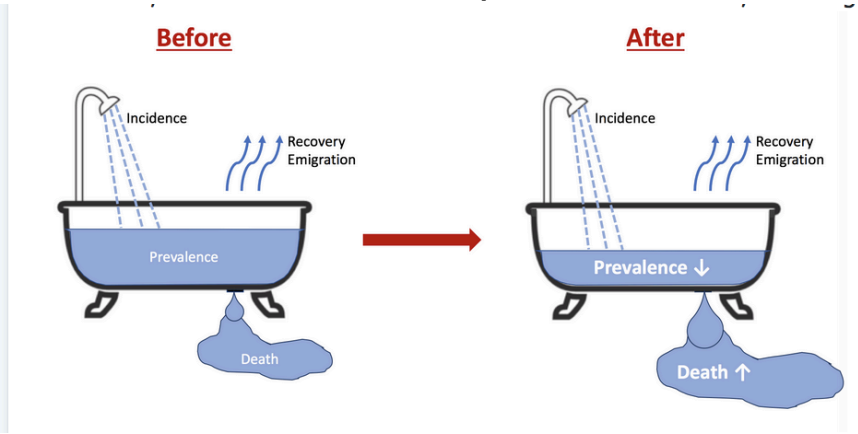
BIOSTATS/ Public health

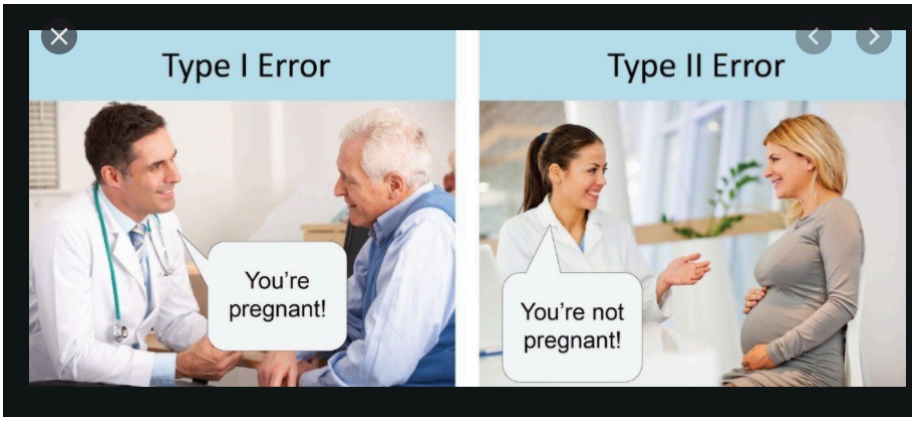
Cardiac output/ Fick's principle	CO= O2 consumption/ arterial - venous content VO2= CO x CaO2 - CvO2 - 350/ 200-150
Correlation analysis	Assesses strength and linear relationship between 2 quantitative variables (dependent and independent) → correlation coefficient

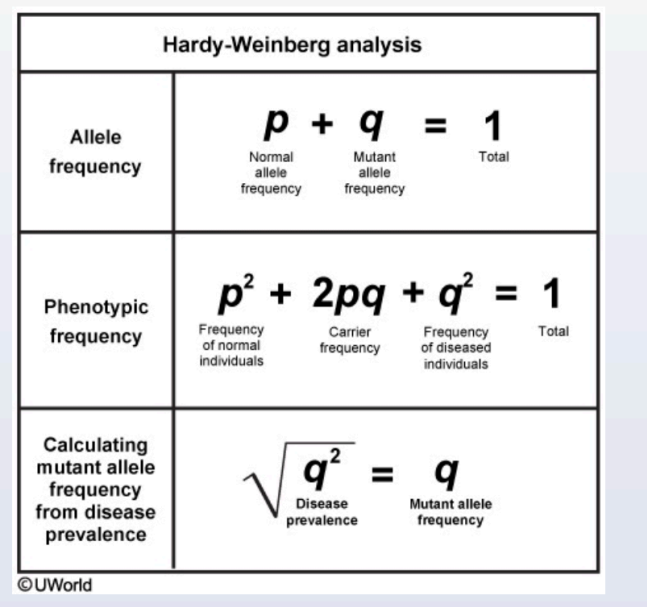
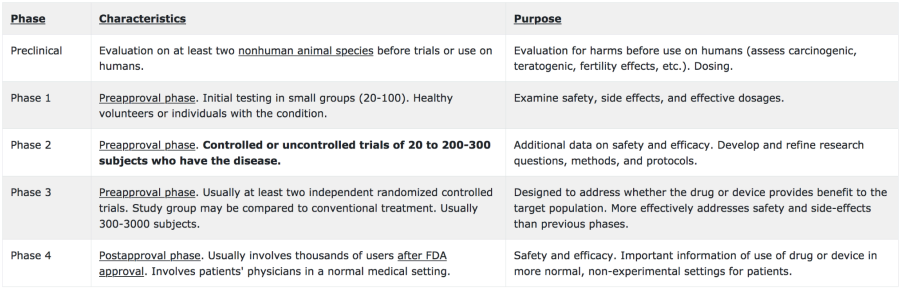
ANOVA	Analysis of variance compares **mean of quantitative** variable in **> 3** independent groups (concentration in various age groups)
Chi-square test	Association between **2 categorical variables** (male, female and presence/ absence)
t-test	Compares the **mean** of quantitative variables between 2 groups
Regression analysis	Association between 1 or more independent variables (risk factors) and 1 quantitative dependent outcome (lab value) while adjusting for other variables → adjusted values reduce confounding factor → calculate line of best fit.
Case-control study - ODDS ratio - A/B / C/D	**Patients with disease and without disease, then determine exposures associated with disease, RISK FACTORS** cases= + disease controls= - disease Look at how groups are different, find exposure. Retrospective and observational. Identify risk factors for disease. Control group= people with out the disease regardless of exposure
Cross-sectional study - **Prevalence**	Prevalence study, snap shot that uses surveys to look at exposure and outcome in a disease of interest. One point in time **Odds ratio**: 2 groups are identified as cases or controls according to an outcome, frequency of exposure to the risk factors is compared
Cohort study **Relative risk** A/ A+B / C/ C+D	**Relative risk**= risk of disease in **exposed/ unexposed**, observational, retrospective or prospective. People with a **risk factor**, see what happens to them Association between exposure to a risk and an outcome in an exposed group. < 1= exposure decreases risk (1- RR= % reduction) = 1 no effect > 1= exposure increases risk of disease If the confidence interval includes the null, not statistically significant.
Attributable risk percent	% of cancer attributed to smoking ARP= 100 x risk in exposed - risk in unexposed/ exposed) 100 x (RR-1)/ RR A/ A+B - C/ C+D nnt= 1/ arr

Hypothesis	• 2 correct decisions:
	  ◦ Fail to reject a true H_0 (ie, determine there is no correlation when one truly doesn't exists)
	  ◦ **Reject a false H_0** (ie, determine there is a correlation when one truly exists)
	• 2 incorrect decisions:
	  ◦ Type I error: reject a true H_0 (ie, determine there is a correlation when one truly doesn't exist)
	  ◦ **Type II error: fail to reject a false H_0** (ie, determine there is no correlation when one truly exists)

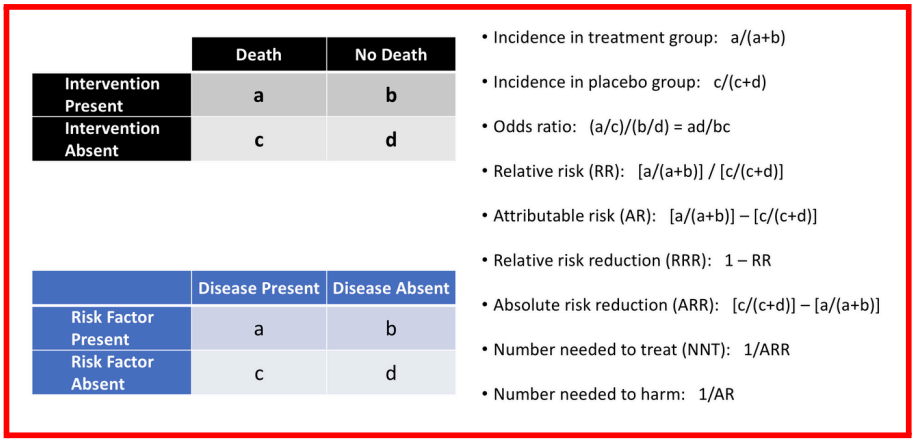
Confounding bias	Confounding variables can arise with **matching** **RANDOMIZATION minimizes confounding variable bias** Association that does not consider an important variable. Stratification makes data nonsignificant in Both groups
Effect modification	Natural phenomenon that affects one group, so there are different measures of association. The effect of the main exposure on the outcome is modified by the presence of another variable
Selection bias	Loss to follow up leading to differences in groups.
Recall bias	Retrospective, forgotten or faded details of events/ exposure
meta-analysis	Large data, need very small P-value to decrease false positives
Intention to treat	Include all subject regardless of what happens. Need to know effects, including those who stopped. Avoids attrition, dropout. Leads to conservative estimate
Per-protocol principle	Study that only includes adherent patients, excludes nonadherent
Positive skew	“Ameanba” tail to right, **Mean** > median> mode
Negative skew	Taili to left, **Mode** > median > mean 

Hypothesis	H0= no association (null)- cross-sectional study - Risks are the same (cohort study) H1= association (p value < very small 0.05)
P value	small= very small probability results were due to chance Reject the null if p value < 0.05, accept alternative hypothesis Probability that a type 1 error has occurred and the null hypothesis is erroneously rejected. % chance of finding an average difference of that percentage or greater
power	Probability the test will reject the null hypothesis Increased power with more participants
Standard deviation	Variation of values with in a sample population
Standard error of the mean	Variation of sample means from the true population
incidence	Number of **new cases** of a disease in population at risk over time **Cumulative incidence** - New cases/ population at risk - those already with disease
Prevalence	Total number of cases in the population over a given time - **Increased duration increases prevalence** 
Randomization	Goal to prevent selection bias and produce comparable groups that are similar in underlying characteristics Increases likelihood that any difference between groups is due to treatment only

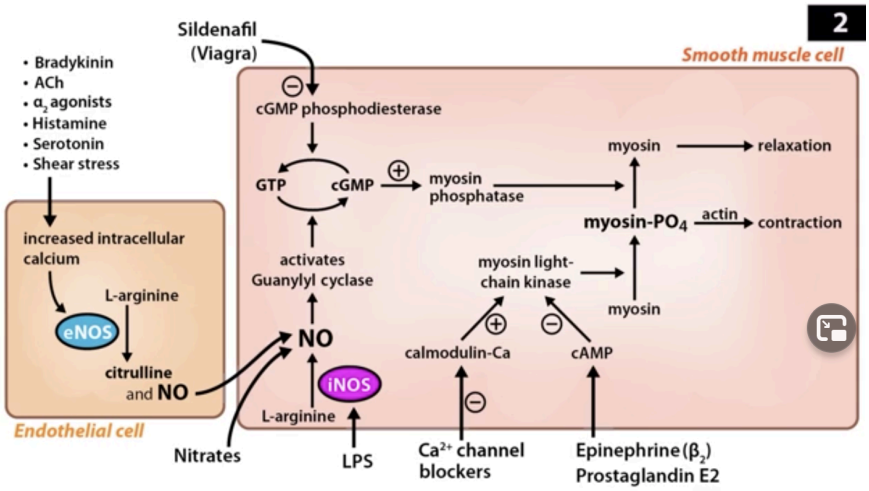
<table>
<tr>
<td>Maintenance dose
Loading dose
Half-life</td>
<td>
<table>
<tr><th>Pharmacokinetic parameter</th><th>Formula</th><th>Note</th></tr>
<tr><td>Half life</td><td>$V_d \times 0.7 / CL$</td><td>Steady-state concentration is achieved in 4-5 half-lives.</td></tr>
<tr><td>Maintenance dose</td><td>$C_{ss} \times CL \times$ dosing interval</td><td>Maintenance dose is decreased in patients with renal or hepatic impairment.</td></tr>
<tr><td>Loading dose</td><td>$V_d \times C_{ss}$</td><td>Loading dose is affected by body weight and composition.</td></tr>
</table>
Renal disease: loading dose is same, maintenance dose is lowered
MD= Cp x CL/ bioavailability
</td>
</tr>
<tr>
<td>Validity</td>
<td>External validity: determines if an experiment can be generalized and conclusions applied to groups</td>
</tr>
<tr>
<td>Type 1 vs type 2 error</td>
<td>
</td>
</tr>
</table>

Hardy weinberg	 Autosomal recessive= ¼ Carrier frequency in population = ALLELES → q^2= 1/x → 2q= carrier status / frequency
68-95-99.7 rule	Standard variation of the mean/ interval - 68: mean +/- SD - 95: mean +/- 1.96 x SD/ sqr(n) - 99.7: mean +/- 2.58 x SD
Ethics laws	cruzan= remove life sustaining treatments schloendorff= informed consent tarasoff= warn person and authorities, contain patient
Clinical trials	
Reportable disease	Four **STDs** are nationally **notifiable**, chlamydia, gonorrhea, syphilis, and chancroid,

Phase	Characteristics	Purpose
Preclinical	Evaluation on at least two nonhuman animal species before trials or use on humans.	Evaluation for harms before use on humans (assess carcinogenic, teratogenic, fertility effects, etc.). Dosing.
Phase 1	Preapproval phase. Initial testing in small groups (20-100). Healthy volunteers or individuals with the condition.	Examine safety, side effects, and effective dosages.
Phase 2	Preapproval phase. **Controlled or uncontrolled trials of 20 to 200-300 subjects who have the disease.**	Additional data on safety and efficacy. Develop and refine research questions, methods, and protocols.
Phase 3	Preapproval phase. Usually at least two independent randomized controlled trials. Study group may be compared to conventional treatment. Usually 300-3000 subjects.	Designed to address whether the drug or device provides benefit to the target population. More effectively addresses safety and side-effects than previous phases.
Phase 4	Postapproval phase. Usually involves thousands of users after FDA approval. Involves patients' physicians in a normal medical setting.	Safety and efficacy. Important information of use of drug or device in more normal, non-experimental settings for patients.

	
NPV and PPV	More prevalence= greater PPV Less prevalence= greater NPV

Antipsychotics Characteristics		
Drug Class	**Mechanism of Action**	**Adverse effects**
Typical Antipsychotics High potency: • Haloperidol • Fluphenazine Low potency: Chlorpromazine	• Blockade of the D_2 receptor • Low potency drugs have greater blockade of the alpha$_1$, histamine, and muscarinic receptors	High potency: extrapyramidal symptoms, NMS, akathisia, tardive dyskinesia Low potency: Weight gain, orthostatic hypotension, constipation, dry mouth/eyes, mydriasis, sedation.
Atypical Antipsychotics • Risperidone • Olanzapine • Clozapine • Quetiapine • Aripiprazole (partial D_2 agonist)	Blockade of 5-HT_{2A} >> D_2 receptor	• Weight gain, insulin resistance. • Increased QT interval Clozapine: agranulocytosis

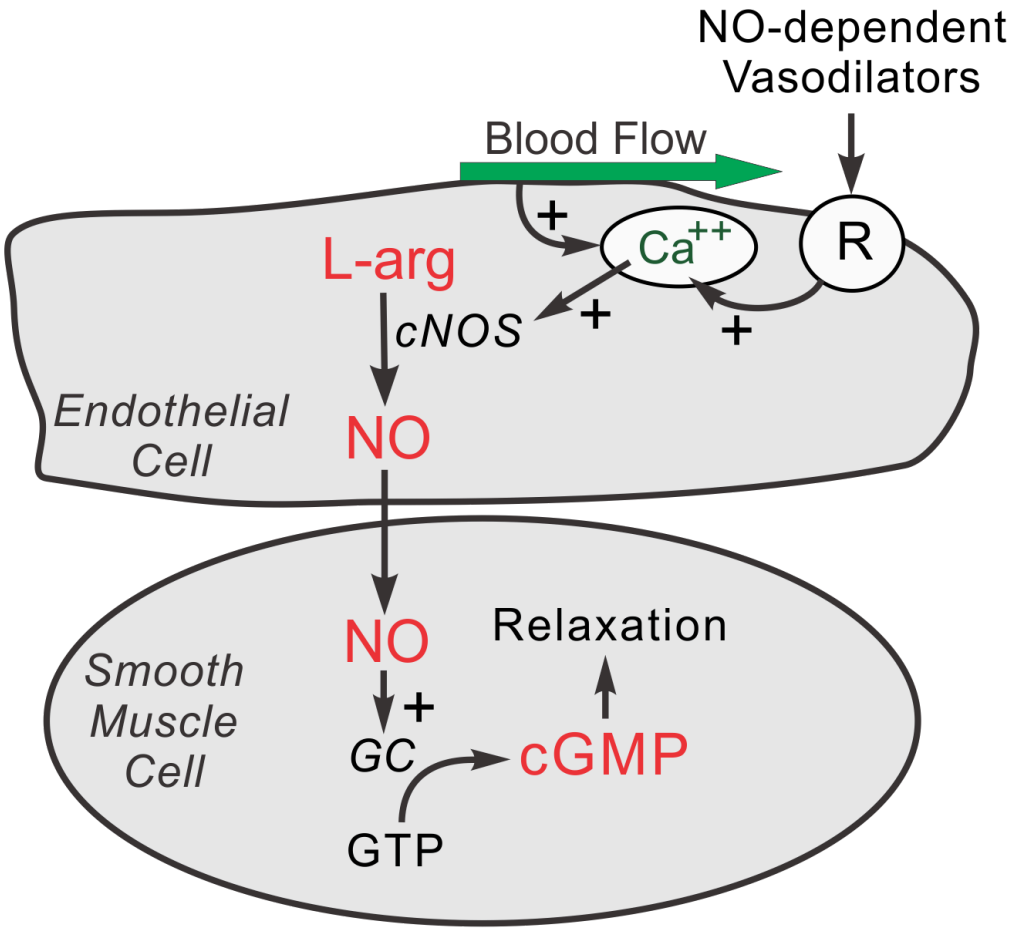


Receptor stimulated	Change in second messenger	Primary effects
Alpha-1	↑ IP_3	• Peripheral vasoconstriction • Urethral constriction • Pupillary dilation
Alpha-2	↓ cAMP	• CNS sympatholytic • ↓ insulin release & intestinal motility
Beta-1	↑ cAMP	• ↑ Cardiac contractility & heart rate • ↑ Renin release by JG cells of kidney
Beta-2	↑ cAMP	• Peripheral vasodilation • Bronchodilation
Muscarinic-2	↓ cAMP	• ↓ Cardiac contractility & heart rate
Muscarinic-3	↑ IP_3	• Bronchoconstriction • ↑ insulin release & intestinal motility • Bladder contraction • Pupillary constriction • Peripheral vasodilation*

Sphingolipidoses*				
Diagnosis	**Inheritance**	**Deficiency**	**Accumulated substrate**	**Key features**
Fabry disease	XLR	α-Galactosidase A	Globotriaosylceramide	• Angiokeratomas • Peripheral neuropathy • Glomerulopathy
Tay-Sachs disease	AR	β-Hexosaminidase A	G_{M2} (ganglioside)	• Macular cherry-red spot • Progressive neurodegeneration
Gaucher disease		β-Glucocerebrosidase	Glucocerebroside	• Hepatosplenomegaly • Pancytopenia • Bone pain/osteopenia
Niemann-Pick disease		Sphingomyelinase	Sphingomyelin	• Macular cherry-red spot • Progressive neurodegeneration • Hepatosplenomegaly
Krabbe disease		Galactocerebrosidase	Galactocerebroside & psychosine	• Progressive neurodegeneration • Peripheral neuropathy • Optic atrophy
Metachromatic leukodystrophy		Arylsulfatase A	Cerebroside sulfate	• Progressive neurodegeneration • Peripheral neuropathy

Common hereditary cancer syndromes			
Syndrome	**Gene**	**Associated neoplasms**	**Pathogenesis**
Lynch syndrome	*MSH2, MLH1, MSH6, PMS2*	• Colorectal cancer • Endometrial cancer • Ovarian cancer	• **Autosomal dominant** • Caused by **inactivating** mutation in corresponding **tumor suppressor gene** • Deletion of remaining normal allele (**second hit**) leads to loss of heterozygosity & **malignant transformation**
Familial adenomatous polyposis	*APC*	• Colorectal cancer • Desmoids & osteomas • Brain tumors	
von Hippel-Lindau syndrome	*VHL*	• Hemangioblastomas • Clear cell renal carcinoma • Pheochromocytoma	
Li-Fraumeni syndrome	*TP53*	• Sarcomas • Breast cancer • Brain tumors • Adrenocortical carcinoma • Leukemia	
Multiple endocrine neoplasia type 1	*MEN1*	• Parathyroid adenomas • Pituitary adenomas • Pancreatic adenomas	
Multiple endocrine neoplasia type 2	*RET*	• Medullary thyroid cancer • Pheochromocytoma • Parathyroid hyperplasia (*MEN2A*)	• **Autosomal dominant** • **Activating** (gain-of-function) mutation in proto-oncogene • **Continuous stimulation** of cell division predisposes to tumor growth

Pharmacotherapy for supraventricular arrhythmias	
Medication	**Short-term adverse effects**
Flecainide/propafenone (class IC)	• Monomorphic VT*
Metoprolol (class II)	• Bradycardia & advanced AV block
Amiodarone (class III)	• Bradycardia • Hepatic toxicity, thyroid dysfunction
Ibutilide/dofetilide /sotalol (class III)	• Torsade de pointes
Verapamil/diltiazem (class IV)	• Bradycardia & advanced AV block • Decreased ventricular contractility • Constipation (verapamil)
Adenosine	• Flushing & hypotension • Bronchospasm • High-grade AV block
Digoxin	• Bradycardia & other arrhythmias • Nausea & vomiting ± visual disturbances



R, receptor; *L-arg*, L-arginine; *cNOS*, constitutive nitric oxide synthase; *GC*, guanylyl cyclase; *GTP,* guanosine triphosphate; *cGMP,* cyclic guanosine monophosphate.

Cranial nerve reflexes			
Reflex	**Effect**	**Afferent**	**Efferent**
Pupillary light reflex	Light-induced pupil constriction	II	III
Corneal reflex	Corneal stimulation causes orbicularis oculi to contract eyelids	V1 (ophthalmic branch)	VII
Jaw-jerk reflex	Stretch reflex stimulating masseter contraction	V3 (sensory from muscle spindles)	V3
Vestibulo-ocular reflex	Compensatory eye movements that provide image stabilization when head/body moves	VIII (vestibular component)	III, IV, VI
Carotid sinus reflex	Increased carotid sinus pressure causes decreased heart rate & blood pressure	IX	X (sympathetic tone also inhibited)
Cough reflex	Cough induced by upper respiratory tract irritation	X	X
Gag reflex	Reflex contraction of the pharyngeal constrictor muscles evoked by touching the back of the throat	IX	X

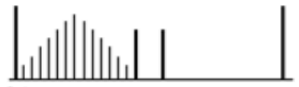
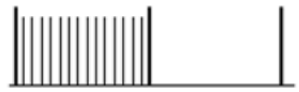
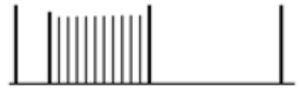
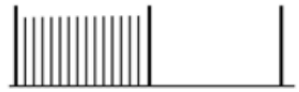
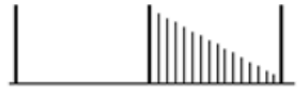
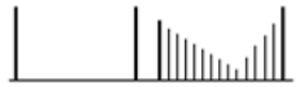
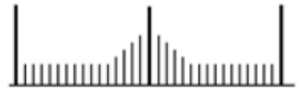
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Laboratory characteristics of coagulopathies				
	PT	**aPTT**	**Platelet count**	**Bleeding time**
Hemophilia A & B	Normal	↑	Normal	Normal
von Willebrand factor deficiency	Normal	Normal or ↑	Normal	↑
Disseminated intravascular coagulation	↑	↑	↓	↑
Uremic platelet dysfunction	Normal	Normal	Normal	↑
Heparin administration	Normal	↑	Normal (except in heparin-induced thrombocytopenia)	Normal
Warfarin use	↑	↑ (weak effect)	Normal	Normal
Immune thrombocytopenia	Normal	Normal	↓	↑

aPTT = activated partial thromboplastin time; PT = prothrombin time.

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Cardiac murmurs*

Systolic	Aortic stenosis		Crescendo-decrescendo at RUSB, A2 soft & delayed
	Mitral regurgitation		Holosystolic at apex & radiates to axilla
	Hypertrophic cardiomyopathy		Crescendo-decrescendo at mid-left sternal border
	Mitral valve prolapse		Midsystolic click followed by late systolic murmur
	Atrial septal defect		Midsystolic with wide & fixed splitting of S2
	Ventricular septal defect		Holosystolic at left sternal border
Diastolic	Aortic regurgitation		Decrescendo at LUSB (valvular), RUSB (aortic root)
	Mitral stenosis		Opening snap followed by middiastolic rumble with presystolic accentuation
Continuous	Patent ductus arteriosus		Machine-like in interscapular region (posteriorly)

Common withdrawal syndromes		
Substance	**Symptoms**	**Examination findings**
Alcohol	Tremors, agitation, anxiety, delirium, psychosis	Seizures, tachycardia, palpitations
Benzodiazepines	Tremors, anxiety, perceptual disturbances, psychosis, insomnia	
Heroin	Nausea, vomiting, abdominal cramping, diarrhea, muscle aches	Dilated pupils, yawning, piloerection, lacrimation, hyperactive bowel sounds
Stimulants (eg, cocaine, amphetamines)	Increased appetite, hypersomnia, intense psychomotor retardation, severe depression ("crash")	No significant findings
Nicotine	Dysphoria, irritability, anxiety, increased appetite	
	Irritability, anxiety,	

Medicare Part	Basics of Coverage
Part A	• Stays in hospitals • Skilled nursing facilities • Hospices
Part B	• Certain doctor's fees • Outpatient care services • Medical supplies • Diagnostic testing
Part C	• A bundling of Parts A, B, and sometimes D delivered by private insurance companies approved by Medicare
Part D	• Prescription drugs

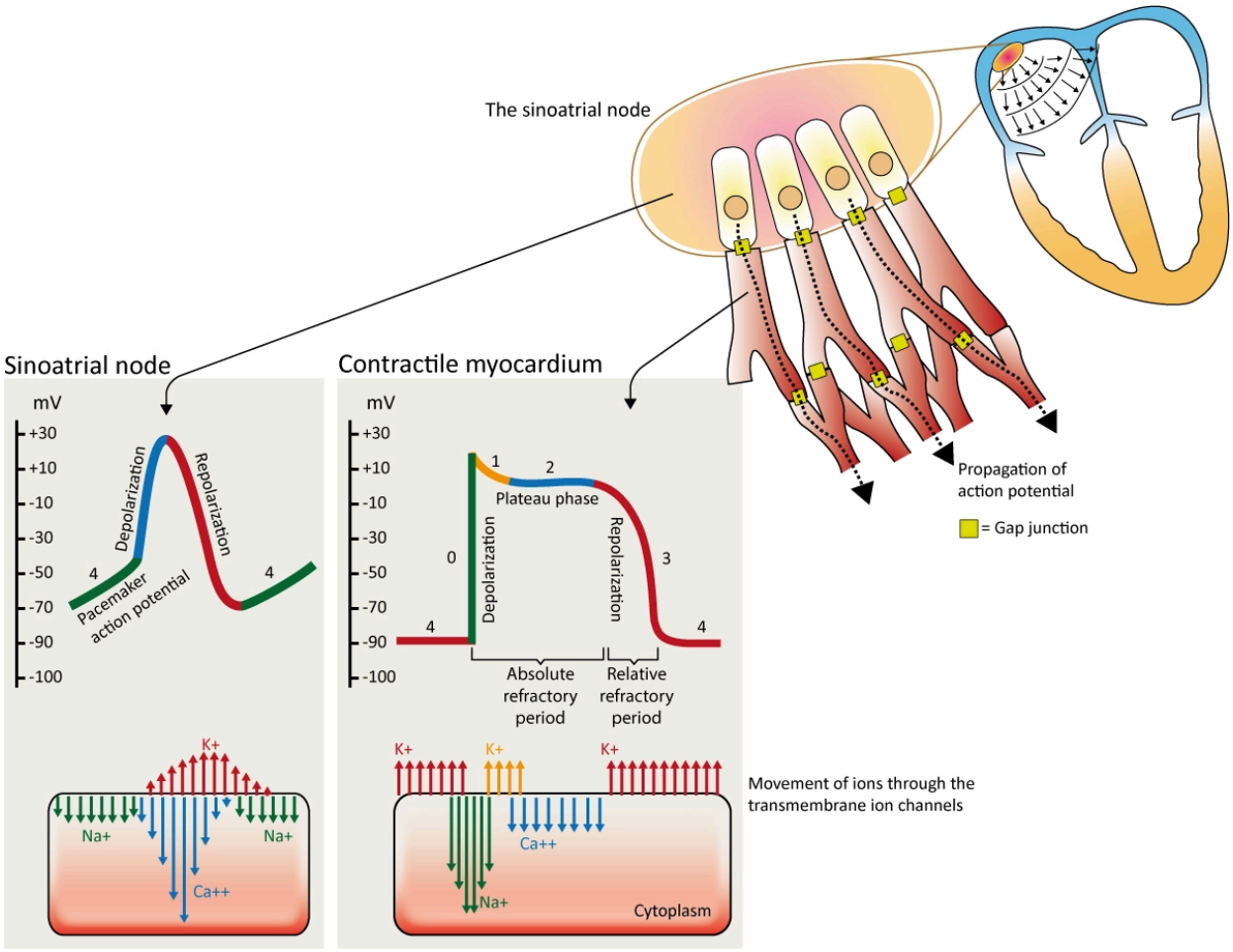
Rotator cuff muscles				
Muscle	**Origin on scapula**	**Attachment on humerus**	**Function on arm**	**Innervation**
Supraspinatus	Supraspinous fossa	Superior aspect of greater tubercle	Abduction (primarily <15º)	Suprascapular nerve
Infraspinatus	Infraspinous fossa	Posterolateral aspect of greater tubercle	External rotation	Suprascapular nerve
Teres minor	Lateral border	Posterolateral aspect of greater tubercle	Adduction & external rotation	Axillary nerve
Subscapularis	Subscapular fossa	Lesser tubercle	Adduction & internal rotation	Upper & lower subscapular nerve

Medicare rotator cuff muscles

Clinical Condition	Artery Involved	Somatosensory Clinical Signs	Additional Differentiating Signs
Lateral medullary syndrome	PICA	Ipsilateral face analgesia Contralateral body analgesia	Dysarthria Dysphagia Ataxia
Lateral pontine syndrome	AICA	Ipsilateral face analgesia Contralateral body analgesia	Ipsilateral face hemiparesis Ipsilateral deafness
MCA stroke	MCA	Contralateral hemianesthesia	Contralateral hemiplegia Contralateral homonymous hemianopia Ipsilateral horizontal gaze preference

Stroke
Glycogen storage disease

Glycogen Storage Diseases		
Type	**Affected Tissue**	**Symptoms**
IA (von Gierke disease)	Liver, kidney	• Enlarged kidney and liver • Slow growth • Very low blood sugar • High levels of acid, fats, uric acid
II (Pompe disease)	All organs	• Enlarged heart and liver • Muscle weakness
III (Cori disease)	Liver, muscle, heart	• Cirrhosis or enlarged liver • Low blood sugar • Damaged muscle and heart • Weak bones
IV (Anderson disease)	Liver, muscle, tissues	• Cirrhosis • Muscle damage • Delayed growth
V (Mcardle disease)	Muscle	• Weakness • Muscle cramps
VI (Hers disease)	Liver	• Low blood sugar • Enlarged liver • Possibly no symptoms
VII (Tarui disease)	RBC, skeletal muscle	• Hemolysis • Muscle cramps



Example:

Exposure	Disease +	Disease −
+	a	b
−	c	d

Smoking	MI +	MI −
+	355	3140
−	140	2507

Relative Risk =

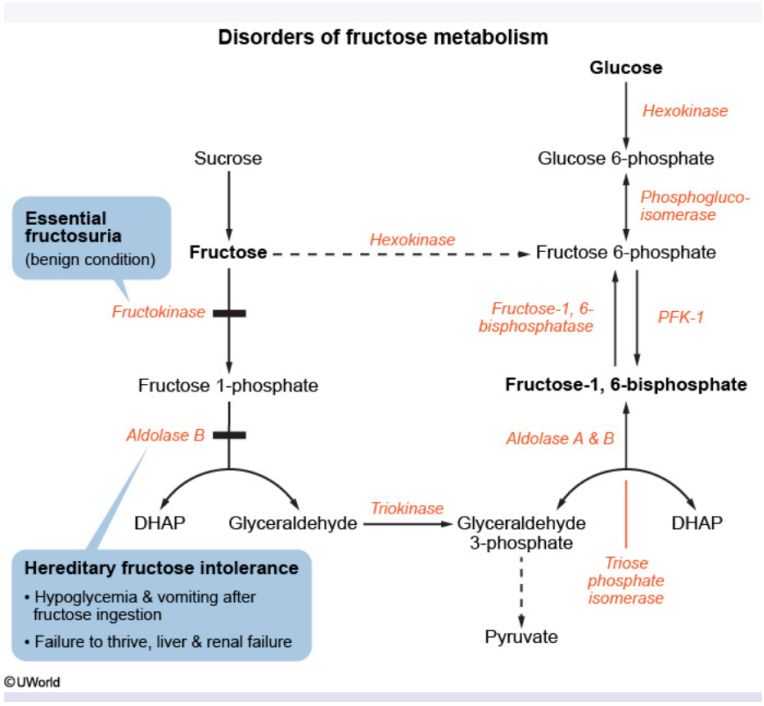
Incidence of disease among those exposed
= (a/a+b) 355/(355+3140) = 1.92

Incidence of disease among those not exposed
(c/c+d) 140/(140+2507)

Odds Ratio =

Odds of people with disease being exposed
= (a/c) 355/140 = 2.02

Odds of people without disease being exposed
(b/d) 3140/2507



Disease	Pathophysiology	High Yields	
Fructokinase Deficiency	✗ Fructokinase	Benign Autosomal Recessive	"Fructo-kinda-se Deficiency"
Hereditary Fructose Intolerance	✗ Aldolase B	Hypoglycemia (↓ATP) after fruits/juices	"Here, you're Fruct Int-irely"

Anti-arrhythmics

Class I (sodium channel-blocking) antiarrhythmics			
	Specific agents	**Inhibition of phase 0 depolarization**	**Effect on length of action potential**
Class IA	Quinidine, procainamide, disopyramide	Intermediate	Prolonged
Class IB	Lidocaine, mexiletine	Weak	Shortened
Class IC	Flecainide, propafenone	Strong	No change

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Cardiovascular effects of adrenergic agonists

- α_1: peripheral vasoconstriction, ↑ SVR
- β_1: ↑ heart rate & contractility, ↑ cardiac output
- β_2: peripheral vasodilation, ↓ SVR
- D_1: renal arteriolar vasodilation

Agonist	Receptor binding	Blood pressure	Heart rate
Dobutamine	$\beta_1 > \beta_2$	–/↓	↑
Dopamine	$D_1 > \beta_1 > \alpha_1$ (low-dose)	–/↓	↑
	$\alpha_1 > \beta_1 > D_1$ (high-dose)	↑	–/↓*
Epinephrine	$\beta_1 > \beta_2 > \alpha_1$ (low-dose)	–/↓	↑
	$\alpha_1 > \beta_1 > \beta_2$ (high-dose)	↑	–/↓*
Isoproterenol	$\beta_1 = \beta_2$	–/↓	↑
Norepinephrine	$\alpha_1 > \beta_1 > \beta_2$	↑	–/↓*
Phenylephrine	α_1	↑	↓*

Receptor stimulated	Change in second messenger	Primary effects
Alpha-1	↑ IP_3	• Peripheral vasoconstriction • Urethral constriction • Pupillary dilation
Alpha-2	↓ cAMP	• CNS sympatholytic • ↓ insulin release & intestinal motility
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Muscarinic-2	↓ cAMP	• ↓ Cardiac contractility & heart rate
Muscarinic-3	↑ IP_3	• Bronchoconstriction • ↑ insulin release & intestinal motility • Bladder contraction • Pupillary constriction • Peripheral vasodilation*

Noninsulin antidiabetic agents for type 2 diabetes mellitus		
Agent	**Mechanism of action**	**Side effects**
Insulin secretagogues • Sulfonylureas • Meglitinides	↑ Insulin secretion by inhibiting β-cell K_{ATP} channels	• Hypoglycemia • Weight gain
Biguanides • Metformin	Stimulate AMPK & inhibit mitochondrial gluconeogenesis, ↓ hepatic glucose production & ↑ peripheral glucose uptake	• Diarrhea • Lactic acidosis
Thiazolidinediones • Pioglitazone	Activate transcription regulator PPAR-γ, ↓ insulin resistance	• Fluid retention/heart failure • Weight gain
GLP-1 agonists • Exenatide • Liraglutide	↑ Glucose-dependent insulin secretion, ↓ glucagon secretion, delayed gastric emptying	• Pancreatitis • Weight loss
DPP4 inhibitors • Sitagliptin • Saxagliptin	↑ Endogenous GLP-1 & GIP levels	• Nasopharyngitis
α-glucosidase inhibitors • Acarbose • Miglitol	↓ Intestinal disaccharide absorption	• Diarrhea • Flatulence
SGLT2 inhibitors • Canagliflozin • Dapagliflozin	↑ Renal glucose excretion	• Urinary tract infections • Hypotension
AMPK = adenosine monophosphate–activated protein kinase; **DPP4** = dipeptidyl peptidase-4; **GIP** = gastric inhibitory polypeptide; **GLP-1** = glucagonlike peptide-1; **K_{ATP}** = ATP-sensitive potassium; **PPAR-γ** = peroxisome proliferator–activated		

Medications that cause hypotension & bradycardia	
Medication	**Distinguishing features**
Beta blockers	Hypoglycemia, bronchospasm, heart block
Calcium channel blockers	Hyperglycemia
Digoxin	Hyperkalemia, "scooped" ST segments on ECG
Clonidine	Miosis, respiratory depression
Cholinergics	SLUD (**S**alivation, **L**acrimation, **U**rination, and **D**efecation)
Magnesium	Hyporeflexia

Characteristics of muscarinic acetylcholine receptors			
Receptor	**Target organ(s)**	**Effect of stimulation**	**Effect of inhibition**
M_1	Brain	Memory formation/cognitive functioning	Confusion
M_2	Heart	Decreased heart rate & atrial contraction	Increased heart rate & contractility
M_3	Peripheral vasculature	Smooth muscle relaxation, vasodilation, hypotension	Smooth muscle contraction, vasoconstriction, hypertension
	Lungs	Bronchoconstriction	Bronchodilation
	Bladder	Detrusor contraction	Detrusor relaxation, urinary retention
	Eyes	Pupillary sphincter muscle contraction (miosis), ciliary muscle contraction (accommodation)	Mydriasis, cycloplegia, may precipitate acute angle glaucoma in elderly patients
	Gastrointestinal tract	Increased peristalsis, increased salivary & gastric secretions	Constipation, dry mouth, decreased acid production
	Skin	Increased sweat production	Increased temperature (from decreased sweating)

Malignant ovarian neoplasms		
Histologic type	**Diagnosis**	**Key features**
Epithelial	**Serous cystadenocarcinoma**	• Most common ovarian cancer • Often bilateral • Histology: Psammoma bodies
	Mucinous cystadenocarcinoma	• Pseudomyxoma peritonei • Mucin-producing epithelial cells
Germ cell	**Dysgerminoma**	• Adolescents • ↑ β-hCG, ↑ LDH • Histology: "Fried egg cells"
	Endodermal sinus (yolk sac)	• ↑ AFP • Aggressive • Schiller-Duval bodies resemble glomeruli
Stroma (sex cord)	**Granulosa cell**	• ↑ Estrogen (eg, endometrial hyperplasia, postmenopausal bleeding) • ↑ Inhibin • Histology: Call-Exner bodies, coffee bean nuclei
	Sertoli-Leydig	• ↑ Androgens (eg, hirsutism, clitoromegaly)

adrenergic agonists, epinephrine, NE, dopamine

	Has Disease	Does Not Have Disease	
Index Test Positive	True positives (TP)	False positives (FP)	Positive predictive value = TP/(TP + FP)
Index Test Negative	False negatives (FN)	True negatives (TN)	Negative predictive value = TN/(TN + FN)
	Sensitivity = TP/(TP + FN)	Specificity = TN/(TN + FP)	

Important inherited hyperlipoproteinemias

Dyslipidemia	Protein defect	Elevated lipoproteins	Major manifestations
Familial chylomicronemia syndrome (Type I)	• Lipoprotein lipase • ApoC-II	Chylomicrons	• **Acute pancreatitis** • Lipemia retinalis • Eruptive skin xanthomas • Hepatosplenomegaly
Familial hypercholesterolemia (Type II A)	• LDL receptor • ApoB-100	LDL	• **Premature coronary artery disease** • Corneal arcus • Tendon xanthomas • Xanthelasmas
Familial dysbetalipoproteinemia (Type III)	• ApoE	Chylomicron and VLDL remnants	• **Premature coronary artery disease** & peripheral vascular disease • Tuboeruptive & palmar xanthomas
Familial hypertriglyceridemia (Type IV)	• ApoA-V	VLDL	• Increased pancreatitis risk • Associated with obesity & insulin resistance

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Noninsulin antidiabetic agents for type 2 diabetes mellitus		
Agent	**Mechanism of action**	**Side effects**
Insulin secretagogues • Sulfonylureas • Meglitinides	↑ Insulin secretion by inhibiting β-cell K_{ATP} channels	• Hypoglycemia • Weight gain
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Drug Intoxication and Differentiating Characteristics			
Category	**Class**	**Signs/Symptoms/Notes**	**Treatment**
Depressants Mood elevation Decreased anxiety Sedation Disinhibition	Alcohol	• Emotional lability • Slurred speech • Ataxia	Supportive care
	Opioids	• Hypotension • Pinpoint pupil • Respiratory depression	Naloxone
	Barbiturates	• Respiratory depression • Low therapeutic window	Supportive care
	Benzodiazepines	• Mild respiratory depression • Ataxia	Flumazenil only if acute (rarely used)
Stimulants Psychomotor agitation Insomnia Cardiac arrhythmias Anxiety Tachycardia	Amphetamines	• Euphoria/grandiosity • Pupillary dilation • Awake for days • Paranoia • Severe hypertension/cardiac arrest	Benzodiazepines
	Cocaine	• Pupillary dilation • Paranoia and agitation • Angina/cardiac death/hypertension • Nasal septum perforation	• Avoid beta-blockers • Benzodiazepines • Alpha blockers
Hallucinogens Altered perceptions Euphoria/dysphoria "Out-of-body" feeling	LSD	• Severe symptoms uncommon • Not confused; aware symptoms are drug induced	• Supportive care • Benzodiazepine for agitation • No antidotes • Minimize stimulation
	MDMA (ecstasy)	• Hypertension/hyperthermia • Hyponatremia • Serotonin syndrome	
	Phencyclidine	• Violent/psychosis/delirium • Psychomotor agitation • Nystagmus	

Acute drug intoxication		
Drug	**Class**	**Clinical features**
PCP (phencyclidine)	Hallucinogen	• Violent behavior • Dissociation • Hallucinations • Amnesia • **Nystagmus** (horizontal or vertical) • Ataxia
LSD	Hallucinogen	• **Visual hallucinations** • Euphoria • Dysphoria/panic • Tachycardia/hypertension
Cocaine	Stimulant	• Euphoria • Agitation/psychosis • **Chest pain** • **Seizures** • Tachycardia/hypertension • **Mydriasis**
Methamphetamine	Stimulant	• Violent behavior • Psychosis, diaphoresis • Tachycardia/hypertension • Choreiform movements • Tooth decay
Marijuana (THC, cannabis)	Cannabinoid	• Increased appetite • Euphoria • Dysphoria/panic • Slow reflexes, impaired time perception • Dry mouth • **Conjunctival injection**
Heroin	Opioid	• Euphoria • **Depressed mental status** • **Miosis** • **Respiratory depression** • Constipation

Tumors associated with specific oncogenes	
Proto-oncogenes (tumor promoters)	
ABL	Chronic myeloid leukemia
ALK	Large cell lymphoma, non–small cell lung cancer
BRAF	Melanoma
HER1	Squamous cell lung cancer
HER2/neu	Breast cancer, ovarian cancer
MYC	Neuroblastoma (NMYC), small cell lung cancer (LMYC)
RET	Medullary thyroid cancer, pheochromocytoma
Anti-oncogenes (tumor suppressors)	
APC/β catenin	Colorectal cancer, pancreatic cancer
BRCA1, BRCA2	Breast cancer, ovarian cancer
NF1	Neuroblastoma, sarcoma
RB	Retinoblastoma, osteosarcoma
VHL	Renal cell cancer
WT1	Wilms tumor

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Hormones

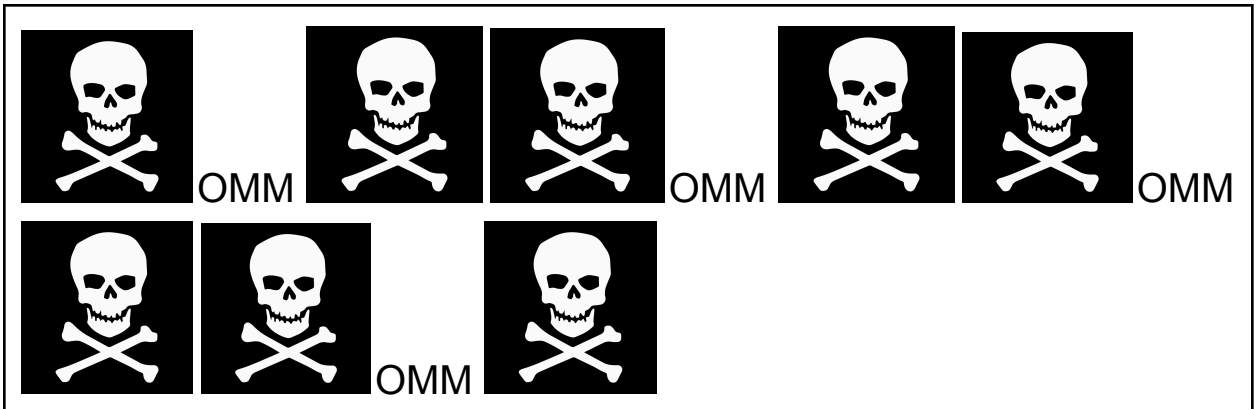
Action	Hormone
Stimulates bone and muscle growth and production of IGF-1	GH
Stimulates milk production	Prolactin
Stimulates milk ejection during lactation	Oxytocin
Responsible for female secondary sex characteristics	Estrogen
Stimulates metabolic activity	Thyroid hormone
Increases blood glucose level and decreases protein synthesis	Glucocorticoids
Responsible for male secondary sex characteristics	Testosterone
Prepares endometrium for implantation/maintenance of pregnancy	Progesterone
Stimulates adrenal cortex to synthesize and secrete cortisol	ACTH
Stimulates follicle maturation in females and spermatogenesis in males	FSH
Increases plasma calcium, increases bone resorption	PTH
Decreases plasma calcium, increases bone formation	Calcitonin
Stimulates ovulation in females and testosterone synthesis in males	LH
Stimulates thyroid to produce TH and uptake iodine	TSH

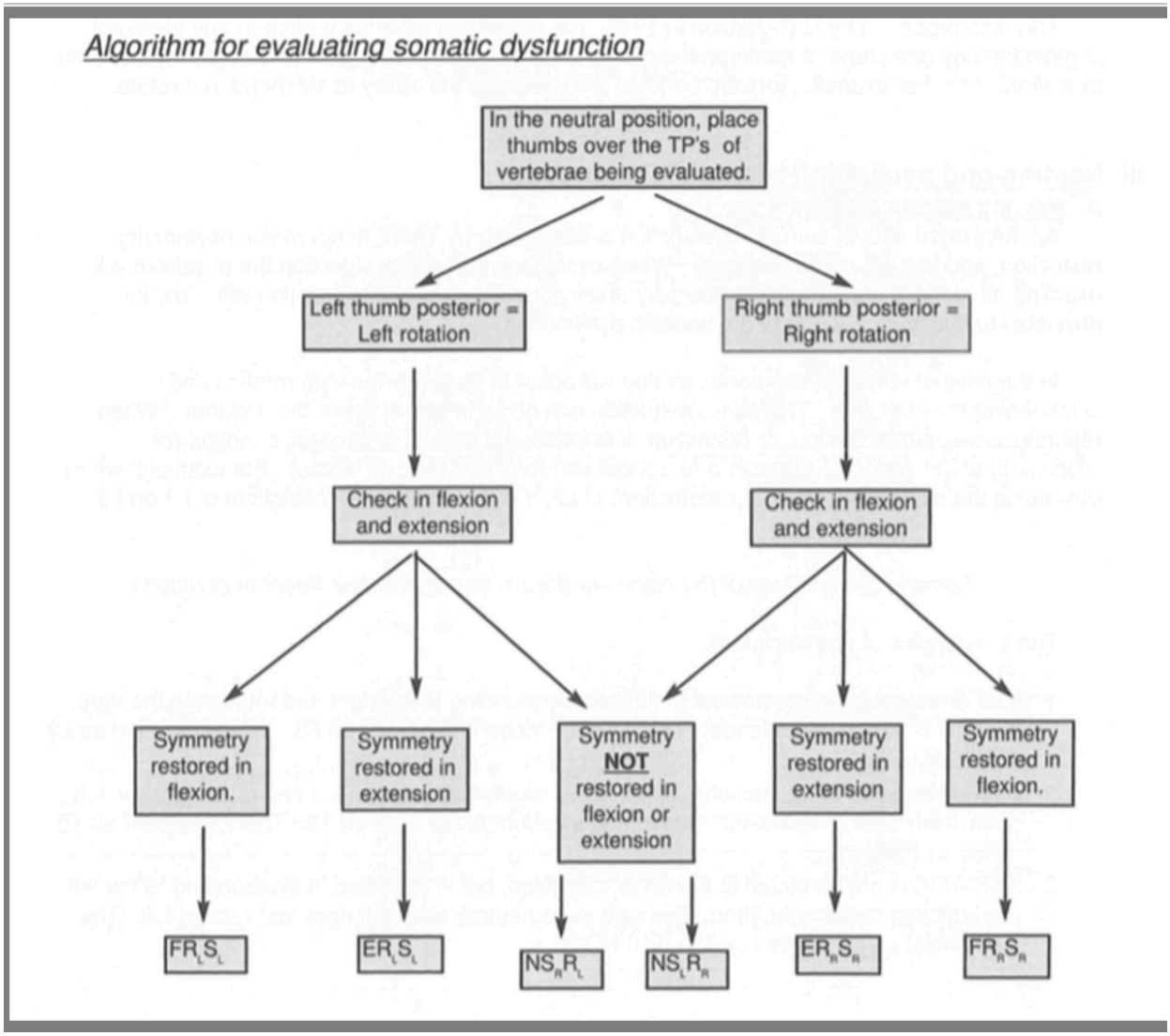
Follicle-stimulating hormone (FSH)	Anterior pituitary
Vasopressin (ADH)	Hypothalamus (supraoptic nucleus)
Calcitonin	Parafollicular cells of the thyroid
Thyroid-stimulating hormone (TSH)	Anterior pituitary
Epinephrine and norepinephrine	Chromaffin cells of the adrenal medulla
Insulin	β-cells of the pancreas
Estradiol	Ovaries
Estriol	Placenta
Estrone	Fat cells
Estrogen in males	Testes, adipocytes
Parathyroid hormone (PTH)	Parathyroid glands
Somatostatin	δ-cells of the pancreas
Luteinizing hormone (LH)	Anterior pituitary
Mineralocorticoids (aldosterone)	Zona glomerulosa
Adrenocorticotropic hormone (ACTH)	Anterior pituitary

Hormone	Location of secretion
Growth hormone (GH)	Anterior pituitary
Thyroid hormone	Thyroid
Glucocorticoids (cortisol)	Adrenal cortex (zona fasciculata)
Progesterone	Ovaries
Prolactin	Anterior pituitary
Oxytocin	Hypothalamus (paraventricular nucleus)
Atrial natriuretic hormone (ANH)	Atria of the heart
Glucagon	α-cells of the pancreas
Testosterone	Testes (men) and ovaries (women)
Follicle-stimulating hormone (FSH)	Anterior pituitary
Vasopressin (ADH)	Hypothalamus (supraoptic nucleus)
Calcitonin	Parafollicular cells of the thyroid
Thyroid-stimulating hormone (TSH)	Anterior pituitary
Epinephrine and norepinephrine	Chromaffin cells of the adrenal medulla

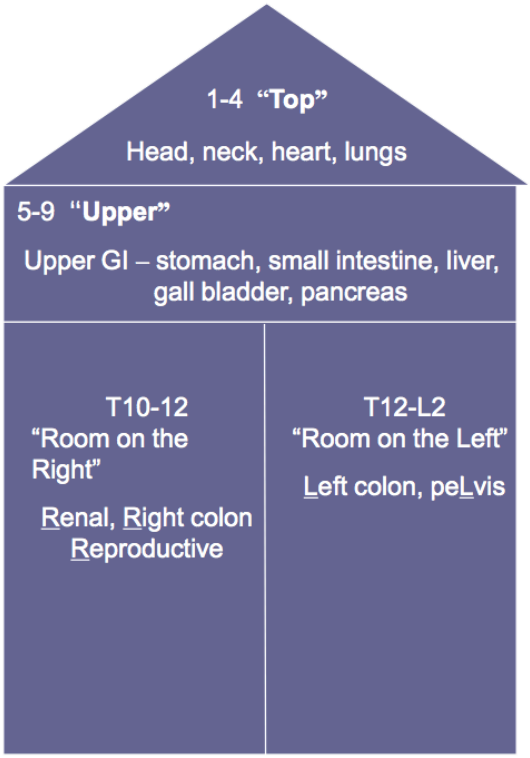
Inflammatory Bowel Disease Clinical Manifestations		
Condition	**Crohn Disease**	**Ulcerative Colitis**
Location	• Anywhere in GI tract • Spares rectum	• Always rectal involvement • Advances proximally
Visualization on colonoscopy	• Cobblestone mucosa • Skip lesions • Linear ulcers	• Superficial friable mucosa • Ulcerations (may be deep)
Abdominal imaging	• Creeping fat • Fistulas • String sign	• Loss of haustra (lead pipe)
Microscopy evaluation	• Noncaseating granulomas • Th1-mediated	• Crypt abscesses; no granulomas • Th2-mediated
Complications	• Fistulas • Abscess • Perianal disease (fissures)	• Fulminant colitis • Toxic megacolon • Colon cancer
Treatment	• Biological medications • Azathioprine • Corticosteroids	• 5-aminosalicylic acid drugs • 6-mercaptopurine • Colectomy if dysplasia

OMM Sucks

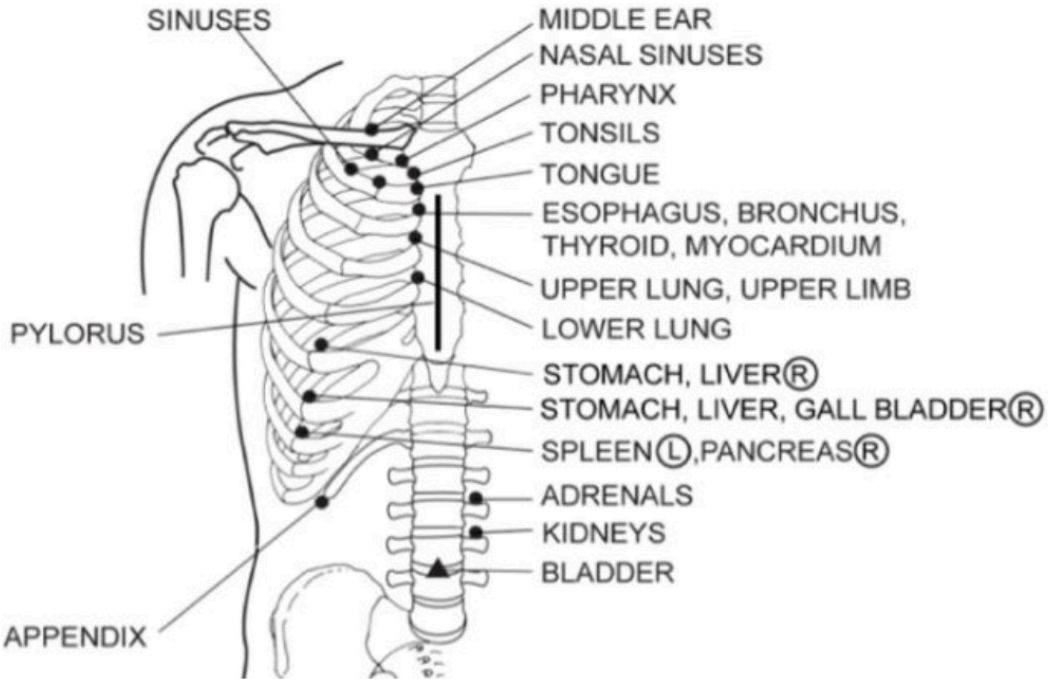




House of Golden



Chapman points are STUPID!

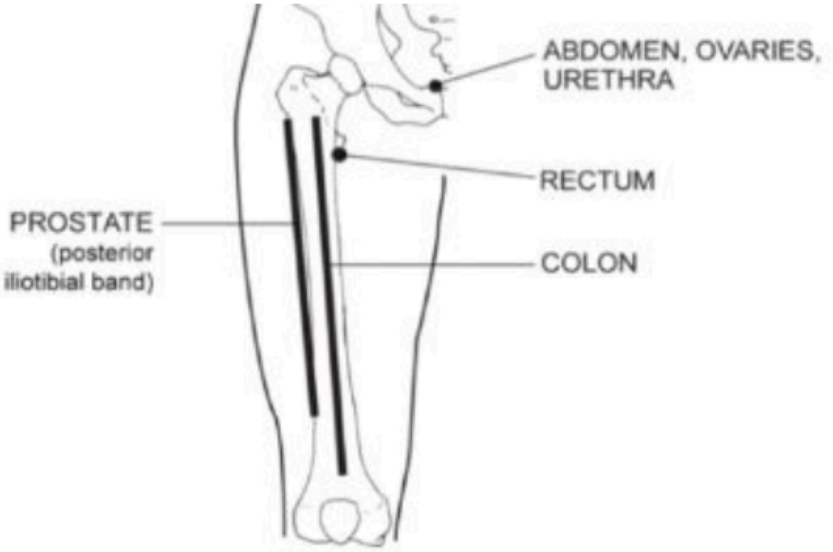


Structure	Anterior Chapman Point	Posterior Chapman Point
Eyes	Surgical neck of the humerus	Squamous portion of the occiput below nuchal line
Middle Ear	Superior portion of the clavicle	C1 articular process
Sinuses	1st rib	C2 between SP/TP
Tongue	2nd rib	———————
Tonsils	1st ICS	C1 between SP/TP
Pharynx	Sternoclavicular joint (inferior aspect)	C2 between SP/TP
Larynx	Lateral to sternocostal junction @ 2nd rib	C2 between SP/TP

Structure	Anterior Chapman Point	Posterior Chapman Point
Heart	2nd ICS	B/w T2 and T3 (intertransverse space)
Upper Lung	3rd ICS	B/w T3 and T4 (intertransverse space)
Lower Lung	4th ICS	B/w T4 and T5 (intertransverse space)

Gastrointestinal Chapman Points		
Organ	**Anterior**	**Posterior**
Stomach (acidity)	5th ICS on the left	Left T5 lamina of TP
Stomach (peristalsis)	6th ICS on the left	Left T6 lamina of TP
Liver	5th- 6th ICS on the right	Right T5-T6 lamina of TP
Gallbladder	6th ICS on the right	Right T6 lamina of TP
Pancreas	7th ICS on the right	Right T7 lamina of TP
Spleen	7th ICS on the left	Left T7 lamina of TP
Small bowel (duodenum, jejunum, ileum)	8th, 9th, 10th ICS bilaterally	Right and left T8-T10 lamina of TP
Appendix	Tip of the 12th rib on the right	Right T11-T12 lamina of TP
Cecum	Upper 1/5 of the right anterior thigh	Triangular area between L2 TP, L4 TP, and iliac crest
Ascending colon	Middle 3/5 of the right anterior thigh	Triangular area between L2 TP, L4 TP, and iliac crest
Right half of the transverse colon	Lower 1/5 of the right anterior thigh	Triangular area between L2 TP, L4 TP, and iliac crest
Left half of transverse colon	Lower 1/5 of the left anterior thigh	Triangular area between L2 TP, L4 TP, and iliac crest
Descending colon	Middle 3/5 of the left anterior thigh	Triangular area between L2 TP, L4 TP, and iliac crest

Structure	Anterior Chapman Point	Posterior Chapman Point
Kidney	1 inch superior + 1 inch lateral to umbilicus	B/w T12 and L1 (intertransverse space)
Bladder	Periumbilical area	L2 transverse process
Gonads	Pubic Symphysis (superior aspect)	T10 transverse process

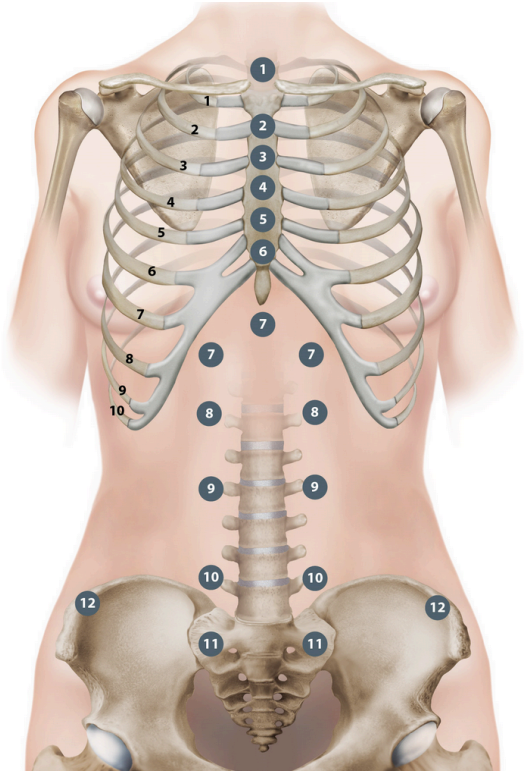


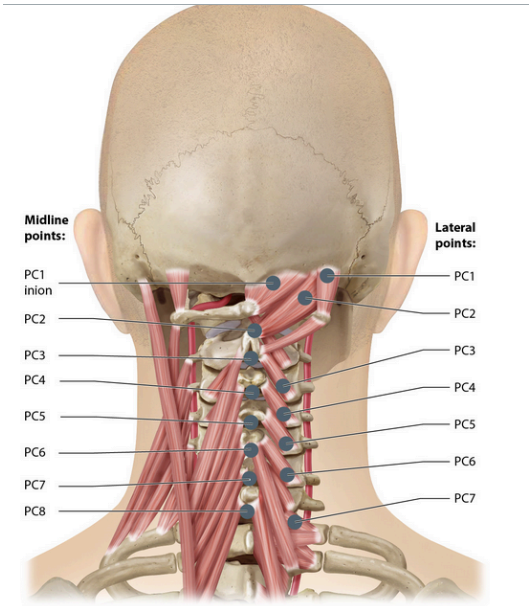
Sympathetic viscerosomatic reflexes

Sympathetic Viscerosomatic Reflexes			
Visceral Organ	**Spinal Cord Level**	**Visceral Organ**	**Spinal Cord Level**
Head and Neck	T1-T4	Kidneys	T10-T11
Heart	T1-T5 (left)	Upper Ureters	T10-T11
Respiratory System	T2-T7	Lower Ureters	T12-L1
Esophagus	T2-T8	Bladder	T11-L2
Upper GI Tract	T5-T9	Gonads	T10-T11
Middle GI Tract	T10-T11	Uterus/Cervix	T10-L2
Lower GI Tract	T12-L2	Erectile Tissue	T11-L2
Appendix/Cecum	T10-T12	Prostate	T12-L2
Arms	T2-T8	Legs	T11-L2

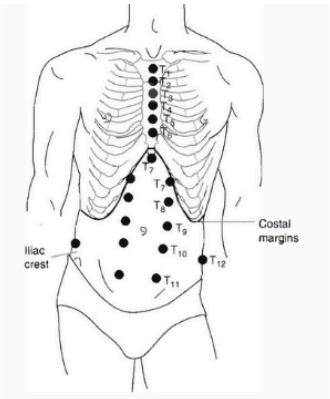
Posterior cervical counterstrain points

Tender Point	Location	Treatment Position
PC1 inion	Inferior nuchal line lateral to inion	Flexion of occipitoatlantal (OA), minor side bending toward, rotation away
PC1 occiput	Inferior nuchal line midway between inion and mastoid on splenius capitis	Extension of OA, mild compression of head, slight side bending, and rotation away
PC2 occiput	Inferior nuchal line within semispinalis capitis muscle	Extension of OA, mild compression of head, slight side bending, and rotation away
PC2 midline spinous process	Superior or superior lateral tip of C2 spinous process	Extension of OA, mild compression of head, slight side bending, and rotation away
PC3 midline spinous process	Inferior or inferolateral tip of C2 spinous process	Flexion, side bending away, rotation away
PC4-PC8 midline spinous process	Inferior or inferolateral tip of spinous process above segment	Extension, slight side bending, and rotation away
PC3-PC7 lateral	Posterolateral tip of articular process on dysfunctional segment	Extension, slight side bending, and rotation away





Posterior cervical tender points.

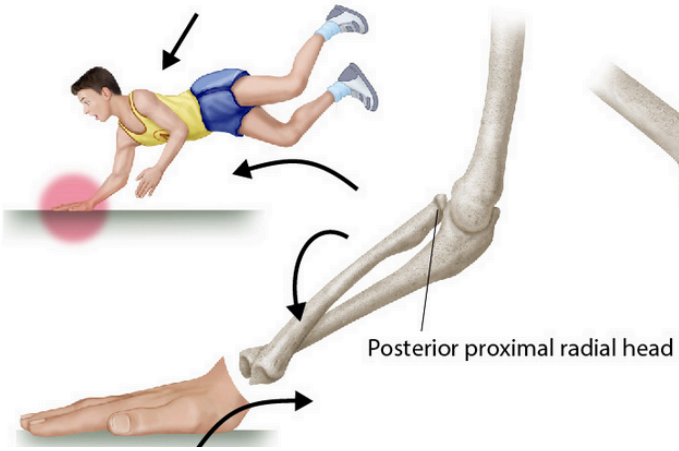


Location	Treatment Position	
AT1 mid-line	Episternal notch mid-line or slightly lateral	Flexion
AT2-6 mid-line	Level of corresponding rib on sternum	Flexion, minimal sidebending and rotation
AT7-9 bilateral	AT7: 1/4 distance from xiphoid tip to umbilicus, AT AT8: 1/2 distance between xiphoid tip and umbilicus, AT AT9: 3/4 distance xiphoid tip and umbilicus	Flexion, sidebend toward, rotate away
AT10-12 bilateral	AT10: 1/4 distance umbilicus to pubic symphysis AT11: 1/2 between umbilicus and pubic symphysis AT12: Apex of iliac crest at mid-axillary line	Flexion, sidebend ankles toward, rotate torso away

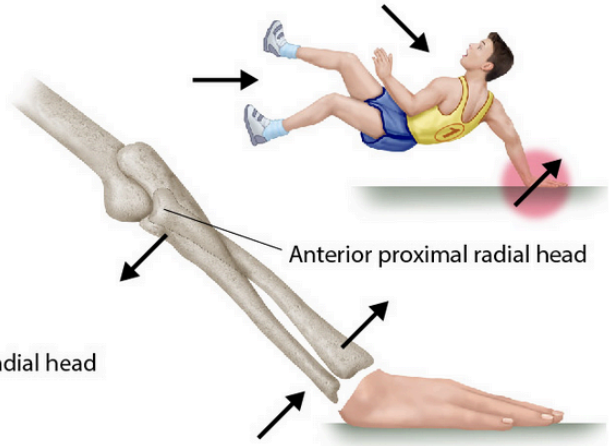
Sacral torsions

Diagnosis	Seated Flexion Test	Sacral Sulcus	ILA	Spring Test
Left on left	Positive on right	Deep on right	Shallow on left	Negative
Right on right	Positive on left	Deep on left	Shallow on right	Negative
Left on right	Positive on left	Shallow on left	Deep on right	Positive
Right on left	Positive on right	Shallow on right	Deep on left	Positive
Left unilateral extension	Positive on left	Shallow on left	Deep on left	Positive
Right unilateral extension	Positive on right	Shallow on right	Deep on right	Positive
Bilateral extension	Positive bilateral	Shallow bilateral	Deep bilateral	Positive
Left unilateral flexion	Positive on left	Deep on left	Shallow on left	Negative
Right unilateral flexion	Positive on right	Deep on right	Shallow on right	Negative
Bilateral flexion	Positive bilateral	Deep bilateral	Shallow bilateral	Negative

Mechanism for posterior radial head somatic dysfunction



Mechanism for anterior radial head somatic dysfunction



- **Ribs 1-3** have a predominantly pump-handle motion
- **Ribs 4-6** have a mixture of pump-handle and bucket-handle motion
- **Ribs 7-10** have a predominantly bucket-handle motion
- **Ribs 11 and 12** have a predominantly caliper motion

Findings	Acute	Chronic
Tenderness	Severe, sharp	Dull, achy, burning
Asymmetry	Present (e.g., paravertebral fullness)	Present with compensation in other areas of the body Obvious rotoscoliosis or increased/decreased spinal curvature (regional lordosis or kyphosis)
Restriction	Present, painful with movement	Present, decreased or no pain
Tissue texture changes	Edematous, erythematous, boggy with increased moisture Muscles hypertonic	Decreased or no edema, no erythema, cool dry skin, with slight tension Contractions or decreased muscle tone, flaccid, fibrotic, ropiness, firmness/hardness of tissue

Anterior Pelvic/Sacral Tenderpoints

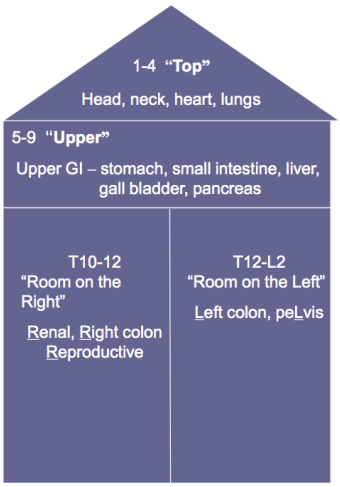
Tenderpoint	**Location**	**Treatment**
Psoas	2/3 from ASIS to midline	FST (Hips)
Iliacus	1/3 from ASIS to midline	F-AB-ER ("Frog position")
Low Ilium	~2 inches superolateral to Pubic Symphysis	Flexion
Pectineus ("*Inguinal*")	Medial aspect of inguinal ligament, near Pubic Tubercle	F-AD-IR
Low Ilium Flareout	Descending ramus of pubic bone	F-AB-ER

Posterior Pelvic/Sacral Tenderpoints

Tenderpoint	Location	Treatment
Piriformis	Halfway between the ILA and greater trochanter	F-AB-ER ("Peeing Dog")
Upper Pole L5 (UPL5)	Superomedial aspect of PSIS	Extension
Lower Pole L5 (LPL5)	Inferior aspect of PSIS	F-AD-IR
PL3 Gluteus	2/3 PSIS to Tensor Fasciae Latae	E-AB-ER
PL4 Gluteus	Posterior aspect of Tensor Fasciae Latae	E-AB-ER

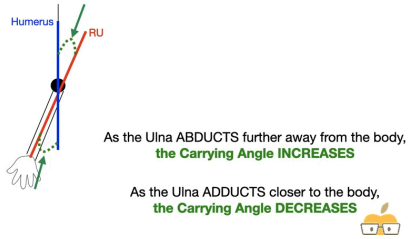
AUTONOMIC LEVELS

Structure	Level
Head & Neck	T1-T4
Heart & Lung	T1-T4
Foregut	T5-T9
Midgut	T10-T11
Hindgut	T12-L2
Kidney	T10-T11
Appendix	T12
Upper Extremity	T2-T8
Lower Extremity	T11-L2
Upper Ureter & Gonads	T10-T11
Lower Ureter & All Else GU	T12-L2

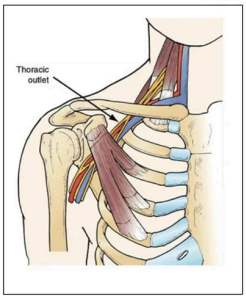


Sympathetic

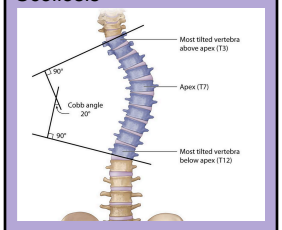
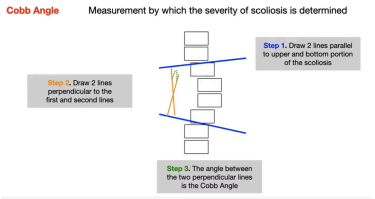
Greater splanchnic nerve: T5-9

viscerosomatics	Lesser splanchnic nerve: T10-11	
Bony landmarks	C7= vertebra prominens T3= spine of scapula T7 SP= inferior angle of scapula, TP of T8 T2= sternal notch T4, 2nd ribs= sternal angle, carina Iliac crest= level of L4 males, L5 females Dimple of venus: PSIS, S2	**BUM** **BUL** **BM**
Articulatory technique	Stabilize vertebrae and spinous process below dysfunctional segment→ oscillate - Spencer technique for shoulder	**Low velocity, high amplitude** Direct technique
Reciprocal inhibition	Muscle energy that lengthens a short muscle (**torticollis**) - Gentle contraction in agonist muscle, reflexive relaxation of antagonist muscle. (capitis muscles → SCM) - LENGTHENS a muscle with gentle contraction	Vs isolytic lengthening: similar, however, patient contracts muscle against a greater force where operators force is greater
Balanced ligamentous tension (**BLT**)	Used in **acute dysfunction, indirect techni**que **MYOFASCIAL**, **counterstrain** and **FPR** are also indicated. Treats somatic dysfunction by moving the segment into direction of ease, restor ligamentous tension, uses patents breathing or muscular cooperation to overcome resistance	Avoid HVLA, Stills, and muscle energy in acute dysfunction - Less aggressive and direct techniques - Do not directly engage the barrier
Rib 1	Anterior and middle scalene	
Rib 2	**Posterior scalene**	
Riib 4-6	Pectoralis	
Rib 7-10	Latissimus dorsi	
Nursemaid elbow	**Radial head subluxation** thru annular ligament Displacement of **radiocapitellar line** Slight flexion and pronation arm position	Colles fracture is fracture of distal radial head and ulna
Carrying angle	> 15 degrees= abduction of ulna + adduction of wrist= **VALGUS** < 15 degrees, ulna adduction, abduction of wrist. = **VARUS** **ULNA and WRIST act opposite of each other**	
Fat pad sign	Radial head fracture, FOOSH	

Acute TTA findings	**Boggy** Normal range of motion with sluggish quality, vasodilation and edema of surrounding tissue, warm and moist	
Chronic TTA findings	**Ropy**, stringy, doughy, flaccidity, fibrotic Dry and scaly skin, cool **Chronic Somatic Dysfunction** • Tissue texture: no edema, no erythema, cool dry skin, decreased muscle tone • Asymmetry is present with compensation in other areas of the body • Restriction of motion is present, but there is no pain/decreased pain with movement into the barrier and the quality of movement is normal • When palpated, the tissues subjectively feel dull and achy	
Viscerosomatic reflex	**Chapman's points are myofascial nodules of sympathetic tone**	
Sympathetics to head	T1-4	
Dysmenorrhea	**Tx sacral inhibition / sacral rock** Chapman points for uterus are sacral bases and between L4/5 transverse processes bilaterally **Sympathetics: T10-L2= uterus → rib raising decreases sympathetic tone, enhance blood flow and relax uterus, decrease pain** Parasympathetics: s2-s4= cervix	Pubic tubercle chapman point = ovary
Appendix	Anterior: tip of 12th rib. Posterior: transverse process of T11	Adrenals chapman: T8-10
Diverticulitis	Left sigmoid colon, left thigh along IT band	
Sacral rocking	**NORMALIZES parasympathetic tone** of pelvic and lower abdominal viscera	
Post-Op ileus	Reduce hypersympathetic tone by performing **paraspinal inhibition** of thoracolumbar junction	
Prostate	Chapman's point= lateral thigh	
Iliotibial band syndrome	Knee pain in athletes Positive OBER'S test, originates from tensor fascia lata	Muscles insert at Gerdy's tubercle at the proximal lateral tibia, lateral femoral condyle
Forward sacral torsions	Type I dysfunction R on R, L on L L5 rotates opposite, side bends same	Negative spring = “junction **springs freely”**

Backward sacral torsions	Type II dysfunction L on R, R on L	Positive spring
Anterior radial head	Prefers supination, restricted in pronation Resists posterior glide, prefers anterior glide	Forearm held in pronation, while patient resists
Posterior radial head	Prefers pronation, restricted in supination Prefers posterior glide	Tx: MET, HVLA - HVLA place into SUPINATION
Terrible triad	Radial head fracture, coronoid process fracture of ulna, posterior elbow dislocation	
Effleurage	Soft tissue technique stroking/ skimming over to push fluid back to heart	
Galbreath technique	Otitis media, traction of jaw downward	
Anterior talofibular ligament pathology	Positive ankle anterior drawer test	Always Tears First
Thoracic inlet syndrome	Uneven pulses due to compression of subclavian vessels and brachial plexus between anterior and middle scalene muscles **Thoracic Outlet** Neurovasculature, lymphatic, musculoskeletal space bound by: •First rib •Clavicle •Pectoralis minor •Anterior & Middle Scalenes 	Dx: military posture test Adson's test → loss of radial pulse with head turn extended arm. Compressed brachial plexus and subclavian vessels. Anterior and middle scalenes. Subclavius muscle under the clavicle protects the brachial plexus in clavicle fractures
Rotator Cuff muscles	**Supraspinatus: ABduction** **Infraspinatus: External rotation** **Teres Minor: External rotation** **Subscapularis: Internal rotation** Rotator cuff tear: ROM deficit Tendonitis: no ROM deficit	**"A, E, E, I the SITS muscles makes the arm touch the sky"**
Shoulder tests	**AC joint:** Cross arm test, apley scratch **Bicipital tendonitis:** speeds test, **yergason's** test **Glenohumeral** joint instability: sulcus sign, inferior traction **Subacromial** bursa impingement: hawkins test, neer/ painful arc **Supraspinatus: empty can test, Drop arm test**	

Nerve impingement	**Extra cervical rib and scalene: brachial plexus** **Corachobrachialis: bench pressing, traps musculocutaneous nerve** **Teres major: quadrangular space, axillary nerve**	
Sympathetics to lower extremities	T10-L2	
Plantar fasciitis	Tight calf muscles: gastrocnemius, soleus. Achilles tendonitis	Tx: counterstrain of gastrocnemius with plantarflexion and knee flexion
Wallenbergs test	Vertebral artery insufficiency	
Postpartum sacral dysfunction	**Bilateral sacral flexion** - **F**uck Labor	Deep sacral sulci and shallow ILAs
Diverticulitis (sigmoid colon)	Left anterior iliotibial band chapman point	T12-L2
Flexion	**External rotation of paired bones** Decreased AP diameter, eyes further apart Dura pulled caudad	Sacral **counternutation**
Extension	**Internal** rotation of paired bones **Increased AP diameter,** eyes closer together Dura pulled cephalad	Sacral nutation
Posterior radial head	**Repeated pronation and supination** Fall forward on outstretched hand	Pronates, but cannot supinate Tx: forearm held in pronation while patient resists
Anterior radial head	Fall backward on outstretched hand Radius is supinated, barrier is pronation	Post-isometric MET: put patient into pronation and have them contract into supination against counterforce
Pronator teres syndrome	Numbness and tingling	
Posterior fibular head - PIP - Inverted - Plantar Flexes - Supinated	Fibular head resists anterior glide Anterior lateral malleolus resists posterior gliding Ease of plantarflexion / restricted **dorsiflexion** Ease in inversion / restricted **eversion** Foot is **supinated**	See-saw motion - Fracture of posterior fibular head can damage the common fibular nerve
Winged scapula	“Asymmetry of upper back”= **C5-7,** long thoracic nerve, serratus anterior	7 heaven
Adrenal gland sympathetics	T8-10 2x1 inch above umbilicus	
Chapman Points	I am funny→ Eye= humerus	

	I heard you broke your clavicle→ **Ear= clavicle (superior proximal)** STLP, 11SC→ sinus, tinsel, larynx, pharynx= 1st rib ICS, Sternoclavicular appendix= comes after right 12th rib	
Chapman points for GI	FLip rule. Open up the guts and fold it down. Iliotibial band. Sigmoid on upper left lateral thigh Splenic flexure: lower left lateral thigh	Posterior of iliotibial band= prostate
Chapman for adrenal	2x1 inch above umbilicus	
Scoliosis 	Idiopathic and women #1 Dextro: right, convex right Levo: left, convex left **Structural: does NOT correct with sidebending. Adams forward bending test assess spinal curvature.** Functional: Does correct with sidebending. Functional FIXES. Due to short leg syndrome Mild: 0- 20 → OMT Moderate: 21-45 → Omt + bracing **Severe: 50+--> surgery , respiratory issues** > 75 degrees= CV involvement , surgery	Cobb angle - Measure of scoliosis severity - Superior - top and inferior - bottom 
Short leg syndrome	**Functional** short leg= **COMPENSATORY** somatic dysfunction, hip replacement or short leg - Anterior innominate rotation Anatomic short leg= genetic - Posterior innominate rotation Heel Lift Tx: 1/16" in elderly, ⅛" in young, ½ " maximum every 2 weeks***	Findings: Uneven landmarks bilaterally Lumbar spine: SART
T10-T11	Middle Gi tract (lesser splanchnic, SM ganglion) **Kidney, upper ureters [lower ureters T12-L1]** Gonads (ovary, testes)	prostate= T12-L2 Uterus, cervix= T10-L2
T11-L2	Bladder, penis, clitoris, Legs	
Occipital condylar decompression	Poor suckling in newborn Decompress occipital condyles and normalize CN XII. apply cephalad and lateral force at base of occiput **Nerve entrapment of CN IX, X, XI at the jugular foramen and CNXII at hypoglossal foramen**	
Fibular head	Named for movement of ease. Lateral malleolus restriction is opposite of fibular head restriction	Teeter-totter
Piriformis syndrome	Bending, hunched over position. Pain with standing and walking	**FABER ½ between ILA and greater trochanter**

CRI	Decreased in stress, depression, chronic fatigue, pituitary tumors. Increased in acute fever, exercise, hyperthyroidism - **CV4**	Normal: 10- 14 Decreased with depression or hypo physiologic states.
Direct treatment	Engages restrictive barriers, away from position of ease. Place patient into barrier that you found it in	
Interossei	PAD: palmer adduct DAB: dorsal abduct	
Rotator cuff tear	Most common is supraspinatus tendon. Drop arm test and painful arc test.	Infraspinatus: promotes external rotation Teres minor: external rotation Supraspinatus: abduction (inn suprascapular n.) Subscapularis: internal rotation
Parallelogram	**Lateral strain pattern, 2 vertical axes in same direction**	Neonate with misshapen head
Psoas syndrome	Thomas test. Pt is supine, flexes right knee to chest and extends opposite leg off table.	Muscular imbalance, strain, spasm, tendonitis, contracture of the iliopsoas muscle. - Kidney stones/ ureter cause viscerosomatic reflex to this muscle - Quadratus lumborum has overlap (inn by T12-L4)
V-spread technique	Alleviate restrictions along cranial **sutures** Apply traction to cranial bones until restriction is released	
CV4 technique	Restore CRI, **resist FLEXION** until a Still point is reached.	
Parietal lift	Treat squamous suture dysfunction	
Venou sinus technique	Decrease congestion in dural venous sinuses, improve circulation thru jugular foramen	
“Fall on buttocks”	Superior shear of affected side Medial malleolus, ASIIS and PSIS are all superior	Tx: Abduction and internal rotation of SI joint → gapping. HVLA engages restrictive barrier
Fryette type 1	Neutral, sidebending and rotation are **opposite** - OA	HVLA treatment is a thrust, position patient and rotate into barrier (rotate patient right→ segment is rotated left). Treat at apex (in the middle of the segment) - NRLSR → Tx is N RRSL
Abduction dysfunction of ulna	Increased carrying angle, increased abduction. Increased ease of medial glide of olecranon process. Wrist is adducted	
	RIBS are FUCKING named for where they are STUCK! That is their dysfunction. BITE	
Exhalation restriction/	Hurt during inhalation, stuck exhaled down	BITE: bottom= inhaled, top= exhaled

inhalation dysfunction		
Inhalation restriction/ exhalation dysfunction	Hurt during exhalation, stuck inhaled/ up	Ribs stuck in inhalation (exhalation dysfunction) common in asthma and COPD

Muscles Used in Treatment of Dysfunctional Ribs (Exhalation Dysfunction)

Ribs	Muscles Used	Activation of Muscle Group
1	Anterior and middle scalenes	Look straight ahead and flex the neck
2	Posterior scalenes	Turn head sideways and flex the neck
3-5	Pectoralis minor	Push ipsilateral elbow toward contralateral anterior superior iliac spine (ASIS) against resistance
6-9	Serratus anterior	Push ipsilateral arm anteriorly
10-11	Latissimus dorsi	Adduction of the affected arm against resistance
12	Quadratus lumborum	Elevate ipsilateral innominate against resistance

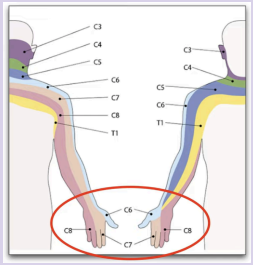
Scoliosis	• Mild (5-15°), moderate (20-45°), and severe (>50°) scoliosis are treated differently. • Moderate scoliosis 20-45° is when bracing should be utilized. • Severe scoliosis >50° may cause respiratory compromise and requires surgery. • Severe scoliosis >75° may cause cardiovascular compromise and requires surgery.	
Backward sacral torsion	Sphinx: landmarks more prominent. Posterior ILA and Deep sulcus on opposite sides. L5 rotated opposite of the axis.	Non-physiological, L on R more common.
Bilateral sacral extension	Pregnant women accommodate enlarging fetus Restrictive sacral rock, negative seated flexion	**Bilateral sacral flexion after child birth**
Lateral strain	Sphenoid and occiput turn clockwise on 2 transverse axes (left) Or counterclockwise (right) Parallelogram head: index finger goes to right, pinky finger does to left	Direct blow to lateral head

Unilateral sacral flexion	Unlevel ILAs= sacral shear → ILAs are posterior Sphinx improves asymmetry → dysfunction is anterior	
Unilateral sacral extension	ILAs are inferior Sphinx worsens asymmetry	
Direct treatment to spine	Reverse all planes of potion in diagnosis FRLSL → ERRSR	Neutral dysfunctions remain in neutral position
Facilitated positional release	Indirect, passive technique : **balanced** neutral position of tissues, gentle activating force. Negative stretch reflex mechanism	**Facilitation**: highly excitable spinal segment needs - Less afferent stimuli - Higher resting membrane potential - Hyperexcitable neural state
Muscle energy	Place patient in r**estrictive barrier → post-isometric relaxation →** push toward ease with physician resistance → maintain contraction for 2-5 seconds → relax → slowly reposition → repeat	Isometric: physician and patient contraction forces are equal
9 physiologic principles in MET	*1. Joint mobilization with muscle force* *2. Respiratory assistance* *3. Oculocephalogyric reflex* *4. Reciprocal inhibition* *5. Crossed extensor reflex* *6. Isokinetic strengthening* *7. Isolytic lengthening* *8. Postisometric relaxation* *9. Using muscle force in one region to achieve movement of another region*	Torticollis: reciprocal inhibition **Crossed extensor reflex**: severely injured areas, one flexor contracted and contralateral flexor relaxes and extensor contracts. I**solytic lengthening:** operator force lengthens muscle by exceeding patient force. **Oculocephalogyric reflex** eye motion to cause reflex muscle contraction , post isometric relaxation of reciprocal inhibition **Respiratory assistance**: voluntary breathing to create muscular forces as fulcrum during muscle energy
Myofascial release	Passive direct or indirect technique Move into the barrier and into the ease Steps of a typical myofascial release treatment: 1. Identify an area of somatic dysfunction through palpation. 2. Once a restriction is palpated, choose a type of myofascial release. In a direct treatment, the physician will move tissues toward the barrier. In an indirect treatment, the physician will move myofascial structures away from the barrier. 3. The physician adds other forces to "fine tune" the treatment (eg, twisting). 4. The patient is asked to use "enhancers" to assist with the release (enhancers include respiration, eye movement, muscle contraction, etc). 5. The physician awaits a release. 6. The patient is returned to neutral. 7. The physician rechecks the area.	

<table>
<tr><td>Muscle contractions</td><td colspan="2">Isometric: increase tension without movement (MET)- entire biceps curl, no shortening of the muscle, pushes against resistance
Isolytic: eccentric, muscle contraction against resistance with muscle lengthening (physician force > patient force)
Eccentric: lengthen muscle during contraction (weight down)==> MUSCLE injuries due to too heavy equipment
Concentric: flexing, contracting muscle with external force
Isokinetic contraction: concentric contraction with constant Speed of contraction
Isotonic: approximation of muscle origin with out increase in tension , CONTROLLED/ CONSTANT</td></tr>
<tr><td>Patellofemoral pain syndrome</td><td>Runners knee, pain worsens with going up or down stairs
Large Q angle, imbalance of quadriceps muscle. Knee cap deviates Laterally.
J sign: patella tracking in joint with contraction of quadriceps.
Weakness of vastus medialis, abnormal lateral tracking of patella.</td><td>Treatment: strengthen vastus medialis muscle.</td></tr>
<tr><td>Medial tibial stress syndrome</td><td>Shin splints, tenderness over anterior tibia, stress fracture</td><td></td></tr>
<tr><td>Ear</td><td>Chapman's point for ear: ABOVE proximal third of clavicle</td><td>Below proximal third of clavicle= sinuses</td></tr>
<tr><td>Skin receptors</td><td><table>
<tr><th>Receptor</th><th>Type</th><th>Location</th><th>Function</th></tr>
<tr><td>Meissner Corpuscle</td><td>Large, myelinated, adapt quickly</td><td>Hairless skin</td><td>Fine/light touch, position</td></tr>
<tr><td>Pacinian Corpuscle</td><td>Large, myelinated, adapt quickly</td><td>Deep skin, joints, ligaments</td><td>Vibration, pressure</td></tr>
<tr><td>Ruffini Corpuscle</td><td>Dendritic endings, adapt slowly</td><td>Fingertips, joints</td><td>Surface slippage, joint angle changes</td></tr>
<tr><td>Merkel Disc</td><td>Large, myelinated, adapt slowly</td><td>Fingertips, superficial skin</td><td>Deep static position</td></tr>
</table>Settings</td><td>Merkel Disc: Deep static touch
Ruffini: Fingertips rough, slippage
Pacinian: Pacific, deep pressure</td></tr>
<tr><td>Viscerosomatic reflex</td><td>Visceral pain → somatic pain (heart attack)</td><td></td></tr>
<tr><td>Viscerovisceral reflex</td><td>Gastric pain and GI motility</td><td></td></tr>
<tr><td>Somatovisceral reflex</td><td>Injury causes visceral response</td><td></td></tr>
<tr><td>Ganglia</td><td>Sympathetic and parasympathetic effects on viscera</td><td></td></tr>
</table>

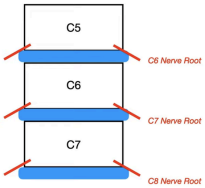
Structure	Levels	Sympathetic Ganglion	Parasympathetic Ganglion
Foregut	T5-T9	Celiac	Vagus
Midgut	T10-T11	Superior Mesenteric	Vagus
Hindgut	T12-L2	Inferior Mesenteric	Pelvic Splanchnic

Cervical OMM



Nerves enter ABOVE corresponding vertebra. C8 exits below C7
"7 UP, 8 DOWN"

Nerve Root	Sensory	Reflex
C3	Neck, shoulder, and superior chest Right shoulder Phrenic Nerve (C3, C4, C5) refers Gallbladder/Diaphragm pain to the right shoulder	– – – – – – – –
C4		– – – – – – – –
C5		Biceps & brachioradialis
C6	Thumb	Biceps & brachioradialis
C7	Index & Middle finger (2nd and 3rd digit)	Triceps
C8	Ring & Pinky finger (4th and 5th digit)	Triceps



Radiculitis: sensory
Radiculopathy: muscle and reflex

Rheumatoid arthritis and down's syndrome have weak **transverse ligament of the atlas** → avoid upper cervical neck HVLA

Cervical motion

Primary Motions

OA	Flexion & extension
AA	Rotation
C2-C7	Sidebending

AA joint: Flexion locks out other motion, focus solely on AA rotation

"**The cervical spine is the First Real Segment"**
- **OA= flex/ extend**
- **AA= rotation**
- **C2-C7= sidebending**

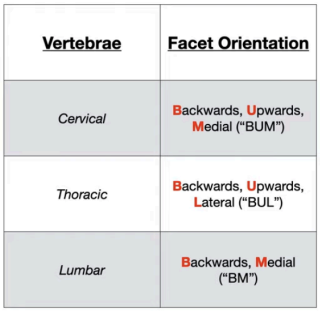
OA is type 1 like, sidebending and rotation opposite
C2-C7 is type 2 like, same sidebending and rotation

<table>
<tr><td></td><td colspan="2">

Joints	Mechanics
Occipitoatlantal joint	Sidebending and rotation opposite
AA	Rotation only
C2-C7	Sidebending and rotation same
T1-L5	Follows Fryette mechanics: • Sidebending and rotation opposite for neutral dysfunctions (type 1) • Sidebending and rotation same for flexion/extension dysfunctions (type 2)

</td></tr>
<tr><td>Cervical pathology</td><td>Alar and transverse ligaments are weak in Down's syndrome and RA
Avoid cervical extension in vertebral artery insufficiency
Whiplash causes loss of cervical spine lordosis</td><td></td></tr>
<tr><td>Cervical Facet orientation</td><td>

Thoracic Rule of 3s	
Segment	**Rule**
T1–3	SP is at the same level as TP
T4–6	SP is 1/2 segment below TP
T7–9	SP is 1 segment below TP
T10	SP is 1 segment below TP
T11	SP is 1/2 segment below TP
T12	SP is at the same level as TP

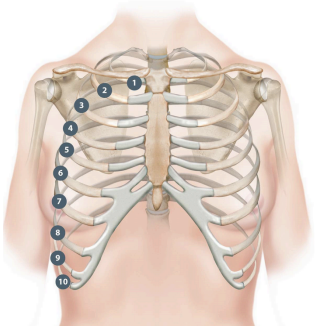
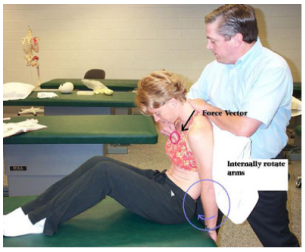
</td><td>Facet orientation
- Cervical: BUM
- Thoracic: BUL
- Lumbar: BM

</td></tr>
<tr><td>Rib categories</td><td>Ribs 1-7
- Increased length and curvature as you descend inferiorly
Ribs 1-5 have pump hand motion, AP diameter
Ribs 5-10: Bucket handle
- Ribs 8-10 are false ribs
Ribs 11-12: floating, caliper motion , transverse diameter</td><td>Direct attachment to the sternum</td></tr>
<tr><td>Typical ribs</td><td>Head, neck and body. Neurovascular groove. One facet articulates with same and superior vertebrae</td><td></td></tr>
</table>

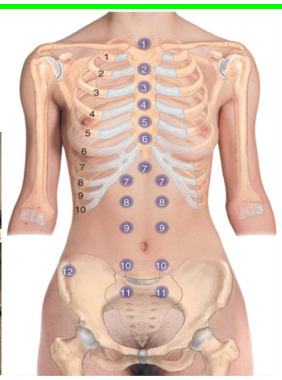
<table>
<tr><td>Atypical ribs</td><td>Rib 1: 1 facet, 2 grooves for subclavian vessels
Rib 2: rough area for serratus anterior
Rib 10: 1 facet
Ribs 11-12: no neck, 1 facet</td><td></td></tr>
<tr><td>Rib motion</td><td>Pump handle: AP diameter increases with inhalation
Bucket handle: transverse diameter increases with inhalation
Ribs 11-12: down and out motion with inhalation</td><td></td></tr>
<tr><td>Inhalation dysfunction</td><td>Rib stuck UP/ inhaled</td><td rowspan="2">Key RIB: BITE=
- inhaled= Bottom-most rib
- exhaled= top-most rib
<table><tr><th>Ribs</th><th>Muscle</th></tr><tr><td>1</td><td>Anterior & Middle Scalene</td></tr><tr><td>2</td><td>Posterior Scalene</td></tr><tr><td>3-5</td><td>Pectoralis Minor</td></tr><tr><td>6-9</td><td>Serratus Anterior</td></tr><tr><td>10-12</td><td>Latissimus Dorsi</td></tr></table></td></tr>
<tr><td>Exhalation dysfunction</td><td>Rib stuck DOWN/ exhaled</td></tr>
<tr><td>Thoracic anatomy</td><td colspan="2">T3= spine of scapula
T7= inferior angle of scapula
Diaphragm: attaches to L1-3, Ribs 6-12.
<table><tr><th>Thoracic Vertebrae</th><th>Rule of 3's</th></tr><tr><td>T1-T3</td><td>SP/TP in-line</td></tr><tr><td>T4-T6</td><td>TP 1/2 segment above SP</td></tr><tr><td>T7-T9</td><td>TP 1 full segment above SP</td></tr><tr><td>T10</td><td>TP 1 full segment above SP</td></tr><tr><td>T11</td><td>TP 1/2 segment above SP</td></tr><tr><td>T12</td><td>SP/TP in-line</td></tr></table>Rule of 3:</td></tr>
<tr><td>Surgical neck fracture</td><td>Axillary nerve injury: flat deltoid, loss of abduction, loss sensation C5</td><td></td></tr>
<tr><td>Midshaft fracture</td><td>Radial nerve injury , wrist drop, decreased grip strength, loss of sensation over dorsal arm</td><td>Crutches, saturday night palsy</td></tr>
</table>

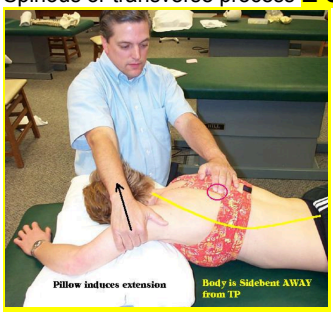
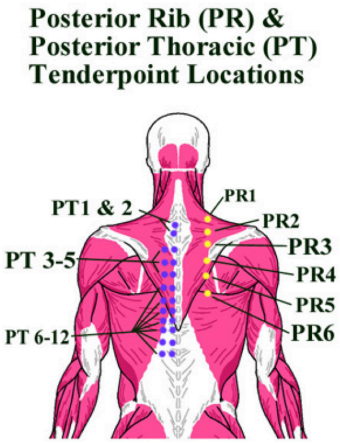
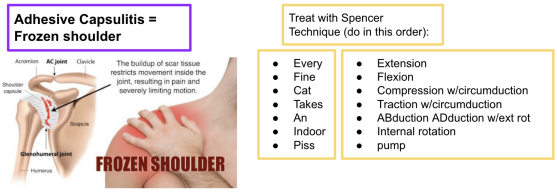
<table>
<tr><td>Supracondylar fracture</td><td>Median nerve. Ape hand and pope’s blessing.
Loss wrist flexion. Loss OPPOSITION. Loss of thenar sensation, dorsal palmar aspect and lateral 3.5 digits</td><td></td></tr>
<tr><td>Medial epicondyle injury</td><td>Hook of hamate / fall on outstretched hand.
Guyon's canal/ flexor retinaculum
Ulnar claw, radial deviation, loss AD/ ABduction of digits</td><td></td></tr>
<tr><td>Upper extremity nerve injury patterns</td><td colspan="2"><table>
<tr><th>Nerve</th><th>Injury</th><th>Dysfunction</th></tr>
<tr><td>Axillary</td><td>Surgical Neck fracture</td><td>Flattened deltoid
Loss of arm abduction
Loss of sensation over deltoid</td></tr>
<tr><td>Radial</td><td>Axillary “crush” injury
Midshaft fracture</td><td>Wrist drop
Decreased grip strength
Loss of sensation over posterior arm/dorsal arm</td></tr>
<tr><td>Median</td><td>Supracondylar fracture</td><td>Ape Hand & Pope’s Blessing
Loss of wrist flexion, thumb opposition
Loss of 2nd and 3rd lumbrical
Loss of sensation over thenar eminence, dorsal & palmar aspect of lateral 3.5 digits</td></tr>
<tr><td>Ulnar</td><td>Hook of the hamate/Guyon Canal
Median epicondyle injury</td><td>Ulnar Claw
Radial deviation of the wrist during flexion
Loss of wrist flexion, AB/ADduction of digits
Loss of sensation over medial 1.5 digits + hypothenar eminence</td></tr>
</table></td></tr>
<tr><td>Clavicle</td><td>AC and SC joints move like a teeter-totter. One goes up, the other goes down</td><td></td></tr>
<tr><td>Carpal tunnel syndrome

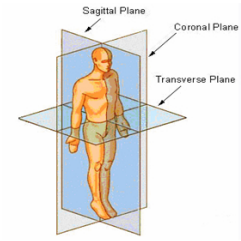
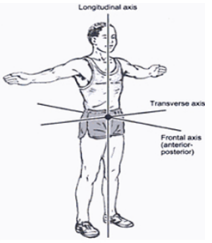
- ABductor pollicis Brevis
- Opponens pollicis
- Flexor pollicis brevis
*BREVIS sandwich</td><td colspan="2">Entrapment of median nerve in flexor retinaculum. Paresthesias in first 3.5 digits, tinel and phalen test
<table>
<tr><th colspan="3">Branches of the Median Nerve</th></tr>
<tr><th>Branch</th><th>Origin</th><th>Innervation</th></tr>
<tr><td>Anterior interosseous nerve</td><td>In the proximal forearm, at the radiohumeral joint line</td><td>Motor: pronator quadratus, flexor pollicis longus, flexor digitorum profundus (radial 1/2)</td></tr>
<tr><td>Palmar cutaneous branch</td><td>In the middle forearm, proximal to the carpal tunnel</td><td>Sensory: skin over the thenar eminence</td></tr>
<tr><td>Recurrent branch</td><td>In the hand, distal to the carpal tunnel</td><td>Motor: abductor pollicis brevis, opponens pollicis, flexor pollicis brevis</td></tr>
<tr><td>Palmar digital branch</td><td>In the hand, distal to the carpal tunnel</td><td>Motor: lateral 2 lumbricals
Sensory: palmar surface and nail beds of the lateral 3 and 1/2 digits</td></tr>
</table></td></tr>
<tr><td>Fall on outstretched hand</td><td>Scaphoid fracture: Proximal scaphoid risk of avascular necrosis (dorsal branch, radial artery) → serial xrays and MRI.</td><td></td></tr>
<tr><td>De Quervain's tenosynovitis</td><td>Inflammation of 1st dorsal compartment along thumb.
Abductor pollicis longus, extensor pollicis brevis.
Finklestein’s test</td><td></td></tr>
</table>

<table>
<tr><td>Epicondylitis</td><td>Medial= Golfers. Flexor muscle tendons
Lateral= tennis, extensor muscle tendons</td><td></td></tr>
<tr><td>Sacral motion axis</td><td>Superior sacral axis= cranioSacral motion/ S2 (nutation, counternutation)
Medial= postural motion
Inferior: innominate motion, S4</td><td>Superior Sacral Axis craniosacral & respiratory motion
Medial Sacral Axis postural motion
Inferior Sacral Axis innominate motion</td></tr>
<tr><td>Anterior Lumbar counterstrain</td><td colspan="2"><table>
<tr><td>AL1 (medial)</td><td>F STRA
#1= STAR</td><td>Same side as dysfunction</td></tr>
<tr><td>AL2 (medial)</td><td>F SART</td><td>Opposite side of dysfunction</td></tr>
<tr><td>AL3 (Lateral)</td><td>F SART</td><td>Opposite side of dysfunction</td></tr>
<tr><td>AL4 (inferior)</td><td>F SART</td><td>Opposite side of dysfunction</td></tr>
<tr><td>AL5 (lateral to physis, superior pubic ramus)</td><td>F SARA
*sarah spelled with 5 letters</td><td>Same side of dysfunction
Or frog legs (FABER)</td></tr>
</table></td></tr>
<tr><td>OA</td><td>Type 1 mechanics, side bending and rotation are opposite
- Primary motion is flexion and extension</td><td>HVLA bring the joint into the barrier</td></tr>
<tr><td>Dural attachments</td><td>Axis, Foramen magnum, C2, C3, S2
- Allow for craniosacral motion</td><td></td></tr>
<tr><td>Primary motion of neck segments</td><td>OA= flex/ extend → fryette 1= sidebending/ rotation are opposite
AA= rotation
C2-C4= rotation
C5-7= sidebending</td><td><table>
<tr><th>Cervical Level</th><th>Motion</th></tr>
<tr><td>OA</td><td>Flexed, extended or neutral; Sidebending and rotation to opposite sides</td></tr>
<tr><td>AA</td><td>Purely rotational</td></tr>
<tr><td>C2</td><td>Flexed or extended;
Sidebending and rotation to same side</td></tr>
<tr><td>C3</td><td>Flexed or extended;
Sidebending and rotation to same side</td></tr>
<tr><td>C4</td><td>Flexed or extended;
Sidebending and rotation to same side</td></tr>
<tr><td>C5</td><td>Flexed or extended;
Sidebending and rotation to same side</td></tr>
<tr><td>C6</td><td>Flexed or extended;
Sidebending and rotation to same side</td></tr>
<tr><td>C7</td><td>Flexed or extended;
Sidebending and rotation to same side</td></tr>
</table></td></tr>
<tr><td>Latissimus dorsi</td><td>Adducts, extends and internally rotates the humerus</td><td></td></tr>
</table>

<table>
<tr>
<td>Anterior rib tender points</td>
<td>AR1= below clavicle on 1st chondrosternal articulation
AR2= MCL, superior rib 2
AR3- 10= axillary line

Posterior tender points are on angle of rib</td>
<td>
<table>
<tr><th>Tender Point</th><th>Location</th><th>Treatment Position</th></tr>
<tr><td>AR1</td><td>Below the clavicle on first chondrosternal articulation</td><td>Patient supine; using the cervical-thoracic spine, flex, side-bend, and rotate towards the point</td></tr>
<tr><td>AR2</td><td>Superior aspect of second rib at midclavicular line</td><td>Same as AR1</td></tr>
<tr><td>AR3–AR10</td><td>On the rib at the anterior axillary line</td><td>In seated position, flex, side-bend, and rotate towards the point</td></tr>
</table>
</td>
</tr>
<tr>
<td>Anterior thoracic counterstrain</td>
<td>Anterior 1-6: flexion +/- sidebending and away rotation
<table>
<tr><th>Tender Point</th><th>Location</th><th>Treatment Position</th></tr>
<tr><td>AT1 midline</td><td>Episternal notch midline or slightly lateral</td><td>Flexion</td></tr>
<tr><td>AT2–6 midline</td><td>Level of corresponding rib on sternum</td><td>Flexion, minimal side-bending, and rotation</td></tr>
<tr><td>AT7–9 bilateral</td><td>AT7: 1/4 distance from xiphoid tip to umbilicus
AT8: 1/2 distance between xiphoid tip and umbilicus
AT9: 3/4 distance from xiphoid tip to umbilicus</td><td>Flexion, side-bend toward, rotate away</td></tr>
<tr><td>AT10–12 bilateral</td><td>AT10: 1/4 distance from umbilicus to pubic symphysis
AT11: 1/2 distance between umbilicus and pubic symphysis
AT12: Apex of iliac crest at midaxillary line</td><td>Flexion, side-bend ankles towards, rotate torso away</td></tr>
</table>


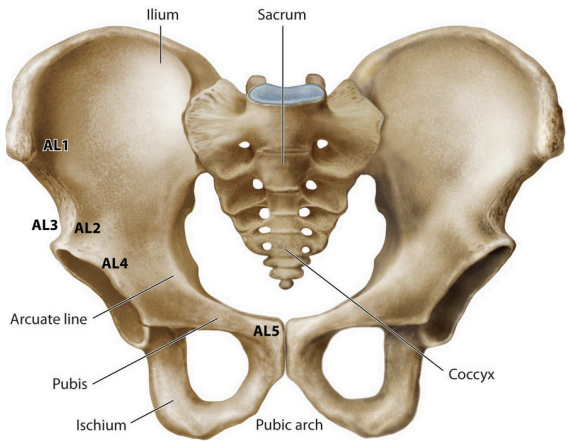

</td>
<td>Anterior 7-12 STRA
</td>
</tr>
</table>

Posterior thoracic counterstrain - Midline on inferior aspect of SP - Inferolateral aspect of SP - Posterolateral aspect of TP	Spinous or transverse process **E SARA**  	
Posterior cervical counterstrain	**ESARA** - Inion (flexion only) - PC3 (FSARA)	
Cranial bones	Ethmoid: CN I Sphenoid: Superior orbital fissure CN III, IV, V1, VI - Foramen rotundum: V2 Temporal bone: CN VII, VIII, IX - Foramen spinosum: V3 Occipital: CN IX, X, XII	
Adhesive capsulitis	 	
Lymphatics treatment order:	Thoracic diaphragm abdominal release → abdominal diaphragm → pedal pump and effleurage	Zinks common compensatory pattern: - OA rotated left - Cervicothoracic (CT diaphragm) rotated right - Thoracolumbar (abdominal d): rotated left - Lumbosacral junction (pelvic): rotated right

Soft tissue techniques	Engage deep cervical muscles and use rhythmic perpendicular stretching: longitudinal, perpendicular (kneading), direct inhibition or sustained pressure - Tension headache	Direct inhibitory pressure: apply deep sustained pressure to muscles around joint Percussion device: apply oscillatory pressure to superficial muscles Myofascial release: engage cervical muscle in many planes and await release Parallel traction : reduce cervical lordosis while applying axial traction through neck
HVLA- kirksville crunch	Direct technique for neutral dysfunctions - Place into barrier (SR RL → SL RR) - Place thenar eminence on the side it is rotated/ most prominent	Somatic dysfunction is named for its ease
Acute cervical strain	Indirect techniques (with or without fracture from MVA), rest, NSAIDS	
Jones counterstrain for UE	Subscapularis muscle: anterolateral surface of scapula Biceps: long head of biceps muscle Pronator teres (medial epicondyle) Levator scapulae: inferior scapula	Tender Points are small, tender areas the size of a fingertip. Found enar bony attachments of tendons/ ligaments or muscle bellies
Barriers	Restrictive barrier: maximum distance a patient can move a joint, sometimes pathologic Physiologic barrier: maximum point a patient can actively move a joint in absence of dysfunction Anatomic barrier: maximum point a joint can move (bone, joint, muscle dependent) Elastic barrier: range between physiologic and anatomic barrier where passive ligamentous stretching occurs before tissue disruption	
Axis	Anterior/ posterior axis: coronal plane= sidebending Horizontal plane: vertical axis, rotation - **AA (C1-C2) motion** **Sagittal plane: flexion, extension** **Coronal plane: sidebending** **Transverse plane: rotation** Transverse axis: fixed position where motion occurs with in the sagittal plane Plane= direction of motion axis= fixed structure upon which the plane of motion occurs	 Figure 1 - Subject in anatomical position with planes of motion  Figure 2 – Axes of Rotation

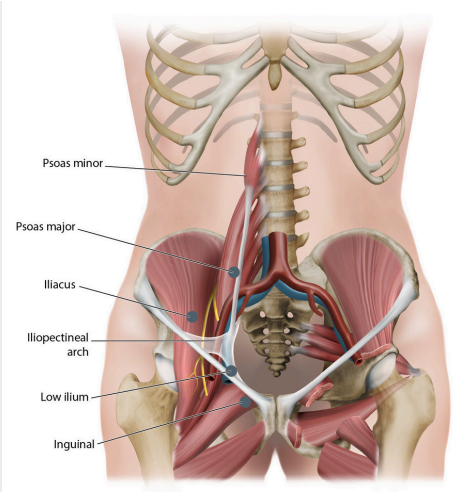
Anterior lumbar points

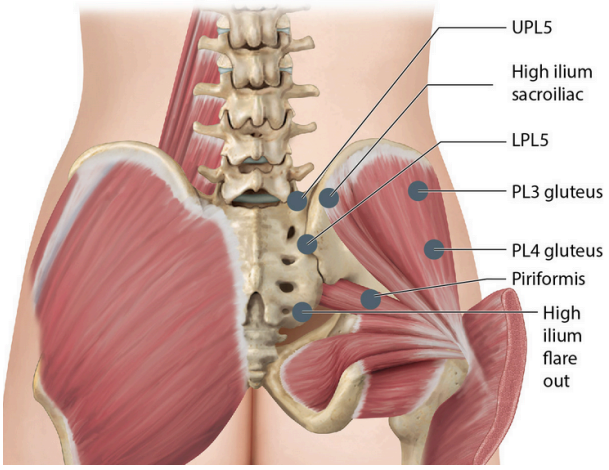
A general rule of thumb for anterior lumbar tender points is:
AL1: Flexion, sidebend toward and rotate away with physician on same side
AL2-AL4: Flexion, sidebend away and rotate toward with physician on opposite side
AL5: Flexion, sidebend away and rotate away with physician on same side



Anterior pelvic tender points

Tender Point	Location	Treatment Position
Psoas	2/3 of the distance from ASIS to midline	Bilateral hip flexion, side-bend lumbar spine toward
Iliacus	1/3 of the distance from ASIS to midline	Bilateral hip flexion and external rotation of hips with knees flexed
Low ilium	Superior surface of iliopubic eminence at attachment of psoas minor	Ipsilateral hip flexion
Inguinal	Lateral aspect of pubic tubercle at attachment of pectineus muscle or inguinal ligament	Flexion of hips with contralateral thigh crossed over ipsilateral thigh; causes flexion, adduction, internal rotation



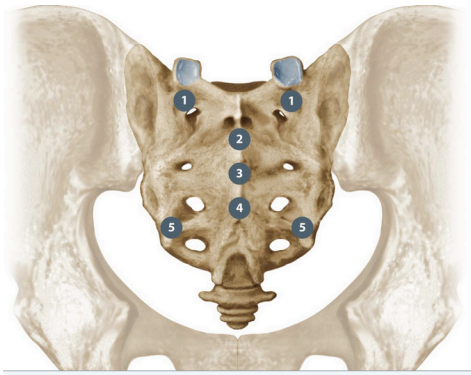


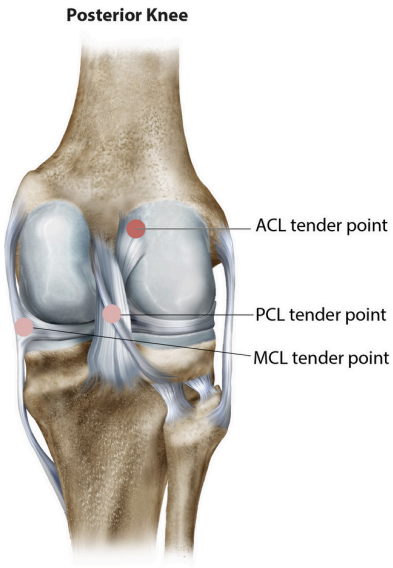
Posterior pelvic tender points

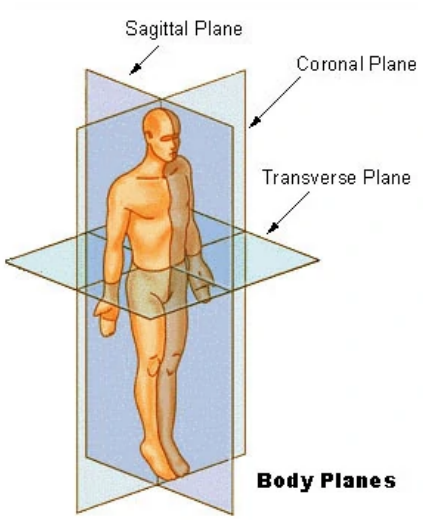
Tender Point	Location	Treatment Position
Upper pole L5	Superior medial surface of PSIS	Hip extension; fine tune with adduction, internal/external rotation
Lower pole L5	On ilium just inferior to PSIS	Hip flexion, internal rotation, adduction
High ilium sacroiliac	2-3 cm lateral to PSIS	Hip extension; fine tune with abduction, external rotation
High ilium flare out	Lateral aspect of inferior lateral angle and/or lateral aspect of coccyx	Hip extension, adduction
Posterior lumbar 3 lateral	2/3 lateral from PSIS to tensor fascia latae in gluteus medius	Hip extension; fine tune in abduction, external rotation
Posterior lumbar 4 lateral	Posterior margin of tensor fascia latae in gluteus medius	Hip extension; fine tune in abduction, external rotation
Piriformis	Midpoint between lower half of lateral sacrum and greater trochanter	Flexion and abduction of hip; fine tune with external/internal rotation

Posterior sacrum tender points

Tender point	Location	Treatment Position
PS1	Medial to PSIS at S1 level	Posterior-to-anterior pressure on opposite ILA
PS2, PS3, PS4 midline	Midline on sacrum at corresponding level	PS2: posterior-to-anterior pressure midline to the sacral apex; PS3: flexion or extension; PS4: posterior-to-anterior pressure midline on sacral base
PS5 bilateral	Medial and superior to ILA	Posterior-to-anterior pressure on opposite sacral base



Knee counterstrain		Popliteus: belly of popliteus muscle inferior to the popliteal fossa PCL: **center/ below** the center of popliteal fossa Medial meniscus/ MCL: medial aspect of the knee at the medial joint line ACL: **superior posterior fossa** medial or lateral to hamstring tendons
Fibular head	Posterior fibular head= compression of common fibular nerve (foot drop), exaggerated plantarflexion Anterior fibular head= exaggerated dorsiflexion	

<table>
<tr><td>Physiologic motion of spine</td><td>Flexion/ extension: FEST (sagittal plane, transverse axis)
Rotation: RVT (vertical axis, Transverse plane)
Sidebending: AP axis, coronal plane</td><td>
</td></tr>
<tr><td>L5 and sacrum</td><td colspan="2">Bottom Line: Know how L5 behaves with sacral somatic dysfunctions:
1. When L5 is rotated, the sacrum rotates in the opposite direction.
2. A sacral oblique axis is engaged on the same side as L5's sidebending.</td></tr>
<tr><td>Tender points</td><td>Do not refer to pain. Painful on compression.</td><td></td></tr>
<tr><td>Myofascial Trigger point</td><td>Small hypersensitive points in myofascial tissues.
Somatic manifestation of a viscerosomatic, somatovisceral or somato somatic reflex
REFERS PAIN</td><td></td></tr>
<tr><td>Ankle</td><td colspan="2">Anterior drawer test: anterior TALOfibular ligament → rolled inversion, pain with supination
Talar tilt= calcaneofibular ligament
Squeeze calf and no plantarflexion= achilles
Kleiger test (external rotation)= deltoid ligaments
Squeeze test= syndesmosis of tibia and fibula
Syndesmotic high ankle sprain: tibiofibular
<table><tr><th colspan="3">Ankle Sprains</th></tr><tr><th></th><th>Action</th><th>Ligaments</th></tr><tr><td>Lateral ankle sprain</td><td>Inversion</td><td>Anterior talofibular, calcaneofibular, posterior talofibular</td></tr><tr><td>Medial ankle sprain</td><td>Eversion</td><td>Deltoid (anterior tibiotalar, posterior tibiotalar, tibiocalcaneal, tibionavicular)</td></tr></table></td></tr>
</table>

Trigeminal neuralgia

CNV
- Sensory innervation to the face
- Muscles of mastication: Masseter, **temporalis**, lateral pterygoid

Trigeminal Nerve (Cranial Nerve V)	
Origin	Ventral pons
Peripheral ganglia	Trigeminal ganglion (semilunar or Gasserian ganglion)
Branches	V1: Ophthalmic nerve V2: Maxillary nerve V3: Mandibular nerve
General somatic sensory function (V1, V2, V3)	Sensation to the face, mouth, anterior 2/3 of the tongue, nasal sinuses, and meninges
Branchial motor function (V3)	Muscles of mastication (masseter, temporalis, medial pterygoid, and lateral pterygoid) and tensor tympani muscle

Lower extremity innervation

Lower Extremity Nerves			
Nerve	**Root**	**Sensory**	**Motor**
Obturator	L2-L4	Medial thigh	Obturator externus, adductor longus, adductor brevis, gracilis, pectineus, adductor magnus
Femoral	L2-L4	Anterior thigh Medial leg	Quadriceps, iliacus, pectineus, sartorius
Sciatic	L4-S3	NA	Semitendinosus, semimembranosus, biceps femoris, adductor magnus
Common peroneal/fibular	L4-S2	Superficial: dorsum of foot (except between second-digit web space) Deep: web space between hallux and second digit	Superficial: peroneus longus and brevis Deep: tibialis anterior
Tibial	L4-S3	Sole of foot	Bicep femoris (long head), triceps surae, plantaris, popliteus, flexor muscle of foot

Chapman point for upper respiratory

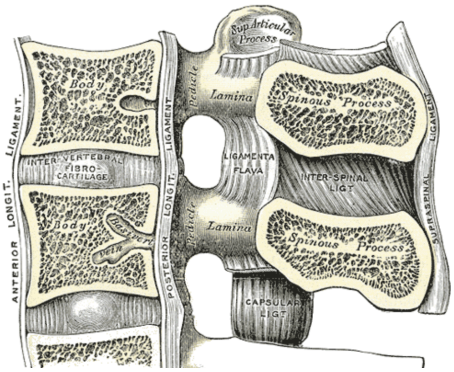
Above proximal third of clavicle: EAR
Below proximal third of clavicle: SINUSES

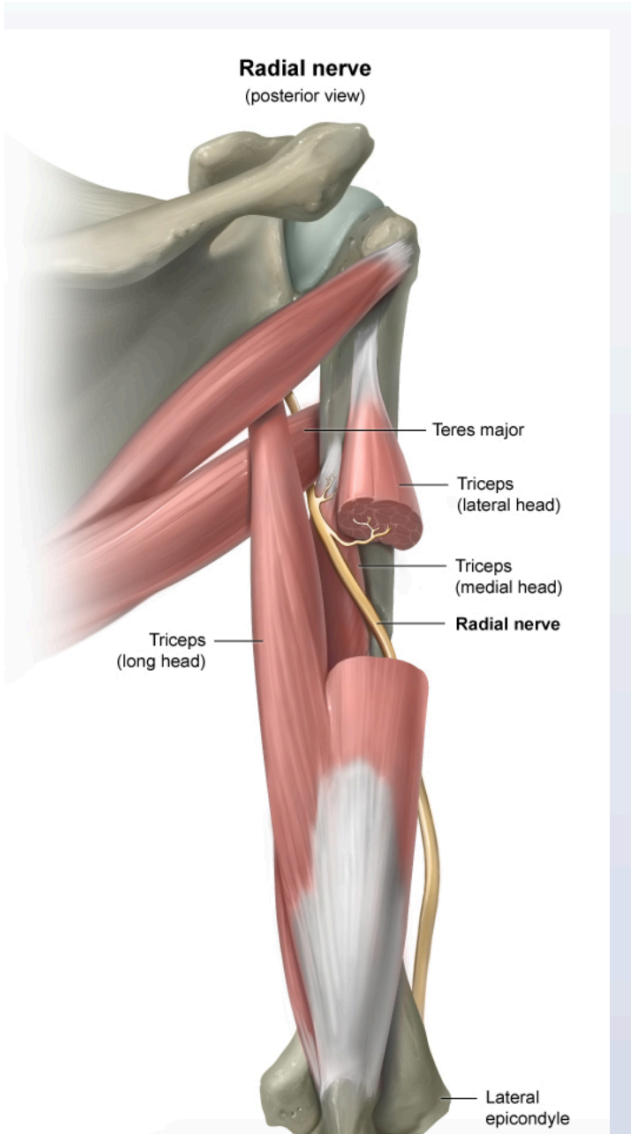
Herniations

Subfalcine: medial frontal lobe and cingulate gyrus cross under anterior falx → primitive reflexes
Tonsillar: posterior fossa through foramen magnum → death
Transcalvarial: cranial trauma, skull fracture
Transtentorial: medial temporal lobe herniation through tentorium, compresses PCA, CN III and cerebral peduncle. DOwn and out eye.

<table>
<tr><td>Elbow</td><td>Lateral UCL: inserts on supinator crest, varus resistance.
Lateral collateral ligament: resists varus stress, stabilizes annular ligament
Quadrate ligament: anterolateral ulna and anterior radial neck under annular ligament. Tightens on supination.
Ulnar collateral ligaments: stabilize valgus stress on elbow and attach between medial epicondyle and coronoid process.</td><td>UCL injury
- Baseball player
- Increased Valgus</td></tr>
<tr><td>Spondylolisthesis

Usually L5/ S1
Type III= L4/5</td><td colspan="2"><table>
<tr><th colspan="3">Types of Spondylolisthesis</th></tr>
<tr><th>Type</th><th>Name</th><th>Description</th></tr>
<tr><td>Type I</td><td>Dysplastic</td><td>Sequela of an anatomic anomaly of S1, with rounding of the superior and ventral aspect. This allows L5 to slip forward. The risk of slippage increases with the increased degree of S1 rounding.</td></tr>
<tr><td>Type II</td><td>Isthmic</td><td>Common in young athletes. It can be further classified into types IIa and IIb (which is likely beyond the scope of COMLEX). Type IIa is seen when there is a stress fracture, with separation of the pars interarticularis. After healing, there can be repeat fracture, causing elongation of the pars, and at that point it is classified as type IIb.</td></tr>
<tr><td>Type III</td><td>Degenerative</td><td>Most commonly at the L4-L5 level, secondary to arthritic degeneration of the facet joints, allowing slippage. The typical patient is older with additional degenerative changes in the lumbar spine such as osteophytosis, intervertebral disc space narrowing, subchondral sclerosis, and subchondral cystic change.</td></tr>
<tr><td>Type IV</td><td>Traumatic</td><td>This is typically caused by high-impact trauma such as that associated with a motor vehicle accident and can occur at any level.</td></tr>
<tr><td>Type V</td><td>Pathologic</td><td>This is a pathologic spondylolisthesis that can be caused by several different etiologies. A couple of examples include generalized bone disease such as osteoporosis or osteopetrosis and lytic osseous lesions from metastatic disease.</td></tr>
</table></td></tr>
<tr><td>Jones counterstrain points for arm</td><td>Biceps: long head of biceps
Supinator: anterior radial head
Subscapularis: anterior and lateral surface of scapula
Pronator teres: medial epicondyle
Levator scapularis muscle: medial scapula near muscle attachment</td><td></td></tr>
</table>

Spinal ligaments		Ligamentum flavum: connects laminae of adjacent vertebrae PLL: posterior vertebral canal, Interspinous ligament: adjacent SP Lateral to medial: Iliocostalis, longissimus, spinalis
Precentral gyrus	UMN, motor	
Postcentral gyrus	Somatosensory	
Innominate rotations	Anterior innominate- hip extensors Posterior innominate- hip flexors	


Radial nerve
(posterior view)
Teres major
Triceps
(lateral head)
Triceps
(medial head)
Radial nerve
Triceps
(long head)
Lateral
epicondyle

Relative Contraindications	Absolute Contraindications
Mild to moderate sprain/strain	Fracture in area treated
Mild osteopenia or osteoporosis in the area to be treated	Joint instability
Osteoarthritic joints with moderate motion loss	Severe osteoporosis
Rheumatoid disease not in the spine	Osteoarthritic joint with ankylosis
Minimal disc bulge/herniation with radicular symptoms	Metastasis in the area to be treated
Atypical joint or other conditions with congenital anomalies	Severe herniated disc with radiculopathy
Some hypermobility	Osteomyelitis in the area to be treated
	Infection of the tissues to be treated
	Joint replacement in the area to be treated
	Severe discogenic spondylosis with associated ankylosis
	Congenital anomalies: Klippel-Feil syndrome, blocked vertebra, Chiari malformation
	Down syndrome
	Rheumatoid arthritis of cervical spine
	Achondroplastic dwarfism
	Vertebrobasilar insufficiency

Concentric muscle contractions occur when a muscle shortens while generating force. In relation to the elbow, the upward motion when performing a bicep curl is considered a concentric muscle contraction.

Eccentric muscle contractions occur when a muscle increases in length with contraction. The muscle elongates while under tension due to opposing forces being greater than the force generated by the muscle, such as the lowering motion of a bicep curl.

Isokinetic muscle contractions occur against resistance in which the angular change of joint motion is at the same rate (velocity). The counterforce is less than the patient's force.

Isotonic describes constant muscle tension as a muscle changes length (constant force). Eccentric and concentric muscle contractions are two examples of isotonic contractions. Operator force is less than the patient's force.

Isolytic muscle contractions are a form of eccentric contraction where the counterforce is greater than the patient force.

Isometric contraction occurs when a muscle contracts while maintaining constant length. An example of an isometric contraction would be pushing against an immovable object.

Plyometric muscle contraction refers to a muscle that is loaded and contracted in a rapid sequence. The short cycle affects the sensory response of the muscle spindles and golgi tendon organs; thus, increasing the excitatory threshold of the golgi tendon, which facilitates a greater contraction force than normal strengthening exercises.

