ABSITE KILLER

High Yield Information For The American Board Of Surgery In-Training Exam

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INTRODUCTION

Throughout my general surgical residency, I have kept notes on information pertinent to the annual American Board of Surgery In-Training Exam (ABSITE). I have condensed notes from texts, review books, and from lectures from faculty and fellow residents. After each ABSITE, and after each 'Mock ABSITE' provided by my program, I have written down as many questions (and answers) as could be recalled. These were researched and more notes were added. I realized that the ABSITE tests much of the same information every year and that a lot of this information was in my extensive notes. I have enjoyed excellent results every year using my notes and I know that many residents feel overwhelmed every January wondering what to study. This led me to organize all of my notes by topic and to distill them down to just the pertinent information that frequently appears on the ABSITE.

What resulted is this book. It will be very helpful for anyone preparing for the ABSITE. Having used a number of other general surgery review books, I know that this book stands alone. It does not waste your time with question/answer format, nor with paragraph- long explanations. It provides many facts that appear repeatedly on the ABSITE. Emphasis is on data that commonly appears on the test with key points italicized to draw attention to *testable* detail.

This book is not a comprehensive review of general surgery. It does not give insight into the management of complex surgical problems. It is no substitute for reading a surgery text throughout the year. However, it is the most concise, efficient way to improve your scores. It is the ultimate tool for 'last minute studying' although it deserves weeks to digest.

My recommendations are to begin reading and re-reading it a month before the ABSITE. Keep it with you and read a page at a time during free moments. It should be the only test-specific preparation that you need other than correcting specific deficiencies. I suggest group study where you go through it verbally with fellow residents to enhance retention and bring up other points—people who have taken the test numerous times before are invaluable resources. After the test, highlight the points that showed up on the test and brainstorm with other residents to generate more notes for next year. Good Luck !!!

GENERAL

Null hypothesis = 'no difference exists'; Type I error = Reject null hypothesis incorrectly,
Type II error = Accept null hypothesis incorrectly; Type III = conclusions not supported by data.

Prospective cohort study = *non-random* assignment to treatment group.

Meta-analysis is review and statistical combining of data from different studies.

ANOVA is a t-test for >2 samples of quantitative data.

Non-parametric statistics: for *qualitative* data analysis.
Qualitative variables a) nominal = named, e.g. color b)ordinal = on a scale e.g. pain rated 1-10

Prevalence = # of people having disease in population studied (is higher w/diseases that last long time).
Incidence = # of *newly diagnosed* cases in a population in a certain time (usually per year).

Sensitivity = ability to detect disease = # with positive test result / # that have disease (true positive).
Specificity = ability to state no disease is present = # with negative test result / # without disease (true neg).

Alveolar macrophages: source of fever in atelectasis.

Mitochondria: 2 membranes, TCA cycle in inner matrix.

Nucleus has an outer membrane that is continuous w/ rough ER; ribosomes are made in nucleolus, which has no membrane.
Rough ER makes protein for export, smooth ER for cytoplasmic proteins.

Plasma membrane is 60% protein, 40% lipid. ↑cholesterol = ↑mobility of proteins.

Malignant Hyperthermia due to Ca release from sarcoplasmic reticulum. Fever, tachy, rigid, acidosis.
1st sign is ↑ end tidal CO2. Rx dantrolene, stop operation/anesthetic, supportive;
often is not patient's 1st exposure to anesthetic agent.

Diaphragm is 1st muscle to recover from paralytics (neck and face are last)

Lymphatics: no basement membrane. Loose cell to cell jxn. Not present in muscle, bone, tendon, brain.

Rate limiting step in cholesterol formation (in liver, steroid precursor): HMG co-A Reductase.

Steroid hormones go to nucleus after binding in *cytoplasm* of target cell.

Kreb's cycle → 38 ATP from 1 glucose (anaerobic glycolysis → 2 ATP and lactate).

Cyt p 450 ↑ activity by anticonvulsants, coumadin, theophylline
↓ by cimetidine, INH, MAOI, disulfiram.

Macula densa senses low Na/Cl, produces *renin* which converts angiotensinogen to Angiotensin I, which is converted to Angiotensin II in the *lung* by A.C.E.
AT II is a vasoconstrictor and ↑'s *aldosterone* which keeps Na, loses K/H in urine. Every Year

Renal Osteodystrophy: kidney loses Ca, keeps PO4; ↓ vit D 1-hydroxylation; all → secondary hyper PTH.

GUT PHYSIOLOGY

L. vagus n (anterior) gives hepatic branch, R (posterior) gives celiac branch and the 'criminal nerve of Grassi' which if undivided can keep ↑ acid levels post vagotomy.

Chief cells produce *pepsinogen* (→ pepsin) which initiates proteolysis.

Parietal cells produce H+ and *intrinsic factor* which binds B12, and is absorbed in terminal ileum.
Acetylcholine (Ach), Gastrin, and Histamine are main stimuli for H+ production.

Ach (vagus) and Gastrin activate PIP, DAG to ↑ Ca, activate protein kinase C which ↑ HCL production.

Histamine acts on parietal cell via cAMP (H for Happy cAMPer) to ↑HCl production.

Gastrin produced by antral G cells (why antrectomy helpful); inhibited by H+ in duodenum.
Stimulated by amino acids, Acetylcholine.

Omeprazole blocks H/K ATP'ase of parietal cell. **Every Year**

Somatostatin inhibits gastrin, insulin, secretin, Ach; ↓ pancreatic, biliary output. Stim by acid in duodenum

Proximal vagotomy abolishes *receptive relaxation* which↑ liquid emptying; no change for solids.

Truncal vagotomy also ↑ emptying of solids when pyloroplasty done. TV ↓ basal acid by 80%.

Most common symptom post vagotomy is diarrhea (35%). Dumping syndrome in 10%; early due to hyperosmotic load, fluid shift; late due to ↑insulin, ↓glucose.
Very rare (1%) that dumping unresponsive to dietary measures. **Every Year**

Enterokinase activates Trypsinogen to Trypsin which then activates other enzymes of digestion.

CCK: from intestinal mucosa. 1) contract gallbladder 2) relax Oddi 3) ↑ pancreatic *enzyme* secretion.
Every Year

Secretin: primary stimulus of pancreatic *bicarb* secretion. High flow rate = high bicarb, low Cl.
Slow flow allows HCO3 / Cl exchange so low bicarb, high Cl concentration.

Enteroglucagon: ↑ small bowel mucosal hypertrophy, adaptation after small bowel resection.

Peptide YY: released from terminal ileum with mixed meal, inhibits acid secretion. "ileal brake".

Bile: 80% bile salts, 15% lecithin, 5% cholesterol. Stones form if ↑chol or ↓ salts or ↓lecithin.
Gallbladder concentates bile by active reabsorption of Na, Cl; H20 then follows.
Bile pool 5g, recirculated q 4 hrs, lose .5g daily (10%). **Every Year**

Primary bile acids: Cholic acid, Chenodeoxycholic acid.
Secondary (formed by intestinal bacteria): deoxycholic acid and lithocholic acid.

MMC: *interdigestive* motility; 90 minute cycles; starts in stomach, goes to TI;
Phase I quiescence, II gallbladder contraction, III peristalsis, IV subsiding electric activity.
Motilin is key stimulatory hormone (erythromycin is prokinetic by stimulating motilin receptor).

Jejunum absorbs most Na and H2O (*para*cellular), more permeable than ileum.

HEMOSTASIS

Intrinsic path (PTT): exposed collagen + XII → XI , IX → X which activates thrombin to produce fibrin.
Extrinsic path (PT): tissue factor + VII → activated X → fibrin. *X is common to both paths.*
XIII crosslinks fibrin to form 'plug'. PT is best single test to evaluate synthetic function of liver.

Banked blood is low in 2,3 DPG which ↑ Hgb affinity for O2 (left shift).
Cryoprecipitate contains fibrinogen and vwf-VIII; used in vwd, hemophilia A, and DIC if fibrinogen low.
Vit K inhibits 2, 7, 9, 10, protein C and S.
Protein C degrades active V and VIII. Protein S helps protein C.
V and VIII are labile factors, low levels in stored blood.
Factor VIII only factor not made in liver (made by reticuloendothelial system).

Von Willebrand's Disease: long PTT, *long bleeding time*, + ristocetin test. Type I and III have low amounts of vwf, respond to DDAVP; type II is qualitatively poor vwf.
(DDAVP causes release of vwf, useful also in pts on ASA or w/ poor platelets due to uremia).
Autosomal Dominant (only one beside Rosenthal's XI deficiency).
Only inherited coagulopathy with long bleeding time.
Rx with VIII, vwf or cryoprecipitate.

Glanzman's thrombasthenia: plt's have IIb/IIIa receptor deficiency, ↓ aggregation.
Bernard Soulier: Ib deficiency, ↓ adherence to exposed collagen.

VII deficiency causes long PT, normal PTT.

Hemophilia A = VIII deficiency, sex linked recessive, replace to 100% levels pre-op.
Have long PTT, nl PT. Newborn has VIII from mom, may not bleed at circumcision.
Hemophiliac joint- do not aspirate; Ice, range of motion therapy, give factor VIII.
Hemophilia B = IX deficiency = Christmas disease, also sex linked. Achieve 50% levels pre-op.

Lupus Anticoagulant: antiphospholipid antibodies, not necessarily w/ Lupus and generally *pro-coagulant*;
Dx: long *Russel viper venom time*; long PTT which does *not* correct by adding normal plasma.

Factor XII = Hagemann factor; activated by cardiopulmonary bypass → need for heparin.
Factor V Leyden = resistance to activated protein C = common cause of DVT.

Plasmin degrades fibrinogen, is inhibited by alpha-2-plasmin inhibitor.

Heparin binds, activates ATIII and inactivates factors 9 – 12; prolongs PTT; counteract w/protamine.
ε-ACA (epsilon amino-caproic acid) inhibits fibrinolysis, is the Rx for overdose of thrombolytics.
Thrombin time is best test to monitor thrombolysis.

DIC: see low platelets, prolonged PT/PTT, low fibrinogen, high fibrin split products.
HIT: 'white clot syndrome', thrombocytopenia due to anti-platelet antibody causing plt aggregation. Use dextran to anticoagulate. Generally see after 5 days of heparin, less frequent with LMWH.

Prostacyclin = PGI2: from endothelium. ↓plt aggregration, , vasodilation, bronchial relaxation.
Thromboxane : from platelets. Opposite effects of above.

Best pre-op test for pt. on nsaids/ASA is bleeding time.

IMMUNOLOGY/ INFECTION

IL 4 stims B cell to become plasma cell (antibody secreting).
IgG, IgM are opsonins, are able to fix complement (2 IgG's or IgM needed).
IgM made first. Decreased levels after splenectomy
IgA in secretions
IgD a helper, largely unknown
IgG #1 in serum. Crosses placenta
IgE allergic reactions, type I hypersensitivity reactions, histamine release (mast cell, basophil), parasites.

Variable region of antibody is responsible for antigen recognition.

Complement cascade: C3a, C5a are *anaphylatoxins*; C5-9 = Membrane Attack Complex.
Classic path initiated w/ antibodies; alternate path by bacteria.
Classic and alternate paths converge at C3.

MHC I: CD8 activation; on all nucleated cells; single chain.
MHC II: CD4 activation; on B cells, dendrites, monocytes; 2 chains.

Natural Killer cells: neither T nor B cell. No antigen presentation needed. Recognize cells w/o self MHC.
Natural Killer is responsible for immunosurveillance against CA.
IL 2 converts Natural Killer cell to Lymphokine Activated Killer.

Intradermal skin test- best test to evaluate cell-mediated immunity.

Basophils- source of histamine in blood.
Mast cells- source of histamine in tissue.

Endotoxin is lipopolysaccharide A from gram negative bacteria.

Hyperglycemia comes 24 hrs before overt sepsis.
Late sepsis noted by ↓02 extraction so ↑SV O2 and ↓ A-V O2 difference.
SVO2 normal 66-77%; >77% = sepsis or cyanide poisoning; <66% due to ↓C.O. or ↓SAO2.

4 intrabdominal abscess locations: sub-diaphragmatic, sub-hepatic, inter-loop, and pelvic.

C. diff colitis: Rx is *oral* vancomycin or flagyl.

β Strep and Clostridial infections can present w/in hours post-op. **Every Year**

Staph Aureus is coagulase +; may produce clear 'slime' with chronic infection (vascular).

Aminoglycosides: bacteri*cidal*, irreversible binding to ribosome; resistance due to ↓active transport.
Clindamycin, tetracycline, erythromycin: bacterio*static*, reversible binding to ribosome.

Vancomycin: binds plasma membrane; resistance is due to altered cell wall.

MRSA resistance due to change in bacteria binding protein, not due to a β-lactamase.

Sulbactam and clavulanate inhibit β-lactamase.
Amphotericin: binds sterols to alter fungal cell wall. 80% get renal impairment; see anemia, fever.
Quinolones (cipro): mechanism is DNA Gyrase inhibition. PO and IV routes equivalent.

MEDICINES

Ketamine: ↑ cardiac work, O2 use, secretions, BP. No respiratory depression. Hallucinations.

Methoxyfluorane has renal toxicity.

Halothane is hepatotoxic.

Succinylcholine is the only depolarizing agent used; generalized contractions; hyperkalemia in burn patients; fast on/fast off ; risk aspiration, glaucoma.

Clindamycin prolongs neuromuscular blockade.

Demerol should be avoided in patients on MAOI's

Octreotide: long acting somatostatin analog.

Reglan = metoclopramide: DA blocker, ↑ LES tone, ↑ gastric motility.

Omeprazole: mech is blocking Na / H pump (ATP'ase); assoc w/enterochromaffin hyperplasia in rats
No evidence for carcinogenesis in humans.

Digoxin: glycoside, inhibits Na-K ATP'ase to ↑Ca in heart. Slows AV conduction.
Inotrope, but does not ↑ O2 consumption.
Associated with ischemic gut, ↓ splanchnic flow. Avoid hypokalemia.

Amrinone: phosphodiesterase inhibitor; inotrope, ↑CO, ↓SVR.

Metyrapone and Aminoglutethimide: 'medical adrenalectomy.'

Leuprolide: 'medical orchiectomy.'

Vasopressin: reduces splanchnic flow, portal flow ≈ 40%. Useful in GI bleeds,
give w/ B-blocker to avoid angina.

Sodium Nitroprusside relaxes arteries *and* veins; has *cyanide toxicity.*
Nitroglycerin primarily relaxes veins.

Aspirin irreversibly binds *cyclooxygenase*, effective for life of the platelet (≈ 7 days).

Indomethacin blocks PG production , used to close PDA (effective in 70%). ↓renal blood flow.

Misoprostil replaces PGE2 (cytoprotective) for pt on nsaids, to reduce PUD.

NUTRITION, FLUIDS, ELECTROLYTES

FeNa < 1, Urine Na <20 , BUN/Cr >30 all indicative of low volume, 'pre-renal'
Saliva has highest K conc (20meq), then gastric (10), pancreatic/duodenal (5).

Branched chain amino acids are metabolized in *muscle* (leucine, isoleucine, valine); all essential.

Vitamin D made in skin, to liver for (25-OH) then to kidney (1-OH); now active.
Vit D ↑ calcium binding protein to ↑ intestinal Ca absorption.
Vitamin A systemic or topical reverses adverse effects of steroids on wound healing.

TBW: infant highest (80%), then men (60%), then women (50%). 10% *less* if obese (less H20 in fat).
Water distribution: if tbw 60%, then 40% is cellular, 15% is interstitial, 5% in plasma.

Carbs have 3.4 kcal/g, protein 4 kcal/g, fat 9 kcal/g. **Every year**

Basal calorie expenditure = 25 kcal/kg/day (≈1g protein/kg/day needed).
Resp quotient = ratio of CO_2 produced to O_2 consumed. .7= fat used, 1.0= carb used **Every Year**

6.25 g of protein contains 1 g of Nitrogen. N balance = N in – N out
(Protein/6.25) – (24 hr urine N + 4g)

Short chain fatty acids: preferred fuel of the colon.
Glutamine: preferred fuel of the small bowel. #1 amino acid in bloodstream, see ↓levels with stress as glutamine goes to kidney to form ammonium to help acidosis.
Shown to ↓translocation, ↑mucosal health with chemo or RT to bowel.

Fat digestion: micelles to enterocytes→chylomicrons to *lymphatics* (to jxn LIJ/Subclavian) **Every year**
Only Medium and Short Chain Triglycerides go to portal system with aa's and carbs.

Chromium <u>deficiency</u>:	hyperglycemia (relative diabetes), neuropathy
Zinc	perioral rash, hair loss, poor healing, Δ taste
Phosphate	weakness (respiratory), encephalopathy (needed for ATP)
Copper	anemia, neutropenia
Linoleic acid (essential fatty acids)	dermatitis, hair loss, Δ vision
Vit A	can ↓vit C stores

Cori cycle : glucose→ lactate, to the liver→glucose.
Starvation: brain begins using ketones from fatty acids (normally brain and rbc's are dependant on glu).
Late starvation: gluconeogenesis shifts to kidney as liver is depleted of alanine.

IVF: Normal saline is 154meq Na and Cl; LR is Na 130, K 4, Ca 2.7, Cl 109, bicarb 28.

Alkalosis causes hypokalemia by driving K into cells and into urine (exchange for H+).
Hyperkalemia (peaKed t wave, wide QRS): give <u>C</u>a to protect heart, <u>B</u>icarb/<u>i</u>nsulin/<u>g</u>lucose, <u>k</u>ayexalate, <u>d</u>ialysis if severe; 'C Big K die'.

Na deficit = .6(wt in kg) (140 – Na); replace no more than 1 meq/hr to avoid CPM.
Hyperglycemia lowers Na; for every 100 glucose over 100, add 2 to Na.
Hypocalcemia and hypomagnesemia both have hyperexcitability, ↑reflexes (Chvostek's), tetany.
Anion gap acidosis with MUDPLES = methanol, *uremia, dka*, paraldehyde, *lactic acidosis*, ethylene glycol, salicylates. Anion gap = Na – (HCO_3 + Cl). Normal less than 12.
Low mag inhibits PTH so replace mag if difficulty correcting a patient's low Ca.

ONCOLOGY

G1 : most variable period of cell cycle. Growth factors act here.

Radiation Therapy: M phase most sensitive;
most effective w/ high O2 levels;
higher energy = less skin damage;
path: *obliterative endarteritis*; ↓ healing due to impaired fibroblasts.

Extremity Sarcoma biopsy: excisional if <4cm, otherwise *longitudinal* incision, incisional biopsy (less lymphatic disruption, easier to excise scar if biopsy +). **Every Year**
post-op RT if high grade sarcoma, close margins, or tumor > 5cm.

Li Fraumeni syndrome: p53 mutation. Sarcomas, breast CA, brain tumors, leukemia.

Sarcomas generally spread *hematogenously*, not to lymphatics. Staging based on *grade*, not size/nodes.

Colon CA associated w/ loss of APC gene, p53, DCC (deleted in colon ca), k-ras activation.

Breast CA associated w/ p53, bcl-2, cmyc, cmyb, her 2 neu.

c-myc assoc w/ small cell lung CA, neuroblastoma, Burkitt's lymphoma.

Bcl-2 gene regulates *Apoptosis*; p53 and c-myc also associated w/ apoptosis.

sis oncogene is homologous to PDGF.

erb B codes for epidermal growth factor receptor. Associated with ↓ survival in breast CA.

K ras proto oncogene encodes for GTP protein; 90% of pancreatic CA, 50% of colon CA; also in lung CA.

Ret proto-oncogene *diagnostic* for Medullary Thyroid Cancer. Patient with family history of MEN who has Ret proto-oncogene should have total thyroidectomy.

Tamoxifen (binds Estrogen Receptor) shown to ↓ Breast CA in high risk; risk DVT, endometrial CA.

Bleomycin and Busulfan both have *pulmonary fibrosis* as complication.

Vincristine, cisplastin both cause neurotoxicity.

Levamisole mechanism: immunostimulant; is an antihelminthic agent.

WOUND HEALING, CYTOKINES

Myofibroblasts (smooth muscle/fibroblast) provide wound contraction. Contract from center of wound.
Responsible for healing *by secondary intention.*

Collagen Type I : most abundant throughout. Principal collagen in scar (late)
III: in healing wound. Low in Ehler Danlos
IV: in basement membranes
XI (and II) in cartilage

Collagen is glycine q 3. α- ketoglutarate, vit C, O2, and iron needed for prolyl hydroxylase, crosslinking.

Collagen production begins day 3, max at day 21 then constant *amount* but more crosslinking, strength.

Type III becomes type I with maturation ≈ week 3.

Tensile strength *never* equal to pre-wound.

Opening a 5 day or older wound results in quicker healing the 2nd time (cells, products already in place).

Giving *Vitamin A* reduces deleterious effects of steroids on wound healing.

Cells to wound (in order): platelets, pmn's, macrophages, fibroblasts (dominant by day 5). Macs essential

TGFβ stimulates fibroblasts; too much/too long → fibrosis (e.g. cirrhosis, pulmonary fibrosis)
Also chemotactic for neutrophils. Speeds healing.
PDGF attracts fibroblasts and ↑ smooth muscle (active agent in Regranex) to speed matrix deposition and collagen formation.
GmCSF is used in chemotherapy patients to ↑ neutrophil and macrophage activity .

TxA2 from platelets; plt aggregation, vasoconstriction.
PGI2 (prostacyclin) : plt inhibition, vasodilation, and bronchodilation.

Initial cytokine response to injury/infection dependent on TNF / IL 1 (synergistic), CXC, IL 6.

TNF: main source is Macrophage / Monocyte. *Endotoxin (LPS a)* is most potent stimulus for production.
Overall has pro-coagulant effect.
Responsible for wasting, cachexia in cancer pts. by lipolysis, glycolysis, anorexia.
Recruits, activates neutrophils → more cytokines, free radicals. Exaggerated response → MOSF.

IL-1 also from macs/monos; potentiates TNF; responsible for *fever.*
Acts to ↑ IL 6 (acute phase response), ↑ endothelium adherence via selectins, ICAM, VCAM.

Acute phase response: ↑ fever, catabolism
↑ C-reactive protein (CRP, an opsonin), amyloid, fibrinogen, haptoglobin, ceruloplasmin, and α-1 antitrypsin.
↓ levels of albumin, transferrin and fibronectin.

CXC chemokines: chemotactic, important in angiogenesis, wound healing.
C stands for Cysteine.

BREAST

Intercostobrachial nerve (off 2nd intercostal n.) sensation to medial arm; can sacrifice.
Long thoracic n. to serratus anterior, injury = winged scapula.
Thoracodorsal n. to latissimus dorsi, injury = weak arm adduction/pull ups.
Medial pectoral n. to pec major and minor; Lateral pec n. to pec minor only.

Batson's Plexus: valveless vertebral veins, allow direct mets to spine.
Poland syndrome: amastia, hypoplastic shoulder, no pectoralis.
Mastodynia: Rx with danazol, OCP, evening primose oil, tamoxifen (?); vit E not useful.
Mondor's disease: thrombophlebitis of superficial vein of breast. Cord like mass laterally. Rx: Nsaids.

T1 <2cm; T2 2-5cm; T3 >5cm; T4 skin or chest wall involvement 'grave signs'-peau d'orange, inflam.

N1 + ax nodes; N2 matted or fixed nodes; N3 internal mammary nodes.

Stage I T1; II up to T2 N1or T3N0; III T4 or N2; IV Mets (includes supraclav node, unlike lung CA).

Breast mets : to bone, lung, brain.

Her 2 neu: a marker for breast CA, implies worse prognosis. *Herceptin* now available for Rx.

Erb B 2 , p53, cathepsin all indicate worse prognosis.

1cm tumor is ≈ 5 yrs old.
Tamoxifen reduces risk 50% in high risk but ↑ endometrial CA, DVT.

Atypical Hyperplasia raises risk x 4 (only finding in fibrocystic disease that ↑ risk).

ER +PR+ is better than ER-PR+ which is better than ER+PR- which is better than ER-PR-

DCIS 50% develop invasive carcinoma, is a *precursor*. Usually lumpectomy + RT, but mastectomy for high grade/large tumor/poor margins. 50% of DCIS recurrence is invasive.

LCIS 30-40% develop invasive carcinoma (either breast); is a *marker* of risk.
Treatment options : nothing, tamoxifen, or bilateral mastectomy.

Comedo Breast CA: likely muliticentric, do mastectomy. Poor Px.

Paget's disease of the breast: eczematous lesion on nipple, there is underlying DCIS or Ductal CA.

Cystosarcoma Phyllodes or 'Phyllodes tumor' since only 10% malignant. Large.
Rare nodal mets. As with other sarcomas,spread is *hematogenous*, not lymphatic.
Rx is wide local excision, rarely mastectomy, *no* axillary node dissection. **Every Year**

BRCA 85% have CA by age 70. I assoc w/ ovarian CA (50%), II assoc w/ male breast CA.

Indications for RT after mastectomy: >4 nodes, skin or chest wall involvement, + margins.

Stewart Treves: lymphangiosarcoma in lymphedematous limb; presents with purplish mass on arm ≈ 10 years s/p MRM.

Intraductal Papilloma: no risk of CA. #1 cause of bloody nipple discharge (although ½ are serous).

CARDIOTHORACIC

Diaphragm: T8 Vena Cava, T10 Esophagus (and vagi), T12 Thoracic duct and aorta (VET from 8–10-12).

Type I alveoli: functional gas exchange; Type II: produce *surfactant* (↓surface tension), 1% of alveoli.

Pre thoracotomy PFT's: need FEV1 > 2 L / > 1 L / >.6 L for pneumonectomy/lobectomy/wedge.
Need predicted post op FEV1 > .8

Adenocarcinoma now #1 lung CA; Squamous assoc w/ PTH like substance; Small cell w/ ACTH, ADH.

T1: <3cm; T2 >3cm; T3 invasion of chest wall, pericardium, diaphragm, <2cm from carina;
T4 = unresectable = into mediastinum, heart, great vessel, esophagus, trachea, vertebra, effusion.

N1: ipsi hilar nodes; N2: ipsi mediastinal; N3 = unresectable = contralateral or scalene or subclavian.

Stage I: T1-2, N0; II: T2, N1; IIIa up to T3 or N2 ; IIIb = unresectable T4 or N3; IV mets.

Pancoast tumor involves sympathetic chain (Horner's syndrome) and or *ulnar* nerve.
Left lung can drain to Right mediastinum (Left to right, like reading).

Thymoma: indication for resection.
Resecting thymus (even if no thymoma) in myasthenia gravis improves 90%. (10% of m.g. have thymoma)

Popcorn lesion on CXR classically is a *hamartoma.*
Thoracic outlet syndrome rarely involves artery or vein (1-3%), generally *ulnar n.* paresthesias.
Spontaneous ptx 10: 1 male. 50% recur, then 75% of those again. Thoracoscopy for 2nd or cont. air leak.

Post MI Ventricular Septal Defect presents day 2-7; 2% of MI's; pan-systolic murmur.
SVC syndrome: 90% due to lung CA; Rx with RT.
Takayasu arteritis: young female, involves thoracic and abd aorta, and pulmonary artery. Dx by angio.

Tissue valves (shorter lasting, but no anti-coag needed) used in pt. who may become pregnant, has contraindication to coumadin; also used for all *tricuspid* replacements.
Rheumatic fever leads to mitral *stenosis*; see regurg w/ MI or valve degeneration.

Chylothorax (non iatrogenic) usually due to posterior mediastinal tumor (3/4 lymphoma). RT may help.
Thoracic duct injury: Rx with drainage/npo x 2 wks; if not resolved then R thoracotomy, ligate duct.
Thoracic duct enters chest on R with aorta at T12, crosses to L at T4, joins at IJ/Subclavian junction.

Thoracic aorta aneurysm: operate for >8cm, symptomatic.

Aortic Dissection: type *A*- involves *A*scending aorta, must operate
Type B does *not* involve ascending aorta. Medical mgmt (control HTN)

CAD: leading killer in U.S. (2 x Cancer)
CABG indications: intractable symptoms, >50% left main, triple vessel dis, or 70% LAD + 1 other vessel
Angioplasty: 20% restenosis by 1 yr ; vein graft 5 yr 80% patent; IMA graft 95% patency at 20 years
VSD: #1 congenital cardiac defect, 50% close on their own, O.R. if symptomatic/failure to thrive.
PDA: close all those that *indomethacin* does not at 6 months of age.

IABP: augments diastolic coronary blood flow and reduces afterload by inflating during *diastole.*
Inflates 40 msec before T wave, deflates with p wave.

Every Year

COLORECTAL

Colon actively secretes K and HCO3.
Superior rectal artery off IMA; Middle off internal iliac; Inferior off internal pudendal (off int iliac).
External sphincter innervated by inferior rectal branch of internal pudendal n. and perineal branch S4.

Squamous cell CA of anal canal : Rx with *Nigro protocol* (chemo *and* RT), not surgery. **Every Year**
APR for recurrent disease.

Transformation of polyp to CA takes ≈ 8yrs.
T1 (limited to submucosa) rectal adenoCA can be excised transanally; T2: 20% are node +, rec APR.
Do not do transanal if poor differentiation, neuro/vasc invasion.
Stage III colon CA (node +) gets chemo, no RT.
Stage II, III rectal CA gets chemo and RT.
½ of Colon CA has ras mutation, p53 absent in 85%, DCC (deleted in colon CA) in 70%.
Familial Adenomatous Polyposis: Autosomal dominant, CA by age 40; APC gene.
Need total colectomy prophylactically.
Have UGI polyps as well, need to survey duodenum for CA.
Also develop desmoids- benign, but very difficult to manage.
Sulindac makes polyps receed.

Lynch I R sided, multiple CA's, young; Lynch II assoc. w/ CA of ovary, bladder, stomach.
Both Lynch (aka Hereditary Non Polyposis Colon CA) assoc w/ *DNA mismatch repair gene*
Amsterdam criteria : 3 1st degree relatives, over 2 generations **Every Year**

Gardner's syndrome: colon CA and desmoid tumors.
Turcot's syndrome: colon CA and brain tumors.
Peutz Jeghers: polyposis (not colon CA) and mucocutaneous pigmentation.

Sigmoid volvulus: decompress w/scope, prep bowel, do sigmoid colectomy that admission.
Cecal volulus (much less common): likely will not decompress; take to OR, most recommend R hemi.
with ileo-transverse anastomosis although some try cecopexy.
Carcinoid of Appendix: ≥ 2cm or involving base = do R hemicolectomy, otherwise appendectomy only.
If operating for appy, find nl appy and Crohn's disease, take appendix (unless cecum very inflamed).
Does not ↑ fistula rate. **Every Year**

Perianal abscess in Crohn's: Incision and drainage as with any abscess.

In Ulcerative Colitis, proctocolectomy does *not* help sclerosing cholangitis, may help skin,anemia;
rarely helps arthritis.
HLA B27 associated with sacroilitis.
Pouchitis: Rx with Flagyl or short chain fatty acid enemas.
Pyoderma Gangrenosum: Rx with Dapsone and/or steroids (topical or systemic).

Fissure in Ano 10% anterior in women, nearly all others *posterior midline*.
Rx sitz baths, regular loose BM (water, fiber); persists then Lateral Internal Sphincterotomy.
Some try nitroglycerine creams (↑O2 for ischemia) or botox (relax sphincter).
Fissure not in midline- think IBD, TB, syphilis.

Bowen's Disease – intraepidermal squamous cell carcinoma, only 5% invasive. Wide local excision.
Perianal Paget's - rare intraepidermal neoplasm of apocrine glands, long pre-invasive phase. + PAS stain.
¼ of pts with colonic AVM have aortic stenosis (1/2 have CAD).
Campylobacter infectious colitis: may see *aphthous ulcers* on colonoscopy.

ESOPHAGUS

No serosa; mucosa is strongest layer (in small bowel, submucosa is strongest).

Central input initiates swallow which elicits primary peristalsis, distension then elicits secondary peristalsis. Sphincters are contracted at rest. Normal LES tone = 15-25 mmHg (length 4cm).

Swallowing order of events: soft palate closes nasopharynx, larynx up, larynx closes, UES relaxes, pharyngeal contraction.

Zencker's diverticulum: occurs in Killian's triangle, due to ↑ pressure (pulsion tic), need *myotomy* and diverticulectomy/pexy. Approach via left cervical incision.

Paraesophageal hernia: always operate since risk of incarceration, strangulation. **Every Year**

Diffuse esophageal spasm: *medical* treatment (Ca channel blockers).

Esophageal rupture (Boerhaave's) key to survival is early Dx (85% dead if > 36 hrs).

Achalasia: ↓ ganglion cells in Auerbach's plexus, absence of peristalsis, and esophageal dilation. Bird's beak on Ba swallow; manometry shows no peristalsis, high LES pressures/failure to relax. Rx: laparoscopic or thorascopic Heller myotomy.

Barrett's esophagus: metaplasia from squamous to *columnar* cells. 1-2% get adenocarcinoma (30-100 x risk). P53 associated (tumor suppressor gene).

Achalasia and chemical ingestion also ↑ risk of esophageal CA.

AdenoCA now #1 esophageal cancer over squamous (also true for lung CA).

R gastroepiploic artery is main supply to stomach when used to replace esophagus.

Leiomyoma: if symptomatic or >5cm, excise by *enucleation* via thoracotomy (R if middle, L if lower eso.) *Do not biopsy* on EGD.

HEAD AND NECK

Anterior to posterior : subclavian vein, phrenic nerve, anterior scalene, subclavian artery.

Parotitis: staph. Seen in elderly, dehydrated. Rx abx; drainage if abscess/not improving.

Painless mass on roof of mouth: Torus (bony exostosis, midline of palate).

Erythroplakia is worse (pre malignant) than leukoplakia. Retinoids can reverse leukoplakia and reduce chance of a 2nd head and neck malignancy.

Head and Neck SCCa : Stage I,II (up to 4cm, no nodes) Rx with single modality (surgery or RT).
III, IV get combined modality.

Nasopharyngeal SCCa present late (50% as a neck mass), drain to posterior neck nodes, assoc w/ EBV.

Glottic Ca: if cords not fixed, then RT; if fixed, need surgery and RT.

Lip Ca (99% epidermoid carcinoma): lower > upper due to sun exposure; resect, primary closure if < ½ of lip, otherwise flaps. Radical neck dissection if node +.

Tongue Ca: Usually need surg and RT. ↑in plummer vinson (dysphagia, spoon fingers, anemia).

Larger salivary glands (parotid) = more likely for tumor to be benign.

Mucoepidermoid Carcinoma: #1 malignant salivary tumor overall
Adenoid Cystic Carcinoma: #1 malignant salivary tumor of the submandibular/minor glands

Pleomorpic adenoma = mixed parotid tumor = #1 benign tumor, do not enucleate, needs superficial parotidectomy (spare CN 7). If malignant, take whole parotid w/ CN7.
If high grade (anaplastic), need radical neck dissection.

Warthin's tumor (adenolymphoma) #2 benign salivary tumor. 10% bilateral.
70% of bilateral parotid tumors are Warthin's tumor. Rx: Superficial parotidectomy.

Radical Neck Dissection takes CN XII, SCM, IJ, submandibular gland. Most morbid = CN XII.

Juvenile Nasopharyngeal Angifibroma: benign, in teen males, present w/obstruction, epistaxis.
Rx embolize (internal maxillary a.), then extirpate.

Frey's syndrome: injury of *auriculotemporal nerve*; gustatory sweating (crossed sweat/salivary fibers).

Massive bleeding from trach is from *innominate artery (tracheo-innominate fistula).* Present w/ small 'heraldic' bleed. Avoid by making tracheostomy no lower than 3rd tracheal ring.

HEPATOBILIARY

R. hepatic artery off of SMA in 17% . **Every Year**; L. hepatic off L. Gastric Artery in 10%.

Kupffer cells: clear portal blood, immunosurveillance.

Portal triad: portal vein posterior to CBD(on R) and hepatic artery (on L).

Portal vein = SMV + splenic vein (IMV joins splenic first). Portal system has no valves.

Hepatorenal syndrome: see low urinary Na.

Cholangitis: jaundice, RUQ tenderness, fever, hypotension, Δ mental status;
Need immediate IV Abx, fluid resuscitation and emergent drainage of CBD. **Every Year**

Retained CBD stone identified on T-Tube cholangiogram 6 wks post op best managed by radiologic stone retrieval.

Benign biliary stricture: #1 cause is iatrogenic (lap chole).

Gallbladder adenocarcinoma: 90% have stones. Cholecystectomy adequate if confined to mucosa.
If grossly visible tumor, do regional lymphadenectomy, wedge segment V, skeletonize portal triad

Porcelain gallbladder = 30-65% risk of cancer. Cholecystectomy indicated.

Hematobilia triad = gi bleed, jaundice, RUQ pain. Workup (and Rx) with arteriogram.

Gallbladder concentrates bile by active absorption of Na, Cl (H2O then follows).

Normal gallbladder ejection fraction is >35%. Less is biliary dyskinesia, indication for lap chole.

Hepatic adenoma: 10% rupture/bleed; have malignant potential; 'cold' on liver scan
Hepatic adenoma *is an indication for resection.* **Every Year**

Hepatic hemangioma: do nothing unless giant or symptomatic/consumptive.
Kasabach Merritt syndrome: consumptive coagulopathy or CHF due to hemangioma.

Amebic Abscess (anchovy paste) Rx metronidazole, not surgical.

Hydatid = Echinococcal cyst : + Casoni skin test, + indirect hemaglutination; resect (pericystectomy).

Hepatocellular CA #1 CA worldwide. May have high αFP.
Chronic Hep B and C is # 1 cause; also assoc w/ any cirrhosis (etoh, hemochromatosis, primary biliary cirrhosis, α-1 antitrypsin deficiency), clonorchis sinensis (flukes), aflatoxins.
Fibrolamellar variant has better Px.

NEUROSURGERY

Peripheral Nerve Injuries:

Neuropraxia = focal demyelination, improves
Axonotmesis = loss of *axon* continuity (nerve and sheath intact). Regeneration 1 mm/day.
Neurotmesis = loss of *nerve* continuity, surgery required for nerve recovery.

ADH produced when high *osmolarity* is sensed at *supraoptic nucleus* of hypothalamus;
Causes ↑ free H2O absorption at the distal tubules and collecting ducts.
Alcohol, and head injury, inhibit ADH release = Diabetes Insipidus.
DI = high urine output, low urine specific gravity, high serum osmolarity, Na.
May also see SIADH w/ CHI = oliguric, high urine osmolarity, low serum osmo, Na **Every Year**

AVM's: congenital, bleed age 20-50; aneurysms younger (age 40-60), are associated with HTN.

Most adult brain tumors are malignant; spinal cord tumors are 60% benign (extradural likely malig/met).

Acoustic neuroma: CN8, at the cerebello-pontine angle (cpa).

13% of patients with head injury have a spinal injury.

Subdural hematoma: crescent shape, conforms to brain; 50% mortality.

Epidural hematoma: lens shape, goes into brain, 10% mortality; *middle meningeal artery*; 'lucid interval'.

Cerebral perfusion pressure = CPP = MAP – ICP, want to keep ≈ 70 **Every Year**

Cushing's triad with ↑ICP : HTN, bradycardia, Kussmaul respirations (slow, irregular).

GCS Motor 6 commands, 5 localizes, 4 w/draw pain, 3 flexion pain (decorticate), 2 extension pain, 1 ϕ

Verbal 5 oriented, 4 confused, 3 inappropriate, 2 incomprehensible, 1 none.

Eye opening 4 spontaneous, 3 to command, 2 to pain, 1 none **Every Year**

GCS 8 or less: ICP monitor indicated; 10 or less intubation indicated; GCS 5 = 50% mortality

Cord injury above T5 can cause spinal shock; Rx with fluids, may need α agonist.
Recognize by hypotension with *bradycardia, warm perfused extremities* (vasodilated).

Anterior Spinal Artery syndrome: lose bilateral motor, pain and temp; keep position sense, light touch.

Brown Sequard: spinal cord transected ½ way; lose ispilateral motor, contralateral pain and temp.

Central Cord Syndrome: bilateral loss of upper extremity motor, pain, temp; legs relatively spared.
Usually due to hyperextended c-spine injury.

Skull fx: to OR if open fx or if depressed (to ≈ thickness of skull or more).

ORTHOPEDICS

Osteo*b*lasts *b*uild bone, osteoclasts destroy it

L3L4 disc = L4 root compression (L4 think 4 quadriceps, weak knee jerk)
L4L5 = L5 (Lift 5 toes, dorsiflexion; may see big toe hypesthesia)
L5S1 = S1 (Stand on tiptoes, plantar flexion, weak ankle jerk; Δsensation to lateral calf/foot)

Biceps reflex C5,6; triceps is C7; anal wink = S2-S4.

Ulnar n. intrinsic musculature of hand, finger abduction (form 'U' shape); wrist flexion; sensation to pinkie, ring fingers, back of hand.

Median n. thumb apposition, sensation to most of palm, 1st 2 ½ fingers (carpal tunnel).

Radial n. no motor in hand; wrist extension, finger extension; sensation to back of lateral hand.

Femur fx : early ORIF allows early mobilization, ↓ fat embolization ↓complications.
Pediatric femur fx : closed reduction, not orif (avoid interference w/ epiphyseal growth plate).

SalterHarris fx III, IV, V are intra-articular and generally need open procedure.

Hip dislocation: 90% posterior which present w/ internal rotation, flexed, adducted thigh.
Risk of *sciatic n.* injury, AVN of femoral head.
Anterior hip dislocation: frog leg (external rotation, abduction).

Femoral Neck Fx: shortened limb, ext. rotation; risk of non-union, AVN.

Terrible Triad of O'Donaghue: lateral blow to knee → injury to ACL, MCL, medial meniscus.

Posterior knee dislocation: popliteal injury common, texts say arteriogram all.

Calcaneous fx : prone to compartment syndrome (as are tibia fx, supracondylar humerus fx).

Shoulder dislocation: 90% anterior (risk *axillary nerve* injury); posterior seen w/seizures, electrocution.

Humerus fx: may see radial nerve injury (weak wrist extension, sensation lateral-dorsal hand). Improves.

Volkmann's contracture: supracondylar humerus fx →compromised *anterior interosseous artery*.
Deep forearm flexor compartment syndrome, need fasciotomy. Pain in forearm w/ extension.
Median nerve.

Dupuytren's contracture of the palmar fascia: Rx with steroids, physical therapy; may need fasciotomy.

Navicular fx: tender snuffbox; even with negative x-ray, requires cast up to elbow.

Monteggia fx: proximal ulnar fx w/ radial head dislocation. ORIF.

Bone mets: can fixate; RT for pain relief. Only 65% symptomatic.

Ewing's sarcoma: 'onion layering', pseudorosettes on path. Rx is R.T. Avg survival 2 yrs.

Osteogenic sarcoma: *sunburst* pattern on xray.

PANCREAS

Santorini is Small duct, Wirsung is major duct. Pancreas divisum = failure of fusion (5% of population, prone to pancreatitis), Santorini is then major duct.

Annular Pancreas: Double bubble on xray. Rx obstruction w/ duodenojejunostomy. Do not resect pancreas.

Pancreatic CA : overall 90% dead in one year.

CA 19-9 (serum marker) is generally high in pancreatic CA.
90% have mutated K-Ras.

Celiac plexus block is effective pain relief for non-resectable CA (50% etoh on both sides of aorta near celiac).

Pancreatic pseudocysts: expectant management if asymptomatic and not enlarging up until ≈ 12 wks after episode of acute pancreatitis. 85% of pseudocysts resolve on their own .

Internal drainage by cyst-gastrostomy, -duodenostomy, or –jejunostomy.
Complications of untreated pseudocyst: bleed, infection, rupture, obstruction of CBD or duodenum.
Recurrence 10%; much higher w/ *external* drainage.

Insulinoma : #1 islet cell tumor overall. Insulin to glucose ratio > .4, ↑ C peptide.
(as with Parathyroid hormone, C terminal portion of hormone is inactive).
90% benign. Rx enucleate.

Gastrinoma: #1 islet cell tumor in MEN (MEN I). 60% malignant, 50% are multiple.

90% are in Gastrinoma Triangle: 1. cystic/CBD junction 2. Pancreas neck 3. 3rd pt. duodenum .

Gastrin level > 1000, do secretin stimulation test (nl patient will ↓ gastrin).

Severe ulcer disease, diarrhea (due to lipase destruction by acid, malabsorption and ↑secretions).

NGT and H2 blockers help diarrhea.

Somatostatinoma: gallstones, steatorrhea, pancreatitis, diabetes.

Glucogonoma: diabetes, glossitis, stomatitis, *migratory necrolytic erythema.*
Streptozocin and octretide help.

VIP-oma : WDHA syndrome = Watery Diarrhea Hypokalemia Achlorhydria.
Diarrhea does *not* improve w/ ngt or H2 blockers.

PEDIATRICS

Choledochal Cyst: must *excise*. Leaving cyst = 25% cancer, 30% pancreatitis. **Every Year**
- Type I (>90%) whole CBD involved. Excise, do hepatico-jejunostomy
- Type II Diverticulum. Do diverticulectomy
- Type III Choledochocele involving sphincter. Excise, sphincteroplasty
- Type IV Intra and Extra hepatic cysts (Caroli's disease) Transplant
- Type V Intrahepatic cysts Transplant

Pulmonary Sequestration: extralobar has systemic artery and veins; intralobar has aorta in, pulm vein out.
Resection is treatment for both. #1 presentation = infection (not as resp distress in newborn).

Congenital Lobar Emphysema: massive hyperinflation of a single lobe, usually upper/middle.
1/3 have resp distress at birth, only 5% present after age 6 months.
M : F ratio is 2:1; CXR: radiolucency of affected lobe, compression of other lobes.
Severely symptomatic → lobectomy; excellent Px.

Cystic hygroma= lymphangioma: resect. Infection is #1 complication.
Sistrunk procedure: excision of thyroglossal duct cyst (*midline*) with hyoid bone.

Ist sign of CHF in children is hepatomegaly.

Strawberry hemangioma: appear in 1st few weeks of life: leave alone since most involute by age 7.
Neuroblastoma: #1 solid peds malignancy; 90% have ↑ VMA; high HVA (homovanillic acid) =worse Px.
From neural crest, only 30% cure. Associated with N- myc.
#1 peds malignancy overall is leukemia.
Wilm's tumor = *nephro*blastoma. 80% cure with nephrectomy.

Biliary atresia: need Kasai procedure (before age 3 mo) = hepatoportoenterostomy.
Meckel's diverticulum: on anti-mesenteric border. 2 ft from IC valve, 2% population, 2% symptomatic,
2 types of tissue (pancreatic, gastric), 2 common presentations (diverticulitis, gi bleed).
#1 gi bleed in children. Embryology: persistent omphalomesenteric duct.
Intussusception: reduce with air/contrast enema. IV glucagon can help (relaxes smooth muscle).
Usually < 3yo. To OR if peritonitis, free air.
Adult w/ intussusception goes to OR since high likelihood of malignant lead point.
Intestinal atresias are secondary to *intra-uterine vascular events*. Mother may have polyhydramnios.
10% of atresias are multiple.
Duodenal atresias present w/ bilious vomiting, 'double bubble'; #1 neonatal duodenal obstruction.
Assoc w/ trisomy 21(Down's) ; 1/3 have cardiac defects.
TE Fistulas: 90% are type *C* as in 'Common' = blind esophagus, distal TEF. Spit up feeds, ngt can't pass.
5% are type A = blind esophagus, no fistula = no air in entire gi tract.
VATER= vertebral, anorectal (imperforate anus in 10%), TEF, Radial, Renal anomalies.
Ladd's procedure for malrotation: appendectomy, take down bands, counterclockwise rotation.
Meconium ileus (Cystic Fibrosis): try gastrograffin enema (dx and rx).
#1 cause of colon obstruction = Hirschsprung's (no bm in 1st 24hrs, dx w/ rectal biopsy).
NEC: presents *after* initiating feeds in neonate (preemie) with blood in stool.
OR for free air, peritonitis, acidosis/thrombocytopenia/clinical deterioration (resect, ostomies).
Must do contrast eval before reconnecting bowel weeks later (20% will have stenoses).

Imperforate anus: if high, have meconium in urine (fistula to bladder, vagina or urethra), need colostomy.

Gastroschisis: *intrauterine rupture of umbilical cord*, no associated defects, lateral (right) defect, no sac.
Omphalocele: midline defect, may contain liver or other non-bowel content, frequent anomalies
(cardiac, pericardium, sternum, diaphragm=Cantrell pentology). Has a peritoneal sac.

PITUITARY, ADRENAL

PNMT converts norepinephrine to epinephrine. Found only in adrenal medulla.

Pheochromocytoma: 10% are: malignant, bilateral, in children, part of MEN, or extra-adrenal (organ of Zuckerkandl at aortic bifurcation).
Pre-op α block first, then β if tachycardia.
Screen w/ urine metanephrines, VMA;
MIBG scan localizes.

Nelson syndrome: post adrenalectomy (10%) ↑ ACTH, pigmentation, Δ vision from ↑ pituitary response.

Waterhouse Friedrickson: adrenal hemorrhage w/ meningococcal sepsis.

Conn's syndrome = hyperaldosterone = 80% adenoma, 20% bilateral hyperplasia (see Δ with postural stimulation test). HTN, low K, high Na.

Addison's disease = low aldosterone and glucocorticoids = low Na, high K, hypoglycemia.
Crisis presents similar to sepsis with hypotension, fever; steroids diagnostic and therapeutic.

Congenital Adrenal Hyperplasia: 21- Hydroxylase defiency most common.

Cushing's syndrome = excess steroids; most commonly iatrogenic.

Pituitary (Cushing's *Disease*): 70% of non-iatrogenic; high ACTH, suppresses w/ high dose steroid test.

Adrenal Cushing's Syndrome: (15%) low ACTH, independent steroid production, does not suppress.

Ectopic Cushing's Syndrome: ACTH produced elsewhere, usually small cell CA, does not suppress.

Posterior pituitary = neurohypophysis → ADH, Oxytocin.

Anterior pituitary = adenohypophysis → GH, ACTH, TSH, LH, FSH, Prolactin.

Bitemporal hemianopsia is classic vision Δ with pituitary mass effect.

Chromophobe pituitary adenoma: non functional, see ↓ GH, FSH, LH, TSH, ACTH.

Prolactinoma #1 pit adenoma: galactorrhea, irregular menses. Bromocriptine or trans-sphenoidal resxn.

Sheehan sydrome: postpartum lack of lactation, persistent amennorhea.

PLASTICS, SKIN

Langerhans cells: antigen recognition; involved in contact hypersensitivity.

Merkel cells: sensory mechanoreceptors. Merkel cell carcinoma presents as red/purple papulo-nodule. A neuroendocrine tumor with staining for neuron specific enolase and neurofilament protein.

Glomus cell tumor: painful subungual tumor, benign, from glomic end organ. Rx: shell out.

Hidadrenitis: involves apocrine glands, therefore see after puberty in axilla, groin.

Basal Cell CA 4:1 more common than SCCa. BCCa has peripheral palisading of nuclei on path.

FTSG contracts less than STSG. STSG donor site regenerates from hair follicles, skin appendages.

STSG blood supply by *imbibition* 1st few days, then neovascularization days 2-7 (capillary ingrowth).

Flap necrosis: most commonly due to *venous thrombosis*.

Risks for melanoma: Dysplasic nevi, Congenital nevi, BK Mole syndrome (100% risk).

Depth <1mm; 1-4mm ; >4 mm = 1; 2; 3 cm margins necessary respectively.

Melanoma sites: skin > eyes > rectum; #1 skin site in men is the back, in women is legs.

Worse Px if on BANS: back, arms, neck, scalp.

Breslow: <.75 mm (90% cure); .75-1.65 mm; 1.65-4mm; >4mm (80% distant mets).

4 types: nodular (worst, early mets), superficial spreading, lentigo maligna, acral lentiginous.

Keloid: extends beyond wound margins; failure of collagen breakdown and ↑ collagen production.

Hypertrophic scar does *not* extend beyond margins.

STOMACH, SMALL BOWEL

MALT is a precursor to gastric lymphoma; it regresses with H. pylori treatment.

Clo test detects *urease* from H. pylori.

Type I gastric ulcer assoc w/ type A blood, other ulcer types w/ type O.

Type I = on lesser curve; II = 2 ulcers (lesser curve and duodenal); III pre-pyloric; IV high lesser curve; V anywhere, assoc w/ Nsaid use.

Gastric Adeno CA ↑ risk w/ adenoma > 2cm, type A blood, nitrosamines, chronic atrophic gastritis/pernicicous anemia.
Has intramural spread so 6cm margin necessary.

Gastric Lymphoma: chemo and RT now treatment of choice, surgery for complications.

Bowel rest/ngt cures 65% of partial SBO, 20% of complete SBO.

Terminal ileum resection : ↓ bile salt absorption → less colonic H2O absorption → diarrhea.

↓ B12/intrinsic factor absorption.

↓ binding of oxalate → more oxalate absorbed in colon → more oxalate stones.

Pt w/Crohn's with numerous strictures: avoid resection (and short gut), perform stricturoplasties.

Carcinoid: tryptophan → serotonin → 5 HIAA (measure in urine).

Tryptophan diversion can cause *pellagra* (3 D's: dermatitis, dementia, diarrhea).

Serotonin is secreted by argentaffin staining cells (enterochromaffin cells) only.

9% of pts *with mets* get Carcinoid syndrome (flushing, asthma, diarrhea, R sided heart valve dis)
Octreotide helps.

Appendix #1 site, followed by Ileum then Rectum (AIR).

1/3 of pt w/ sb carcinoid have multiple primary sites, ¼ have a metachronous adenocarcinoma

chemo for carcinoid: streptozocin, doxorubicin, 5 FU palliate.

Fistula: less likely to heal with FRIENDS: Foreign body, Radiation, IBD, Epitheliazation, Neoplasm, Distal obstruction, Sepsis/infection.

TPN proven to ↑ closure rate of fistulas but not shown to improve survival.

SBO due to gallstone (from cholecysto-enteric fistula): SBO with air in biliary tree. 'Gallstone ileus'.
Remove stone to relieve SBO but leave gallbladder, and fistula to ↓↓mortality.

THYROID AND PARATHYROID

Parafollicular C cells derived from neural crest, produce *calcitonin* (↓ serum calcium).
T3 is 3 times as active as T4, half life 3 days.
PTU: prevents DIT, MIT coupling; crosses placenta →cretinism; rare but dreadful *aplastic anemia.*
*P*TU, *P*ropranolol, *P*rednisone (steroids in general) all block *P*eripheral conversion of T4 to T3.
Wolff Chaikoff effect: high I- doses (lugol's, KI) inhibit TSH, useful in thyroid storm.

FNA cannot distinguish malignant/benign with follicular or Hurthle cell, need *tissue.*

Papillary Thyroid cancer most common 85% (*P* for Popular). Lymphatic spread, but nodes don't predict survival. 20% of adults, 80% of children, present node positive. 80% are multicentric.
*P*sammoma bodies on path (P again), represents deposited calcium.
History of exposure to radiation ↑↑ risk.
F : M ratio is 3:1; ½ are before age 40.
'Lateral aberrant thyroid rest' = nl appearing thyroid in a neck node = papillary thyroid *cancer.*
MACIS criteria: Mets, Age (M >50, F>40 is worse), Completeness of resection, Invasiveness and Size (>1.5 cm generally means *total* thyroidectomy needed).

Follicular Thyroid cancer spreads hematogenously, 60% present w/ met.
Present a little older (50's), also 3:1 female. Needle dx not adequate.
Generally do total thyroidectomy with ablative RI post op.

Medullary Thyroid Cancer (MTC): 20% with MEN2 (tend to be bilateral, younger, worse Px).
See *amyloid* on path (is pathognomonic).
Gastrin is used as provocative test for Medullary thyroid CA (↑ calcitonin).
Orginates from parafollicular C cells.
Ret proto-oncogene is diagnostic.
Rx total thryoidectomy; neck dissection if node +.

Cold nodule more likely CA than hot.
1st step in work up of thyroid nodule after H + P is FNA. **Every Year**
No radioactive iodine during pregnancy. Operate in 2nd trimester if possible.
Radioactive iodine only useful for well differentiated tumors (papillary and follicular).

Superior laryngeal n, external branch : motor to cricothyroid muscle, injury = lose projection, high pitch.
Provides sensory to supraglottis.
Recurrent laryngeal n. innervates all of larynx except cricothyroid. Bilateral injury = occluded airway.

Superior parathyroids from 4th pouch, inferior (and thymus) from 3rd; inferior more variable position.
All parathyroids generally receive blood supply from inferior thyroid artery.
N terminal is active, C terminal is inactive portion of hormone (as w/ insulin).
PTH ↑ calcium binding protein to ↑gut absorption of Ca; ↑kidney Ca absorption, ↑ PO4 loss.
Hyperparathyroidism: assoc w. *prad oncogene* and h/o radiation exposure.
↑ Ca, ↓Phos; Cl- to Phos ratio > 33.
Osteitis fibrosa cystica is pathognomonic for hyper PTH.
Check urine Ca, should be high (r/o FHH = familial hypocalciuric hypercalcemia).
Most patients are asymptomatic, found incidentally with high Ca.
85% have single gland adenoma (except in MEN where ↑PTH is due to 4 gland hyperplasia)
Rare parathyroid adenocarcinoma: palpable mass, very high Ca; resect widely.

MEN I :	'PPP'	Pancreatic islet cell, Pituitary tumor, hyperParathyroidism.
MEN II A:	'2 MPH'	Medullary thyroid Ca (nearly all pts), Pheo, Hyperparathyroidism.
MEN II B:		Medullary thyroid Ca (nearly all), Pheo, mucosal neuromas/Marfans Sx.

TRANSPLANT

Graft vs Host disease is mediated by *T cells*. **Every Year**

Hyperacute rejection due to *pre-formed antibodies* (avoid by not transplanting when *crossmatch is positive*)

Acute rejection due to foreign MHC antigens of graft cells. Biopsy shows lymphocytic infiltrate, Rx OKT3

Chronic rejection : gradual loss of blood supply. No treatment.

Immunosuppression is largely cellular not humoral system, therefore viral risk > bacterial.

See ↑ cancers (skin, leukemia, lymphoma, cervical).

CMV is #1 virus post-transplant.

Azathioprine: 6 MP derivative, purine analog that acts as an antimetabolite, ↓ DNA synthesis.

Mycophenolate (cellcept) blocks purine synthesis to ↓ T and B cell proliferation.

Cyclosporine inhibits mRNA encoding for IL-2. *Rotamase* inhibitor. Nephrotoxic.

FK506: more potent than Cyclosporine, blocks IL2 expression/production from T cells.

Prednisone blocks IL 1 from macrophages.

OKT3 monoclonal antibody, used to Rx rejection.

Biliary stricture post liver transplant? Check hepatic artery flow, may be due to ischemia.

#1 cause of oliguria post renal transplant is ATN.

Cardiac transplant: 84% 1 yr survival.

Liver transplant: 70% 1 yr graft survival.

TRAUMA, CRITICAL CARE

Catecholamine response to injury is maximal at 24-48hrs.
Also see ↑ADH, ↑ACTH (which ↑ cortisol and aldosterone).

Neck zones: I below cricoid; II cricoid to angle of jaw (most amenable to OR exploration); III jaw to skull
Remember 1 to 3 *low to high* as with LeForte fx and with embryology of PTH glands.
(inferior glands and thymus from 3rd pouch, superior from 4th).

#1 cause of preventable blunt trauma death is missed intra-abdominal injury.

DPL: Perform supra umbilical if + pelvic fx; 10cc/kg infusion for peds. Positive if 1. 10cc frank blood
2. Food particles 3. Bile 4. Bacteria 5. >100,000 rbc/mm 6. 500 wbc/mm
Positive = exploratory lap.

Indications for thoracotomy for hemothorax: 1. Instability 2. >1500 cc out initially 3. >200cc/hr x 4 hrs
4. incompletely drained hemothorax despite 2 good tubes.
Cardiac tamponade: hypotension is due to ↓ diastolic ventricular filling. Tapped blood does not clot.

Fat emboli: petechia, hypoxia, confusion/agitation; sudan urine stain for fat.

Diaphragm rupture from blunt trauma: 8:1 on Left; dx by ngt in chest on CXR. Rx laparotomy.
Delayed presentation—consider approaching via chest since there will be adhesions.

Splenectomy: lose *tuftsin, properidin, fibronectin* (non specific opsonins); ↓ IgM production.
Splenectomy helps *all* pts with hereditary spherocytosis (anemia and jaundice remit).
Helps 80% of pts w/ ITP.
Do not do splenectomy for TTP (low plts, hemolytic anemia, neuro Δ's). Rx plasmapheresis.

Pulmonary compliance = ΔVolume for a given Δ in Pressure (want high compliance).
Compliance ↓ with ARDS, pulmonary edema (takes greater pressures to get same volume)
Aging reduces FEV1 and FVC.
O2 delivery = C.O. x O2 content = C.O. x Hgb x 13 x O2 sat.
O2 use = C.O. x (CaO2 – CvO2).

Initial Rx for air embolus is place pt. in Trendelenberg with left side down.
Can then attempt air aspiration with central line to RA.

PEEP: ↑FRC, ↑compliance, keeps alveoli open; rare ptx unless very high peep. **Every Year**
FRC = air in lungs after normal exhalation.
Inspiratory capacity: air breathed in from FRC; vital capacity: greatest vol. that can be exhaled = FEV.
Hbg: O2 dissociation with ↑ temp, CO2, H+, 2-3 DPG(high altitude, babies) = ' right shift' to provide O2.
EDRF = nitric oxide, made from *arginine* in endothelial cells. Vasodilation via cGMP. ↑ in sepsis.

Hydrofluoric acid burns: Rx with topical calcium.
Carbon monoxide (CO) falsely elevates the O2 sat reading; it reduces available Hgb.
Giving 100% O2 reduces T ½ of CO from 5 hrs to 1 hr.
Silvadene: risk of neutropenia. Good activity against Candida. Poor eschar penetration.
Sulfamylon: painful; Acidosis due to carbonic anhydrase inhibition (less $H2CO3 \rightarrow H20 + CO2$).
Silver Nitrate: hyponatremia and hypochloremia due to leeching of NaCl.
#1 infection in burn pts is *pneumonia* .
Burn patients have initial drop in cardiac output, then are hyperdynamic.
SCCA that develops in chronic wound = *Marjolin's Ulcer.*

UROLOGY

Alpha Feto Protein and βHCG are markers for non-seminomatous testicular CA.

Testicular mass: biopsy is orchiectomy via *inguinal incision.* Never trans-scrotal **Every Year**

Seminoma very radiosensitive- even stage I gets RT (25% have occult mets).

Node + gets platinum chemo.

Usually age 20-35; most tumors are malignant. Rare in African Americans.

Cryptorchidism: ↑testicular CA x 3-14. Orchiopexy ↑ fertility but does not ↓ Ca risk. Do age ≈ 2y.

Testicular torsion: Rx with *bilateral* orchiopexy.

Varicocele: remember L gonadal vein drains to L renal vein (may be obstructed by Renal cell CA); R drains directly to IVC.

Ureteral injury (iatrogenic or otherwise): avoid ureteral dissection (compromise blood supply), use absorbable suture (otherwise is nidus for stones as with bile duct), stent, and *drain.*

Urethral injury: suspect w/ blood at meatus, scrotal/penile injury, high riding prostate.
Dx with retrograde urethrogram (RUG), 1st Rx is do not place foley, need suprapubic cath.

Bladder injury : when with pelvic fx, is usually *extraperitoneal,* generally need foley drainage only.
If no pelvic fx, is usually dome rupture (full bladder in mvc) needs OR, 3 layer closure, keep foley

Prostate Ca mets to bone are osteoblastic, radio-dense.

Oxalate stones most common (especially after small bowel resection);mag ammonium phos 15%; urate 8%

Proteus infection (urease producing) → struvite stones, 'staghorn'.

Renal Cell CA: triad of abd pain (capsule stretching), mass, hematuria.
Can see erythrocytosis due to ↑ erythropoeitin; fever; HTN; Stouffer syndrome (↓ hepatic fxn)

Erythropoietin: 95% made by kidney, stimulated by hypoxia. ↓ production in ESRD.

VASCULAR

Popliteal aneurysm: #1 peripheral aneurysm; 50% bilateral; 1/3rd have AAA also; risk of emboli and thrombosis so operate (exclude and bypass).

Visceral aneurysms: splenic #1 (60%). Rx if >2cm , child bearing age or planning pregnancy, or symptomatic.

AAA rupture risk: <5cm 20% 5yr risk; 5-7 cm 33% 5yr; >7 cm 95% 5yr risk. ↑ risk w/ HTN, COPD.

Bloody diarrhea first few days s/p AAA repair demands sigmoidoscopy to eval for ischemic colon (due to loss of IMA). Take to OR if necrosis.

Claudication: initial Rx is smoking cessation, exercise, trental; not surgery. **Every Year**

ACAS (asymptomatic, >60% stenosis) CEA reduces 5yr stroke rate from 11 to 5%.

NACAS (symptomatic, >70% stenosis) CEA reduces 5yr stroke rate from 26 to 9%.

#1 CN injury with CEA = vagus n. (clamp application) → hoarseness.

Fibromuscular dysplasia: young women, R renal artery most likely involved; amenable to angioplasty. See young woman w/ HTN think FMD.

Atherosclerosis path: type I foam cells (lipids in macrophages); II fibrointimal lesion= smoth muscle proliferation due to mac's growth factors; III: disruption exposes collagen→thrombosis.

MISCELLANEOUS

GYNECOLOGY

PID: each episode ↑ infertility approx 10%, also ↑ risk of ectopic pregnancy.

Krukenberg tumor: colon or stomach CA met to ovary. See *signet cells* on path.

Meig's syndrome: pelvic tumor→ascites, hydrothorax.

Appendicitis in pregnancy: 50% premature delivery; fetal mortality 2-8%, maternal 1%.

Endometriosis can involve rectum; presents w/ rectal bleed, irregular menses, pelvic pain, bluish mass on proctoscopy; Rx hormonal therapy.

Ovarian cancer: stage I limited to ovary (5 yr survival only 66%); II in pelvis; III throughout abd; IV distant met.

HERNIA

Howship Romberg sign = inner thigh pain w/internal rotation = obturator hernia (women 5:1).

Ileoinguinal nerve traverses inguinal canal; sensation to superomedial thigh *and* scrotum.

Genitofemoral nerve: genital branch runs on spermatic cord to cremaster (motor) and scrotum (no leg).

Femoral hernia is medial to vein, artery and then nerve ; 'NAVEL' E= empty space for hernia.

Spigelian hernia: inferior to linea semicircularis, through linea semilunaris; *deep to ext oblique* and therefore hard to diagnose. Often incarcerates bowel, repair all.

Petit's hernia: inferior lumbar triangle(iliac crest, ext oblique, lat dorsi).

Grynfelt's : superior lumbar triangle (12^{th} rib, internal oblique, lumbosacral aponeurosis).