Cardiac Disease (surgical recall p 96) (pocket notebook 15-1)

- **MI**
  - Periop MI risk:
    - Goldman criteria for noncardiac surgery – RF include:
      - CHF (check EF → if < 35% = no surgery)
      - MI w/in 6 months (check EKG → stress test → cath → reperfusion)
      - Arrhythmia
      - Age > 70
      - Emergent surgery
      - Aortic stenosis, poor medical condition, thoracic or abdominal procedure
  - Most dangerous period for a post-op MI are the 6 months following a previous MI (2/3 occur on post-op days 2-5)
  - Risk factors for post-op MI: Hx of MI, angina, QS on EKG, S3, JVD, CHF, aortic stenosis, advanced age, extensive surgical procedure
  - Often presents with chest pain
  - May present with new onset CHF, new onset dysrhythmia, hypotension, chest pain, tachypnea, tachycardia, N/V, bradycardia, neck pain, arm pain
  - EKG findings: inverse T waves, ST elevation, ST depression, dysrhythmias (new onset atrial fibrillation, PVC, ventricular tachycardia)
  - Labs: troponin I, cardiac isoenzymes

- **Unstable Angina**
  - Previously stable and predictable symptoms of angina that are now more frequent, increasing or present at rest

- **Valvular Disease**
  - **Systolic Murmurs**
    - **Aortic stenosis**: harsh systolic ejection crescendo-decrescendo murmur at the right upper sternal border (aortic area) with radiation to the neck and apex heard best by leaning forward with expiration
      - Dyspnea → chest pain → syncope with exercise
    - **Pulmonic stenosis**: harsh, loud, medium pitched systolic murmur heard best at the 2nd /3rd left intercostal space (pulmonic area) that may decrease with inspiration
    - **Mitral regurgitation**: holosystolic high-pitched blowing murmur at apex (mitral area) that radiates to axilla with a split S2
    - **Tricuspid regurgitation**: high pitched holosystolic murmur at LLSB (tricuspid area) radiates to the sternum and increases with inspiration
    - **Mitrval valve prolapse**: midsystolic ejection click heard best at the apex (mitral area)
  - **Diastolic Murmurs**
    - **Aortic regurgitation**: soft early diastolic blowing murmur along left sternal border with patient sitting leaning forward after exhaling
    - **Pulmonic regurgitation**: high pitched early diastolic decrescendo murmur at the LUSB (pulmonic area) that increases with inspiration
    - **Mitrval stenosis**: diastolic low pitched decrescendo rumbling murmur with opening snap heard best at the apex (mitral area) with patient in lateral decubitus position
    - **Tricuspid stenosis**: diastolic rumbling murmur at the LLSB (tricuspid area) with an opening snap

- **HTN**
  - Common causes of postop HTN: pain (from catecholamine release), anxiety, hypercapnia, hypoxia, preexisting condition, bladder distention
  - Patients should continue antihypertensive meds and take on the day of surgery

- **Arrhythmias**
  - See Cardiology Section below

- **Heart Failure**
  - HF is a major risk factor for adverse cardiac events, including death following noncardiac surgery
  - Preop evaluation: clinical exam, EKG, CXR, echocardiogram, BNP levels, exercise testing
  - Preop management options: BB, ACEI, digoxin, diuretics
  - Intraop management options: fluids, hemodynamic monitoring, mechanical circulatory support devices
Pulmonary Disease

- Asthma
  - REVERSIBLE hyperirritability → airway inflammation & bronchoconstriction
  - MC chronic childhood disease
  - Samter’s triad: asthma, nasal polyps, ASA/NSAID allergy
  - Atopy is a RF
  - Pathophys:
    - **Airway hyperreactivity:** early IgE mediated → T cell later on
      - Extrinsic (allergic): allergen triggers
        - MC in children & adolescents
      - Intrinsic (idiosyncratic): nonallergic triggers (infection, drugs, etc)
        - MC in <3yo and >30yo
    - **Bronchoconstriction:** airway narrowing 2ry to smooth muscle constriction, edema, mucus → leads to airway trapping
      - Obstruction: ↓ expiratory airflow, ↑ airway resistance & V/Q mismatch
    - **Inflammation:** 2ry to cellular infiltration & their pro inflammatory cytokines; ↑ histamine released from mast cells
      - Sxs: dyspnea, wheezing, cough (esp at night)
      - PE: prolonged expiration w/ wheezing, hyperresonance to percussion, decreased breath sounds
      - Status asthmaticus: altered mental status, pulsus paradoxus, tripoding, silent chest, severe tachycardia
    - Dx:
      - **Pulmonary function test gold standard:** ↓ FEV1, ↓ FEV1/FVC (reversible obstruction)
      - **Methacholine challenge test:** (>20% decrease in FEV1)
      - **Peak expiratory flow rate:** best and most objective way to assess exacerbation severity
        - FEV1:FVC < 80%
        - > 15% increase in FEV1 after bronchodilator therapy
  - Tx:
    - **Asthma treatment steps:**
      - Step 1: SABA (i.e. albuterol) PRN
      - Step 2: Low-dose ICS (i.e. fluticasone) daily
      - Step 3: Low-dose ICS + LABA (i.e. salmeterol) daily
      - Step 4: Medium-dose ICS + LABA daily
      - Step 5: High-dose ICS + LABA daily
      - Step 6: High-dose ICS + LABA + oral steroids daily
    - **Acute treatment:**
      - Oxygen, nebulized SABA, ipratropium bromide and oral corticosteroids
    - **Admission criteria:**
      - PEFR < 50% predicted
      - ER visit w/in 3 days of exacerbation
      - Status asthmaticus
      - Posttreatment failure
      - AMS
    - **Treatment by level of control:**
      - Well controlled >/= 3 months: step down & reassess in 1-6 mo
      - Partially controlled: step up 1 step & reassess in 2-6 wks
      - Poorly controlled: step up 1-2 steps, consider a short course of PO steroids & reassess in 2 wks
      - Exacerbation: SABA q 2-4 hours PRN + step up one step +/- low dose oral steroid x 3-10 d
<table>
<thead>
<tr>
<th></th>
<th>Intermittent</th>
<th></th>
<th>Persistent</th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Symptoms</strong></td>
<td>≤2x/day</td>
<td>≤2x/week</td>
<td>&gt; 2d/week</td>
<td>Daily</td>
<td>Throughout the day</td>
<td></td>
</tr>
<tr>
<td><strong>SABA Use</strong></td>
<td>≤2x/day</td>
<td>≤2x/week</td>
<td>&gt; 2d/week</td>
<td>Daily</td>
<td>Several times a day</td>
<td></td>
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<tr>
<td><strong>Nighttime awakenings</strong></td>
<td>≤2x/month</td>
<td>3-4x/mo</td>
<td>&gt;1x/week</td>
<td>Almost nightly</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Interference w/ normal activity</strong></td>
<td>None</td>
<td>Minor limitation</td>
<td>Some limitation</td>
<td>Extremely limited</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Lung function</strong></td>
<td>Normal FEV1 between exacerbations</td>
<td>FEV1 &gt; 80% predicted</td>
<td>FEV1/FVC normal</td>
<td>FEV1 60-80% predicted</td>
<td>FEV1/FVC reduced by 5%</td>
<td>FEV1 ≤ 60% predicted</td>
</tr>
<tr>
<td><strong>Recommended management</strong></td>
<td>STEP 1</td>
<td>Inhaled SABA</td>
<td>STEP 2</td>
<td>SABA prn + Low dose ICS</td>
<td>STEP 3</td>
<td>Low ICS + LABA or ↑ ICS dose</td>
</tr>
<tr>
<td><strong>Exacerbations requiring PO steroids</strong></td>
<td>0-1 year</td>
<td>≥ 2/year</td>
<td></td>
<td></td>
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</tbody>
</table>

- **COPD**
  - Progressive largely **irreversible airflow obstruction** d/t loss of elastic recoil & increased airway resistance
  - Chronic bronchitis usually episodic while emphysema usually has a steady decline
  - Both usually coexist w/ one being more dominant
  - RF: smoking (MC), a-1 [antitrypsin deficiency](https://example.com) in pts < 40yo
  - Chronic Bronchitis
    - Chronic airway inflammation → mucus hypersecretion, airway narrowing
    - Defined as a **chronic productive cough** occurring on most days x 3 months for 2+ consecutive years
    - Blue bloaters (2ry to chronic hypoxia)
    - Common in smokers (80% of COPD patients)
    - Physical exam: *rales, rhonchi*
    - Dx:
      - FEV1/FVC < 0.7
      - CXR: peribronchial and perivascular markings
      - ↑ Hgb and Hct because of chronic hypoxic state
      - ↑ pulmonary HTN w/ RVH, JVD, hepatomegaly
  - Emphysema
    - Abnormal permanent enlargement of terminal alveoli → loss of elastic recoil & ↑ compliance
    - The body’s natural response to decrease lung function is chronic hyperventilation → Pink Puffers!
    - CO2 Retainers - the body must increase ventilation to blow off CO2
    - Sxs: minimal cough (compared to chronic bronchitis), quiet lungs, thin, barrel chest
    - Dx:
      - FEV1/FVC < 0.7
      - CXR: loss of lung markings and hyperinflation – parenchymal bullae and blebs are pathognomonic
      - Normal hematocrit (HCT)
Emphysema | Chronic Bronchitis
---|---
**Clinical Manifestations** | **Productive cough hallmark**, prolonged expiration, mild cough
- Dyspnea MC symptom, accessory muscle use, prolonged expiration, mild cough | - Rales, rhonchi, wheezing
- Signs of cor pulmonale

**Physical Exam** | Hyperinflation: **hyperresonance** to percussion, ↓/absent breath sounds, barrel chest, quiet chest
- Rales, rhonchi, wheezing
- Signs of cor pulmonale

**ABG/Labs** | Resp asthma
- Can develop resp acidosis in acute exacerbations | Resp acidosis
- ↑ Hct/RBC (chronic hypoxemia → RBC production)

**V/Q Mismatch** | Matched V/Q defects
- Mild hypoxemia
- CO2 normal | Severe V/Q mismatch
- Severe hypoxemia
- Hypercapnia

**Appearance** | Cachectic, pursed lip breathing – pink puffers
| Obese & cyanotic – blue bloaters

- **Mild disease**: short acting bronchodilators for mild disease
- **Moderate-severe disease**: long acting bronchodilators +/- inhaled corticosteroids
- **Ipratropium bromide is inhaler of choice for COPD**
- Smoking cessation and supplemental O2
  - O2 is single most important medication in long term
  - Start O2 when SpO2 <88% or PaO2 < 55mmHg
- Antibiotics for acute exacerbations
- Flu and pneumococcal vaccines are a must
- Meds don’t alter long-term decline, just decrease sxs and exacerbations
- **Surgical nutrition**: can decrease carbs and increase calories from fat if CO2 retention is a concern
- Med options:
  - Short acting: SABA (albuterol) or SAMA (ipratropium)
  - Long acting: LABA (“terol” - salmeterol), LAMA (“ium” - tiotropium), LAMA/LABA (umeclidinium/vilanterol), ICS (fluticasone, budesonide), ICS/LABA (fluticasone/salmeterol)

- **GOLD category**:
  - A: FEV 50-80% predicted or < 1 exacerbation/year + mild sx
  - B: FEV 50-80% predicted or < 1 exacerbation/year. + uncontrolled sx
  - C: FEV < 50% predicted or >/= 2 exacerbations/year or >/= 1 hospitalization + mild sx
  - D: FEV < 50% predicted or >/= 2 exacerbations/year or >/= 1 hospitalization + uncontrolled sx
Metabolic Disease

- Diabetes
  - Mellitus
    - Patients shouldn’t take oral hypoglycemic agent on day of surgery if NPO
    - Insulin on day of surgery: half of a long acting insulin and start D5NS IV
    - Check glucose levels preoperatively, operatively and postoperatively
    - DKA (p 94)
      - Deficiency of body insulin, resulting in hyperglycemia, formation of ketoacids, osmotic diuresis and metabolic acidosis
      - Sxs: polyuria, tachypnea, dehydration, confusion, abdominal pain
      - Tx: insulin drip + IVFs + K supplementation +/- bicarb IV
      - Need to monitor potassium closely!
      - Must r/o infection in a diabetic with DKA (perirectal abscess commonly missed)
  - Insipidus (p 96)
    - Failure of ADH renal fluid conservation resulting in dilute urine in large amounts
    - Source: posterior pituitary
    - 2 types
      - Central: decreased production of ADH
        - Classic causes: brain injury, tumor, surgery, and infection
      - Nephrogenic: decreased ADH effect on kidney
        - Classic causes: amphotericin B, hypercalcemia and chronic kidney infection
    - Labs: hypernatremia, decreased urine sodium, decreased urine osmolality, and increased serum osmolality
    - Tx: fluid replacement
      - Central: warrants vasopressin
      - Nephrogenic: may respond to thiazide diuretics

- Adrenal Insufficiency (p 94)
  - Need to increase steroid doses 5-10 fold with surgery to mimic normiologic response
  - Addisonian crisis (p 94)
    - Acute adrenal insufficiency in the face of a stress (surgery, trauma infection)
    - ADDisonian = ADrenal Down
    - Causes: postop, inadequate cortisol release usually results from steroid administration in the past year
    - Sxs: tachycardia, nausea, vomiting, diarrhea, abd pain, fever, progressive lethargy, hypotension, eventual hypovolemic shock
    - Commonly presents with tachycardia and hypotension refractory to IVF and pressors
    - Dx: ↓ Na+, ↑ K+
    - Tx: IVFs (D5 NS), hydrocortisone IV, fludrocortisone PO

Hematologic Disease

- Review
  - Vit K dependent factors → II, VII, IX, X → influenced by warfarin
  - Common pathway: II, V, X
  - PT = extrinsic & common pathways (VII) → monitors coumadin
  - PTT = intrinsic pathway (VIII, IX, XI, XII) → monitors heparin
- Clotting Disorders (1-9)
  - See hematologic section
- Bleeding Risk
  - Get a good history!
  - Current meds and last dose: ASA/NSAIDs, Plavix, coumadin, Vit E supplements (ginseng, St John’s wort, garlic)
  - Medical conditions: liver disease, biliary obstruction, renal disorder, anemia, short gut, prosthetic valves
- Anticoag Use
  - ASA, NSAIDs, VitE → stop 2 weeks prior
  - Warfarin → stop 5 days prior
• **DVT (p 90) (14-12)**
  o **Most originate in calf**
  o Risk Factors: *Virchow’s triad: stasis, vascular injury, hypercoagulable state* (OCP, cancer, surgery, factor V Leiden)
  o **Unilateral (ASYMMETRICAL) swelling of lower extremity**
  o **Calf pain/tenderness 50%, homan’s sign** (calf pain w/ dorsiflexion), phlebitis
  o **Up to 50% can be asymptomatic**
  o **Dx: venous duplex ultrasound 1st line imaging** (noncompressible echogenicity), **venography gold standard, d-dimer** (used to r/out, not r/in)
  o **Tx: Anticoag therapy** (heparin ⎯ warfarin) x 3-6 months for 1st DVT and then for at least 1 year for subsequent
  - **Warfarin C/I in pregnancy** (use LMWH)
  o Thrombolytics only used when C/I to anticoags exist or in phlegmasia cerulean dolens (severe iliofemoral clot)
  o Prophylaxis (Caprini Score):
    - **Very low risk** (patients undergoing general or abdominal/pelvic surgery with a Caprini score of 0 or patients undergoing plastic/reconstructive surgeries with a Caprini score of 0-2): **early ambulation**
    - **Low risk** (undergoing general or abdominal/pelvic surgery with a Caprini score of 1 or 2 patients undergoing plastic/reconstructive surgery with a Caprini score of 3 to 4): **pneumatic compression devices or compression stockings**
    - Moderate/high risk:
      - Low bleeding risk: pharmacologic alone (ie heparin)
      - High risk: mechanical methods

<table>
<thead>
<tr>
<th>Points</th>
<th>3 points</th>
<th>2 points</th>
<th>1 point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke (in the previous month)</td>
<td>Age ≥75 years</td>
<td>Age 61-74 years</td>
<td>Age 41-60 years</td>
</tr>
<tr>
<td>Fracture of the hip, pelvis, or leg</td>
<td>Prior episodes of VTE</td>
<td>Arthroscopic surgery</td>
<td>BMI &gt;25 kg/m²</td>
</tr>
<tr>
<td>Elective arthroplasty</td>
<td>Positive family history for VTE</td>
<td>Laparoscopy lasting &gt;45 min</td>
<td>Minor surgery</td>
</tr>
<tr>
<td>Acute spinal cord injury (in the previous month)</td>
<td>Prothrombin 20.210 A</td>
<td>General surgery lasting &gt;45 min</td>
<td>Edema in the lower extremities</td>
</tr>
<tr>
<td></td>
<td>Factor V Leiden</td>
<td>Cancer</td>
<td>Varicose veins</td>
</tr>
<tr>
<td>Lupus anticoagulants</td>
<td>Anticardiolipin antibodies</td>
<td>Plaster cast</td>
<td>Pregnancy</td>
</tr>
<tr>
<td>Antiplatelet agents</td>
<td>High homocysteine in the blood</td>
<td>Bed bound for &gt;72 h</td>
<td>Puerperal</td>
</tr>
<tr>
<td>Heparin induced thrombocytopenia</td>
<td>Other congenital or acquired thrombophilia</td>
<td>Central venous access</td>
<td>Oral contraceptive</td>
</tr>
<tr>
<td>Other bleeding risk: pharmacologic alone (ie heparin)</td>
<td>Mechanical methods</td>
<td></td>
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</tr>
</tbody>
</table>

VTE: Venous thromboembolism. BMI: Body mass index

• **PE (p 90) (2-11, 14-14)**
  o A complication of a DVT – thrombus in the pulmonary artery or its branches
  o Classic scenario: a patient recovering from a recent surgery presents with sudden onset of pleuritic chest pain, dyspnea, apprehension, cough, hemoptysis, and diaphoresis. The cardiac monitor demonstrates a regular rhythm with a rate of 120 bpm (tachycardic). Upon auscultation you notice tachypnea and crackles
  o **Virchow’s triad: hypercoagulable state, venous stasis, vascular injury**
  o RF: Cancer, surgery, oral contraceptive pills, pregnancy, long bone fracture (fat emboli)
  o **Dyspnea MC symptom, tachypnea MC sign**
  o Saddle embolus – PE that straddles the pulmonary artery and is in the lumen of both the right and left pulmonary arteries
  o **Dx:**
    - **Homan’s sign:** (Dorsiflexion of foot causes pain in calf) indicative of DVT
    - **EKG:** Tachycardia (MC), ST changes, **S1Q3T3** (Indicates cor pulmonale)
    - **Helical CT: best initial test**
    - **Gold Standard is pulmonary arteriography**
    - **CXR:** Westermark’s sign and Hampton’s Hump (triangular infiltrate secondary to intraparenchymal hemorrhage)
    - Doppler US: for DCTs
    - D-dimer: only helpful if negative & low suspicion for PE
o Tx:

  • Hemodynamically stable:
    • IV heparin to PO Coumadin bridge, 3-6 mo treatment, target INR of 2.5
    • IVC filter in stable patients whom anticoag is CI or unsuccessful
      o Placed into IVC via jugular vein to catch the emboli
  • Hemodynamically unstable:
    • Thrombolysis: streptokinase
    • Embolectomy

o Prophylaxis: preoperative pts undergoing surgery w/ prolonged immobilization, pregnant women, h/o prior DVT/PE

  • Early ambulation: low risk, minor procedures in pts < 40yo
  • Elastic stockings/pneumatic compression devices: moderate risk
  • LMWH: pts undergoing orthopedic or neurosurgery, trauma
    • 40 mg SQ daily OR 30mg SQ bid

Tobacco Use/Dependency

  • Is a major cause of pulmonary, cardiac, and cancer deaths
  • Smoking within 1 year of surgery is associated with increased postop complications
  • Smoking risks: impairs wound healing, increases risk of blood clots, HTN, poor blood supplt
  • Improvement seen in wound healing and pulmonary function seen within 4-8 weeks of smoking cessation

Substance Use Disorder

1. Marijuana

  • Behavior/physiological effects: Glassy, red eyes; loud talking and inappropriate laughter followed by sleepiness; a sweet burnt scent; loss of interest, motivation; weight gain or loss; dry mouth.
  • Withdrawal: usually only seen w/ heavy usage; irritability, depression, insomnia, nausea, anorexia. Most symptoms peak at 48 hours and last for 5 - 7 days.
  • Surgical complications: similar to cigarette smoking
  • Symptomatic treatment only

2. Alcohol

  • Behavior/physiological effects: Dilated pupils; clumsiness; difficulty walking; slurred speech; sleepiness; poor judgment; depression.
    • Withdrawal: Uncomplicated: 6-24 hours after last drink
      • Increased CNS activity: trembling, irritability, anxiety, headache, tachycardia, insomnia.
    • Withdrawal seizures: 6-48 hours after last drink
    • Alcoholic hallucinosis: 12-48 hours after last drink
      • Clear sensorium & normal VS
    • Delirium tremens: 2-5 days after last drink
      • Altered sensorium and abnormal VS
  • Treatment
    • Withdrawal: Benzodiazepines
    • Dependence: Disulfiram (Antabuse), Naltrexone
    • IV thiamine & magnesium, multivitamin, dextrose (particularly if chronic alcoholism)

3. Cocaine, Crack, Meth & Other Stimulants

  • Behavior/physiological effects: Dilated pupils; hyperactivity; euphoria; irritability; anxiety; excessive talking followed by depression or excessive sleeping at odd times; go long periods of time without eating or sleeping; weight loss; dry mouth and nose; aggression and agitation.
  • Withdrawal: severe depression and suicidality, hyperphagia, hypersomnolence, fatigue, malaise, severe psychological craving.
  • Treatment: bupropion, bromocriptine, SSRI's for depression. Antipsychotics (haloperidol), benzodiazepines, vitamin C (promotes excretion), antihypertensives, propranolol (BP + tachycardia control).
4. Opiates
   • Includes heroin, oxycodone, morphine, meperidine and codeine
   • Behavior/physiological effects: respiratory depression, bradycardia, hypotension, contracted pupils; needle marks; sleeping at unusual times; sweating; vomiting; coughing and sniffling; twitching; loss of appetite; no response of pupils to light.
   • Withdrawal: Anxiety, insomnia, anorexia, sweating, dilated pupils (mydriasis), piloerection ("cold turkey"). Fever, rhinorrhea, nausea, stomach cramps, diarrhea ("flu-like" symptoms)
   • Treatment:
     - Acute intoxication: naloxone (narcan), MC used in patients w/ respiratory distress
     - Withdrawal: clonidine, suboxone, methadone tapering
     - Long term management: suboxone (buprenorphine + naloxone) long-acting oral administration with fewer withdrawal symptoms than methadone.

5. Depressants
   • Behavior/physiological effects: Contracted pupils; seems drunk as if from alcohol but without the associated odor of alcohol; difficulty concentrating; clumsiness; poor judgment; slurred speech; and sleepiness.
   • Withdrawal: anxiety, seizures, delirium, similar to alcohol, life-threatening cardiovascular collapse.
   • Treatment: long-acting benzodiazepines with taper.

6. Inhalants
   • Behavior/physiological effects: Watery eyes; impaired vision, memory and thought; secretions from the nose or rashes around the nose and mouth; headaches and nausea; appearance of intoxication; drowsiness; poor muscle control; anxiety; irritability.
   • Withdrawal: not well characterized, no treatment.

7. Hallucinogens
   • Behavior/physiological effects: Dilated pupils; bizarre and irrational behavior including paranoia, aggression, hallucinations; mood swings; detachment from people; absorption with self or other objects, slurred speech; confusion.
   • Withdrawal: depression, anxiety, irritability, restlessness, anergia, disturbances of thought and sleep.
   • Treatment: symptomatic treatment only.

Post-Op Fever (1-17)
   • Temp > 38.5C (101.5F)
   • 5 Fs
     - Wind – atelectasis, pneumonia
     - Water – UTI
     - Wound – wound infection
     - Walking – DVT/thrombophlebitis
     - Wonder drugs – drug fever (heparin or abx)
   • Timing:
     - First 24-48 hrs – atelectasis
     - After day 3 – UTI
     - After day 5 (can be anytime) – wound infection
     - Days 7-10 – DVT/PE
     - Anytime – drug fever, IV site infection, central line infection
   • MCC of fever on days 1-2 is atelectasis
   • Workup:
     - < 48 hours post op → no need to workup
     - >48 hours post op → CXR, urine cx, blood cx, CBC
     - Fever > 1 week is a serious complication
   • Malignant hyperthermia is an anesthetic cause of fever intraoperatively; treat w/ dantrolene
   • Prevention: early ambulation, incentive spirometry, DVT prophylaxis, d/c foley catheters ASAP

Wounds/Infections (1-11)
   • Wound closure:
     - Primary (first intention): suture wound closed immediately
       - Takes the wound 24-48 hours to epithelialize
       - Dressing should be removed POD #2
Patient can take a shower any time after POD 2
  - Secondary (secondary intention): wound is left open and heals over time WITHOUT sutures; heals by granulation, contraction and epithelialization over weeks
  - Delayed primary closure: suture wound closed 3-5 days AFTER incision

- Components of Optimal Wound Healing
  - Well-vascularized wound bed
  - Wound free of devitalized tissue
  - Wound clear of infection
  - Moist wound

- Wet to dry dressing: damp gauze dressing placed over a granulating wound and then allowed to dry the wound

- Things that inhibit wound healing: infection, ischemia, DM, malnutrition, anemia, steroids, cancer, radiation and smoking
- Vitamin A can reverse the bad effects of steroids on wound healing

### Surgical Infection (p 110)

- **Overview**
  - SIRS: 2+ of the following
    - Temp < 36 C or > 38 C
    - Tachypnea > 20 bpm
    - Heart rate > 90 bpm
    - Leukocytes < 4,000 or > 12,000
  - Sepsis: SIRS and documented infection

- **Surgical Site Infection**
  - Classically presents post op days 5-7
  - Sxs: pain at incision site, erythema, drainage, induration, warm skin, fever
  - Defined as infection related to the operative procedure occurring at or near the surgical incision within 30 days of an operative procedure or within 1 year of an implant
  - **MC source is direct inoculation of pt’s endogenous flora at the time of surgery**
  - Prevention
    - Preop showering with antimicrobial soaps
    - Preop prepping of operative site with antiseptics (chlorhexidine superior to iodine)
    - Washing and gloving of surgeon’s hands (alcohol rubs may be as effective as traditional soap scrubbing)
    - Use of sterile drapes
    - Use of gowns and masks by OR personnel
    - Good surgical technique: gentle traction, effective hemostasis, removal of devitalized tissue, obliteration of dead space, irrigation with saline, use of fine nonabsorbable monofilament suture, judicious use of closed suction drains, wound closure without tension
    - Antibiotic prophylaxis: should be administered within 60 min of first incision; may need to be repeated more than once depending on length of surgery
    - Hair removal: may increase risk of surgical site infection, must use clippers or depilatories if removing hair vs razor
    - Tight glucose control in diabetic pts
    - Perioperative warming (bear huggers) to prevent hypothermia, warmed IVF, hats and booties
    - Minimally invasive and laparoscopic procedures associated with ↓ risk of SSI
  - **Tx:**
    - Open exploration, draining and irrigation of wound
    - Sharp surgical debridement of devitalized tissue
    - Wound can be closed or allowed to heal by secondary intention once granulation tissue is apparent

### Fluid/Volume Disorders (p 67) (1-15)

- **Volume Overload**
  - Increase interstitial > increase plasma volume
  - Causes: iatrogenic, CHF, resuscitation, cirrhosis, CRF
  - Sxs: crackles on lung auscultation, edema
  - Dx: decreased HCT & albumin
Volume Depletion
- Physiologic response: Na and H2O retention via renin → aldosterone, H2O retention via ADH, vasoconstriction via angiotensin II and sympathetics, low urine output and tachycardia (early), hypotension (late)
- Causes: trauma, GI losses, dehydration, third spacing, diuretics
- Sxs: tachycardia, tachypnea, pulse pressure variability, delayed cap refill
- Dx: increased BUN/Cr

**Electrolyte Disorders (p 71) (1-16)**

### Hyperkalemia
- K+ > 5 mEq/L (critical > 6.5)
- **Most dangerous of electrolyte abnormalities seen!**
- Common causes: false/spurious (MCC), renal issues (2nd MC), acidosis, meds (lisinopril, spironolactone), trauma (dead tissues release potassium), rhabdomyolysis
- **Surgical causes:** iatrogenic overdose, blood transfusion, renal failure, diuretics, acidosis, tissue destruction
- Sxs:
  - Neuromuscular: malaise, **skeletal muscle weakness**, cramping, smooth muscle dysfunction
  - Cardiac: arrhythmias, hypotension, cardiac arrest
  - Other: polyuria, nocturia, hyperglycemia, cardiac arrest
- EKG: **peaked T waves**
- Tx:
  - Calcium to stabilize cardiac membrane (CaGlu vs CaCl)
  - Insulin and dextrose
  - +/- diuretics
  - Bicarb if acidic (< 6.9 pH)
- Albuterol can help lower K+

### Hypokalemia
- K+ < 3.5 mEq/L
- Causes: diuretics, renal tubular acidosis, GI loss (diarrhea)
- **Surgical causes:** diuretics, abx, steroids, alkalosis, diarrhea, NG aspiration, vomiting, insulin
- Sxs:
  - Neuromuscular: malaise, **skeletal muscle weakness**, cramping, smooth muscle dysfunction
  - Cardiac: arrhythmias, hypotension, cardiac arrest
  - Other: polyuria, nocturia, hyperglycemia, cardiac arrest
- EKG: T wave abnormalities, **U waves**, ST seg depression, ventricular ectopy
- Important to check Mg2+ too!
- Tx: potassium replacement
  - IV K+ very uncomfortable, so use central line for > 10mEq

### Hypernatremia
- Na > 145 mEq/L
- Etiology: Too much salt or not enough water
- **Surgical causes:** inadequate hydration, diabetes insipidus, diuresis, vomiting, diarrhea, diaphoresis, tachypnea
- Sxs: lethargy, cramping, thirst, N/V/D, disorientation, weakness, dry MM, fever, oliguria/anuria, delirium, agitation, coma or seizures
- Tx: need to figure out cause 1st
  - If hypovolemic: lactated ringers or NaCl
  - If not hypovolemic: water + **hypotonic IVF** (D5 ½ NS)

### Hyponatremia
- Na < 135 mEq/L → leads to increased free water
- Causes: urinary loss, GI loss, burns, diuretics, DI
- **MCC post op: fluid overload**
- Sxs: lethargy, cramping, anorexia, N/V/D, weakness disorientation, delirium, agitation, coma, seizures
  - Sxs may not be present until 125 mEq/L
- **Hallmark:** AMS
- Tx: strict monitoring of input/output; treat w/ IVFs if AMS/comatose/seizures/severe neuro findings (hypertonic saline)
  - **Danger w/ rapid reversal** – can cause seizures (increase by no more than 4-6 mmol/L in 24 hrs)
  - Caution w/ concomitant K+ repletion
- **Hypercalcemia**
  - MC d/t primary hyperparathyroidism or malignancy
  - PTH mediated
    - Primary hyperparathyroidism MCC overall
  - PTH independent
    - Causes: malignancy, vit D excess, vit A excess, thiazides, lithium
  - Pathophys: increased excitation threshold for heart, nerves & muscle → stronger stimulus needed for activation/contraction
  - Causes: CHIMPANZEEES – calcium supplementation, hyperPTH, immobility, mets, paget’s disease, addison’s, neoplasm, Zollinger-ellison, excessive Vit A/D, sarcoid
  - Sxs: **most are asymptomatic**, have sxs of hyperparathyroidism if symptomatic (bones, stones, abd groans w/ psychiatric overtones)
  - Dx:
    - ↑ ionized Ca2+ & total serum Ca2+ (< 8.5)
    - ECG: **shortened QT interval**, prolonged PR
  - Tx:
    - Mild: no treatment needed
    - Severe/symptomatic: IV saline → diuresis (furosemide 1st line)
      - Avoid HCTZ
    - Other options: steroids, calcitonin, bisphosphonates, dialysis

- **Hypocalcemia**
  - Hypocalcemia w/ ↓ PTH
    - Hypoparathyroidism MCC
  - Hypocalcemia w/ ↑ PTH
    - Causes: chronic renal disease MCC, liver disease, Vit D deficiency, hypomagnesemia
  - Pathophys: decreases excitation threshold for heart, nerves & muscle → less stimulus needed for activation/contraction
  - Surgical causes: short bowel syndrome, intestinal bypass, Vit D deficiency, sepsis, acute pancreatitis, diuretics, renal failure, rhabdomyolysis
  - Sxs:
    - Neuromuscular: **muscle cramping**, bronchospasm, syncope, seizures, finger/circumoral paresthesias
    - Tetany: Chvostek’s sign, trousseau’s sign
    - Cardio: CHF, arrhythmias
    - Skin: dry skin, psoriasis
    - GI: **diarrhea, abd pain/cramps**
    - Skeletal: osteomalacia, abnormal dentition
  - Dx:
    - ↓ ionized Ca2+ & total serum Ca2+ (< 8.5)
    - ↑ phosphate, ↓ magnesium
    - ECG: **prolonged QT interval**
    - Check PTH, BUN/Cr
  - Tx:
    - Mild: PO Ca + Vit D
      - Never administer IV Ca → can cause tissue necrosis
    - Severe/symptomatic: CaGl IV
    - Chronic tx: PO calcium + Vit D

- **Hypermagnesemia**
  - Mg > 2.5 mEq/L
  - Surgical causes: TPN, renal failure, IV over supplementation
  - Sxs: respiratory failure, CNS depression, decreased DTRs
  - Tx: CaGl IV, insulin + glucose, furosemide

- **Hypomagnesemia**
  - Mg < 1.5 mEq/L
  - Surgical causes: TPN, hypocalcemia, gastric suctioning, aminoglycosides, renal failure, diarrhea, vomiting
  - Sxs: increased DTRs, tetany, asterixis, tremor, Chvostek’s sign, ventricular ectopy, vertigo, tachycardia, dysrhythmias
• Tx:
  ▪ Acute: MgSO4 IV
  ▪ Chronic: Mg oxide PO (side effect → diarrhea)

• Hypomagnesemia can make hyperkalemia difficult to correct

• Hypoglycemia
  ▪ Surgical causes: excess insulin, decreased caloric intake, insulinoma, drugs, liver failure, adrenal insufficiency
  ▪ Sxs: sympathetic response (diaphoresis, tachycardia, palpitations), confusion, coma, headache, diplopia, neurologic deficits, seizures
  ▪ Tx: glucose (IV or PO)

• Hyperphosphatemia
  ▪ > 4.5 mg/dL
  ▪ Causes: renal failure, sepsis, chemo, hyperthyroidism
  ▪ Sxs: calcification, heart block
  ▪ Tx: aluminum hydroxide

• Hypophosphatemia
  ▪ < 2.5 mg/dL (critical < 1 mg/dL)
  ▪ Causes: GI losses, inadequate supplementation, medications, sepsis, alcohol abuse, renal loss
  ▪ Sxs: weakness, cardiomyopathy, neurologic dysfunction, rhabdomyolysis, hemolysis, poor pressor response
  ▪ Severe hypophosphatemia can cause respiratory failure
  ▪ Tx: Na phosphate or K+ phosphate IV

Acid/Base Disorders (p 68) (1-15)
• Classic acid-base finding with significant vomiting or NGT suctioning: hypokalemic and hyperchloremic metabolic alkalosis
• Metabolic Acidosis
  ▪ Too much acid or little bicarb
  ▪ Anion gap
    ▪ MUDPIGERS: methanol, uremia, DKA, propylene glycol, lactic acidosis, ethylene glycol, renal failure, salicylates
  ▪ Non-anion gap
    ▪ HARDUP: hyperalimentation, acetazolamide, renal tubular acidosis, diarrhea, uretero-pelvic shunt, post-hypocapnia, spironolactone
  ▪ Surgical causes: loss of bicarb (diarrhea, ileus, fistula), increase in acids (lactic acidosis, ketoacidosis, renal failure, necrotic tissue)
• Metabolic Alkalosis
  ▪ Little acid or too much bicarb
  ▪ ↑ HCO3- with ↑ pH
  ▪ Surgical causes: vomiting, NG suction, diuretics, alkali ingestion, mineralocorticoid excess
• Respiratory Acidosis
  ▪ Anything that decreases respiration
  ▪ Surgical causes: hypoventilation (CNS depression), drugs (morphine), PTX, pleural effusion, parenchymal lung disease, acute airway obstruction
• Respiratory Alkalosis
  ▪ Anything that increases respiration
  ▪ Surgical causes: hyperventilation (anxiety, pain, fever, wrong ventilator setting)

CARDIOVASCULAR – 9%

Chest Pain/Angina
• Angina:
  ▪ Stable
    ▪ Predictable, reproducible w/ exertion, relieved by rest and/or nitroglycerine
    ▪ Pain is deep, visceral, squeezing; may radiate to jaw/neck/arm; transient lasting 2-30 mins
- **Tx:** BBs 1st line (prevents re-infarction and improves survival in patients who had an MI), CCBs, nitrates, daily ASA
  - Unstable
    - Previously stable and predictable symptoms of angina that are now more frequent, increasing or present at rest
  - Prinzmetal
    - Coronary artery vasospasms causing transient ST segment elevations, not associated with clot
    - Chest pain usually NOT exertional, often occurring at rest; occurs w/ stress or cold weather
    - Look for a history of smoking (#1 risk factor) or cocaine abuse
    - EKG may show inverted U waves
    - **Tx:** CCBs 1st line, statins, ASA, nitrates prn
    - **AVOID** BBs (increase vasospasms), high dose ASA and triptans
- Cardiac causes of chest pain: MI, PE, pericarditis, valvular disease (aortic stenosis), cardiomyopathies
- Noncardiac causes: GERD, Boerhavve syndrome, costochondritis, panic attacks

**Syncope**
- Sudden, brief LOC w/ loss of postural tone followed by spontaneous return to baseline
- Patient is motionless and limp, usually has cool extremities, weak pulse, and shallow breathing
- Sometimes brief involuntary muscle jerks occur (resembling a seizure)
- Near-syncope: light headedness and a sense of an impending faint w/o LOC
  - Usually classified and discussed w/ syncope b/c the causes are the same
- Syncope and pre-syncope are different diagnoses, but are given the same work up
- **High risk factors:** syncope during exertion (think arrhythmia), supine position (think arrhythmia), chest pain, palpitations, SOB, LOC w/o prodrome (think arrhythmia), older age, FHx of sudden death, congestive HF, hypertrophic cardiomyopathies, anemia, bradycardia, or LBBB
- Cardiac causes: arrhythmia, aortic stenosis, MI, HOCM, pulmonary HTN, PE, atrial myxoma
- Noncardiac causes: orthostatic/postural hypotension (hypovolemia; drugs – BBs, diuretics; autonomic insufficiency), situational (micturition, defecation, cough), carotid sinus hypersensitivity
- **ALL** patients get EKG
- **Tx:** unless cardiac or neurologic cause of syncope or concerning sxs, patient can be discharged

**Dyspnea on Exertion**
- Acute causes: asthma, pneumonia, pulmonary edema, pneumothorax, PE, metabolic acidosis, ARDS
- Pulmonary causes: asthma, COPD, restrictive lung disease, pneumonia, pneumothorax, PE, ARDS
- **Cardiac causes:** MI, CHF, valvular obstruction, arrhythmia, cardiac tamponade

**Claudication (p 351)**
- Pain, cramping of both of the lower extremities, usually the calf muscle, after walking
- Pain resolves after stopping for an amount of time while standing
- Pattern is reproducible
- Causes: peripheral arterial disease, MSK pain, lumbar spinal stenosis, DVT, peripheral neuropathy, thromboangiitis obliterans
- Unilateral claudication in young/athletic person: popliteal artery entrapment, trauma, baker’s cyst
- **ABI:**
  - Normal: >/= 1
  - Claudication: < 0.6
  - Rest pain: < 0.4
- **Tx:** conservative – exercise, smoking cessation, treatment of HTN, diet, ASA

**Aortic Aneurysm/Dissection**
- Aortic Aneurysm
  - Abdominal Aortic Aneurysm (AAA) (p 51, 356) (14-3)
    - Dilation of aorta > 3cm (AA is normally 2cm); rupture occurs @ > 5cm
    - MC below renal arteries (@ aortic bifurcation or common iliac MC)
    - Sxs: most are asymptomatic and found incidentally
    - Rupture: flank pain radiating to back, hypotension, pulsatile abdominal mass
- **Cullen** (periumbilical ecchymosis) or **grey turner** (flank ecchymosis) signs
- **Dx:** US study of choice if unruptured; CT if ruptured
- **Tx:** refer if > 4 cm; surgical repair if > 5.5 cm or expands > 0.6 cm per year
  - Open surgical repair: open aneurysm and place prosthetic graft then close old aneurysm sac around graft
  - Endovascular repair: femoral catheter used to place stents
  - Endovascular has lower short-term mortality/morbidity but open repairs have better long-term outcome
  - Post-op complications: MI, reduced blood flow to LE from emboli, AKI, mesenteric or spinal cord ischemia, device migration or endoleak with graft placement
- Monitor every 2 years if <4 cm. Monitor every 6 months if >4 cm
- **Screen all males 65-74 yo w/hx of smoking**
  o Thoracic Arterial Aneurysm (p 470)
    - Most asymptomatic; may have substernal back or neck pain
    - **Hoarseness** → stretching of left recurrent laryngeal nerve
    - Rupture → chest pain radiating to back
    - **Dx:** CT test of choice
    - **Tx:** refer for repair > 6 cm
      - Replace w/ graft, open or endovascular stent
    - Surgical repair is risky and complicated (can cause paraplegia and anterior spinal syndrome)
    - Less likely to spontaneously rupture than AAA
- **Aortic Dissection** (p 470) (14-5)
  o Spontaneous intimal tear → blood dissects into tunica media of aorta
  o **Medical emergency**
  o Risks: HTN, collagen disorders (Marfan)
  o **Sudden onset tearing chest pain,** radiates to back between scapulas, diminished pulses
  o **Dx:** CT study of choice, ECG, CXR (widened mediastinum)
  o **Tx:**
    - Ascending aorta – surgical emergency (risk of aortic insufficiency, tamponade or rupture)
      - Open the aorta at the proximal extent of dissection and then sew graft to intimal flap and adventitia circumferentially
        - Greater than 20% intra-op mortality
    - Descending aorta – medical therapy (beta blockers) unless complications are present
      - Lower BP to 100-120 systolic
- **Arterial Embolism/Thrombosis**
  o **Peripheral Arterial Embolisms**
    - **MC involves popliteal artery**
    - Pulsatile mass in groin – femoral
    - **Dx:** arterial US
    - **Tx:** refer for repair > 2 cm
  o **Acute Arterial Occlusion** (p 355)
    - **Sudden cessation of blood flow** to an extremity d/t embolus, thrombus, arterial dissection, trauma
    - A fib is the MCC of embolus from the heart
    - Common femoral artery is the MC site of occlusion by an embolus
    - **W/in 1 hour have the 6 Ps**
      - **Dx:** MRA, CTA
    - **Tx:** IV heparin bridge to warfarin preoperatively followed by an arteriogram → surgical embolectomy
    - Watch for compartment syndrome postoperatively
Peripheral Arterial Disease (p 350) (14-5, 14-8)

- Occlusive atherosclerotic disease in the lower extremities
- Sxs: intermittent claudication, atrophic skin, rubor, hair loss, decreased pulses or non-healing ulcers

<table>
<thead>
<tr>
<th>Vessel Involved</th>
<th>Area of Claudication</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aortic bifurcation/common iliac</td>
<td>Butt, hip, groin</td>
<td>25-35%</td>
</tr>
<tr>
<td></td>
<td>Leriche’s syndrome: triad of claudication, impotence &amp; decreased femoral pulses</td>
<td></td>
</tr>
<tr>
<td>Femoral artery</td>
<td>Thigh, upper calf</td>
<td>80-90%</td>
</tr>
<tr>
<td>Popliteal artery</td>
<td>Lower calf</td>
<td></td>
</tr>
<tr>
<td>Tibial/Peroneal artery</td>
<td>Foot</td>
<td>40-50%</td>
</tr>
</tbody>
</table>

- 6 Ps: paresthesias, pain, pallor, pulselessness, paralysis, poikilothermia
- Dx: ABI (claudication if < 0.9, rest pain if < 0.4; normal 1-1.2), angiography is gold standard
- Beta blockers are contraindicated in isolated PAD - it will worsen claudication
- Tx:
  - Conservative: smoking cessation + ACEI + statin (LDL < 70) + ASA or clopidogrel (platelet inhibition) + pentoxifylline (increases flexibility of RBCs)
  - Indications for surgery: severe claudication refractory to conservative treatment, tissue necrosis, infection and rest pain
  - Surgical options: surgical bypass graft (FEM-POP or FEM-DISTAL), angioplasty (balloon dilation), endarterectomy (remove diseased intima and media), or surgical patch angioplasty (place patch over stenosis)
    - Postop concerns: cardiac status main concern b/c most have CAD as well; concern for MI or AAA
- Avoid support hose

Arterial Ulcer Disease
- Results from damage to arteries d/t insufficient blood flow to the legs
- Skin ulcers usually located on lateral malleolus, heels or toes
- PAINFUL
- Sxs: full thickness, punched out appearance, smooth edges, bright red granulation tissue in wound bed
- Tx: goal is to increase blood flow to area to promote healing; wound should be DRY to decrease risk of infection

Venous Ulcer Disease
- Results from damage to veins d/t insufficient blood flow out of the legs
- Skin ulceration on medial malleolus caused by venous stasis of a lower extremity
- Typically PAINLESS
- Sxs: shallow, superficial, irregular borders, may have related edema/phlebitis/infection
- Tx: unna boot is commonly used; need to debride wound occasionally; wound should be WET

Varicose Veins
- MC occur in the saphenous veins
- Causes: incompetent valves, AV fistula, congenital malformations
- Sxs: dilated tortuous superficial veins, venous stasis ulcers, ankle edema, lower extremity pain after sitting/standing, pruritis
- Tx:
  - Conservative: leg elevation, compression stockings
  - Surgical: laser venous ablation, sclerotherapy, great saphenous vein stripping (rarely done now)
- Complications: thrombophlebitis

Arrhythmias
- Arrhythmias of Sinus Origin
  - Sinus Tachycardia
    - Rate > 100 bpm
    - Physiologic causes: exercise, stress, children/infants
    - Pathologic causes: fever, infection, hemorrhage, anxiety, pain, sympathomimetics (cocaine, decongestants)
    - Tx: usually none; treat underlying cause
Sinus Bradycardia
- Rate < 60 bpm
- Physiologic causes: athletes, vasovagal reaction, increased ICP, nausea/vomiting
- Pathologic causes: B-blocker, CCB, digoxin
- Tx: atropine 1st line (b/c excess vagal stimulation is MCC)

Sinus Arrhythmia
- Heart rate increases during inspiration
- Heart rate decreases during expiration

Supraventricular Arrhythmias
- Atrial Premature Beat
  - Abnormally shaped P wave
- Junctional Premature Beat
  - The QRS complex will be narrow, usually measured at 0.10 sec or less, no P wave or inverted P wave

Sustained Supraventricular Arrhythmias
- PSVT
  - A SVT with abrupt onset and offset (MC preceded by a premature atrial contraction)
  - > 100 bpm, regular w/ narrow QRS, P waves hard to discern
  - 2 types:
    - Atrioventricular nodal reentrant tachycardia (AVNRT): Any tachydysrhythmia arising from above the level of the Bundle of His (in the AV node)
      - MC type
      - Slow vs fast
      - 2 pathways (both w/in AV node)
    - AV reciprocating tachycardia (AVRT):
      - 1 pathway w/in AV node
      - 2nd pathway (accessory) outside the AV node (ex WPW and LGL)
  - 2 conduction patterns
    - Orthodromic (MC): impulse goes down AV node pathway first then returns via accessory pathway → narrow complex tachycardia
    - Antidromic: impulse goes down accessory pathway first then returns via normal pathway → wide complex tachycardia (mimics V tach)
  - Tx:
    - Stable (narrow)
      - Vagal maneuvers
      - Adenosine 1st line medical tx (caution in COPD/asthma pts)
      - AV nodal blockers: BBs, CCBs
    - Stable (wide)
      - Antiarrhythmics: amiodarone
    - Unstable
      - DCC

Atrial Flutter
- Regular, sawtooth pattern
- Atrial rate 250-350 BPM
- Narrow QRS complex w/ no P waves
- Tx: stable – vagal, BBs; unstable – synchronized cardioversion; ablation is definitive tx
- Use anticoags like in A fib

Atrial Fibrillation
- Irregularly, irregular w/ narrow QRS and no P waves
- Low-amplitude fibrillatory waves @ 350-600 bpm
- Ventricular rate of 80-140 bpm
- MC chronic arrhythmia, most are asymptomatic
- Increased risk for thrombi formation which can embolize and cause ischemic strokes
- +/- Ashman’s phenomenon: occasional aberrantly conducted beats (wide QRS) after short R-R cycles
- Types:
  - Paroxysmal: self-terminating w/in 7 days (usually < 24 hours)
  - Persistent: fails to self-terminate, lasts > 7 days; requires termination
- **Permanent**: persistent AF > 1 year
- **Lone**: paroxysmal, persistent or permanent w/o evidence of heart disease
  - **Tx:**
    - Stable
      - **Rate control** (usually initial management of symptomatic AF)
        - BBs (metoprolol, esmolol) → MI/ischemia
        - CCBs (diltiazem) → hypotension, LV dysfunction
        - Digoxin (preferred for rate control in patients w/ hypotension or congestive heart failure)
      - **Rhythm control** (used in younger patients w/ lone A fib)
        - DCC preferred over pharmacologic rhythm control
          - Only done if AF present < 48 hours OR after 3-4 weeks of anticoagulation & a TEE shows no atrial thrombi OR start IV heparin, cardiovert w/in 24 hours and continue anticoags x 4 weeks after
          - Pharmacologic: flecainide, sotalol, amiodarone (best in HF)
          - Radiofrequency ablation
    - **Unstable:**
      - IV BBs or CCBs → DCC (if shock, hypotension, pulmonary edema, MI)
    - **Anticoagulation**: consider in all patients w/ nonvalvular A fib (use CHADS2)
      - **Non vitamin K** (direct thrombin inhibitors or factor Xa inhibitors): now preferred over warfarin in most cases
      - **Warfarin** preferred in some w/ severe chronic kidney disease or mechanical heart valves; usually bridged w/ heparin until warfarin in therapeutic
        - Monitoring: INR goal of 2-3, PT
  - **Multifocal Atrial Tachycardia**
    - Multiple ectopic atrial foci (3+ P wave morphologies)
    - HR > 100 bpm; difficult to treat
    - Classically associated w/ severe COPD
  - **Wandering Atrial Pacemaker**
    - Same as multifocal atrial tachycardia, but HR > 100 bpm
  - **Ventricular Arrhythmias**
    - **Premature Ventricular Contractions**
      - Early wide "bizarre" QRS, no p wave seen
    - **Ventricular Tachycardia**
      - EKG: **Wide complex** tachycardia with 3+ consecutive ventricular premature beats
      - Prolonged QT interval is a common predisposing condition
      - Stable: Treat with **amiodarone** → lidocaine → procainamide (in this order)
      - Unstable: Treat with **CPR + DCC**
    - **Ventricular Fibrillation**
      - EKG: **No discernible heart contractions**
      - Coarse vs fine
      - Treatment: **CPR and defibrillation** (AKA unsynchronized cardioversion)
    - **Torsade de Pointes**
      - EKG: **Polymorphic** ventricular tachycardia that appears to be **twisting around a baseline**
      - **MC d/t hypomagnesemia**, hypokalemia
      - Treatment: **IV Magnesium** sulfate

**HEMATOLOGY – 3%**

**Easy Bruising/Bleeding**
- **Clotting Factor Disorders**
  - **Von Willebrand Disease**
    - Most common genetic bleeding disorder, autosomal dominant, MC in women
    - Ineffective platelet adhesion
    - ↓von Willebrand's factor (vWF) and ↓ Factor VIII
- **Mucocutaneous bleeding**, bleeding after minor lacerations, **petechiae** common (*Lack of hemarthrosis*)
- PT & PTT normal
- Treat with DDAVP (desmopressin), transfusion if severe bleeding
- Avoid ASA
  - Hemophilia A
    - **MC type of hemophilia**
    - X-linked recessive, MC in males
    - Lack of **Factor VIII** (intrinsic pathway)
    - **Hemarthrosis**, excessive hemorrhage in response to trauma & surgery
    - Less commonly presents with purpura/petechiae
    - ↑ PTT, normal PT and platelets, with ↓ **Factor VIII** on assay
    - Tx: replacement of Factor VIII, DDAVP
  - Hemophilia B
    - X-linked recessive, MC in males
    - Lack of **Factor IX** (Christmas Disease)
    - **Hemarthrosis**, excessive hemorrhage in response to trauma & surgery
    - ↑ PTT, normal PT and platelets, with ↓ **Factor IX** on assay
    - Tx: replacement of Factor IX
      - DDAVP NOT useful (only used in Hemophilia A & vWD)
  - Hemophilia C
    - Lack of **Factor IX**
    - Noonan syndrome
  - Vitamin K deficiency
    - Neonatal deficiency common (given at birth)
  - DIC
    - Widespread **microthrombi & severe thrombocytopenia**
    - Etiologies include infections, malignancies and obstetric
    - Usually patient is **acutely ill** w/ widespread **hemorrhage** and/or **thrombosis**
    - ↑ PTT/PT/INR
    - Schistocytes on smear
    - ↑ D-dimer
    - Treat underlying cause, FFP if severe bleeding, heparin if **severe** thrombosis

<table>
<thead>
<tr>
<th>Disorders</th>
<th>PT</th>
<th>PTT</th>
<th>Bleeding Time</th>
<th>Platelet Count</th>
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<tbody>
<tr>
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<td>Unaffected</td>
<td>Prolonged</td>
<td>Decreased</td>
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<tr>
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<td>Prolonged</td>
<td>Prolonged</td>
<td>Prolonged</td>
<td>Unaffected</td>
</tr>
</tbody>
</table>

- Thrombocytopenias
  - Drug/heparin induced
    - Postop, decreased platelets, clots
    - Tx: leparudin or agatrobain (synthetic heparin)
  - Idiopathic Thrombocytopenic Purpura (ITP)
    - **Autoimmune antibody reaction to platelets** which results in splenic platelet destruction often **after an acute infection**
    - Associated with HIV, HCV, SLE, CLL
    - Typically, it is **chronic in adults**, but it is usually acute and **self-limited in children**
    - **Isolated thrombocytopenia** and otherwise normal CBC and peripheral blood smear
    - (+) Direct Coombs Test
    - Observation in patients with a platelet count > 30,000/µL and no bleeding. Corticosteroids 1st line when platelets < 30,000, then IVIG, then splenectomy.
Thrombotic Thrombocytopenic Purpura (TTP)
- **Pentad (FAT-RN):** thrombocytopenia (petechial, mucocutaneous bleeding), hemolytic anemia, kidney failure/uremia, neurological sx, & fever
- Splenomegaly
- Idiopathic vs ADAMTS13 deficiency
- Thrombocytopenia, normal coag (PT/PTT)
- Schistocytes on smear
- Plasmapheresis tx of choice

HUS
- **Triad:** thrombocytopenia, hemolytic anemia, & kidney failure (lacks fever and neuro sx seen in TTP)
- MC in children
- Severe kidney problems
- ↓ Platelets + anemia + renal failure (associated with E.coli O157: H7 and diarrheal illness in child)
- Normal coags
- Observation in most children; abx worsen the condition!

**Anemia**
- Macrocytic anemias
  - B12 deficiency
    - Can be malabsorptive (ETOH, gastric bypass, Celiac, Chron’s) but may also be secondary to ↓ intrinsic factor (pernicious anemia or gastric bypass)
    - **Neurological sx:** paresthesias, gait abnormalities, memory loss
    - ↑ MCV (macrocytosis) and hypersegmented neutrophils on blood smear
    - Normal folate, ↑ MMA & ↑ homocysteine
    - Start w/ IM B12 replacement (watch for hypokalemia)
  - Folate deficiency
    - May result from inadequate intake, malabsorption, or use of various drugs (Bactrim, methotrexate)
    - NO neuro sx
    - Causes **neural tube defects** in babies
    - ↑ MCV (macrocytosis) and hypersegmented neutrophils on blood smear
    - Normal B12, ↑ homocysteine
    - Tx: folic acid In patients with megaloblastic anemia, vitamin B12 deficiency must be ruled out before treating with folate. If vitamin B12 deficiency is present, folate supplementation can alleviate the anemia but does not reverse, and may even worsen, neurologic deficits.

- Microcytic anemias
  - Iron deficiency
    - The **MCC of anemia**
    - Important cause of anemia in 6-24m age group
    - Healthy term infants have sufficient iron stores for 1st 4 mo of life
    - Breast fed babies need iron supplement beginning @ 4mo (1mg/kg/d)
    - Pagophagia (ice craving), pica, angular chelitis, kollonychia, pallor, fatigue, irritability
    - ↓ MCV (microcytic), ↑ TIBC, ↓ Ferritin (low iron stores) ↓ MCH (hypochromic)
    - **Adults:**
      - Treat w/ 325mg Fe po daily. Vitamin C increases absorption
    - **Children**
      - Screen @ 12 mo
      - Tx: therapeutic trial of iron (6 mg/kg/d divided TID)
    - Anemia should resolve in 4-6 weeks
  - Lead poisoning anemia
    - MC in children
    - Abdominal pain w/ constipation, neuro sx (ataxia, fatigue, learning disabilities)
    - ↑ serum Pb & ↑ serum Fe, ↓ TIBC, ↑ Ferritin
    - Basophilic stippling on smear
    - Tx: remove lead source, chelation therapy if severe
- Thalassemias
  - Alpha thalassemia
    - MC in Asians
    - 4 states based on deleted a-chains:
      - Silent carrier (−a/aa): clinically normal
      - Alpha thalassemia minor/trait (−/−a): mild microcytic anemia
      - Alpha thalassemia intermedia/HbH (−/−a): presents similar to B-Thalassemia major (HSM, frontal & maxilla bony overgrowth)
      - Hydrops fetalis/Hgb Barts (−/−−): stillbirth or death shortly after birth
    - Very ↓ MCV on the exam with a normal TIBC and Ferritin
    - Target cells, small/pale RBCs, basophilic stippling on smear
    - Heinz bodies in HbH
    - Tx:
      - Mild (trait): none
      - Moderate disease: folate, avoid oxidative stress, avoid Fe supplementation
      - Severe: blood transfusions weekly if severe anemia, chelation therapy, splenectomy
  - Beta thalassemia
    - MC in Africans, Mediterranian
    - Decreased production of B-chains → excess a-chains
    - 3 states
      - B-thalassemia minor (trait): usually asymptomatic
      - B-thalassemia major (cooley's anemia): frontal bossing, maxillary overgrowth, HSM, severe hemolytic anemia
      - B-thalassemia intermedia: milder sx compared to major
    - Usually patients are normal at birth (due to presence of fetal HgbF) but become symptomatic at 6 months of age.
    - Very ↓ MCV on the exam with a normal TIBC and Ferritin
    - Target cells, small/pale RBCs, basophilic stippling on smear
    - X-rays: skull bossing "hair on end appearance" due to extramedullary hematopoiesis
    - Tx:
      - Minor: none (genetic counseling)
      - Major: periodic blood transfusions, Vit C/folate supplements

<table>
<thead>
<tr>
<th>Iron Deficiency</th>
<th>MCV</th>
<th>RDW</th>
<th>Ferritin</th>
<th>Serum Iron</th>
<th>HGB Electrophoresis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron Deficiency</td>
<td>↓</td>
<td>↑</td>
<td>↓</td>
<td>↓</td>
<td>Adults: normal ratio of HgbA, Q2, F</td>
</tr>
<tr>
<td>α-Thalassemia</td>
<td></td>
<td>Normal</td>
<td>Normal</td>
<td>Normal/↑</td>
<td>↑ RBC count with normal Iron and Iron Stores</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Newborns: normal (trait) ± HgbH or Hgb Barts</td>
</tr>
<tr>
<td>β-Thalassemia</td>
<td></td>
<td>Normal</td>
<td>Normal</td>
<td>Normal/↑</td>
<td>↑ HgbA2, ↑ HgbF, ↑ RBC Count</td>
</tr>
</tbody>
</table>

- Normocytic anemias
  - G6PD
    - X-linked, common in AA, males
    - Hemolysis after acute illness, eating fava beans, or taking certain drugs [antimalarials (primaquine, pamaquine), analgesics, ASA, sulfa drugs]. Avoid triggers.
    - Oxidative stress + AAM + Heinz bodies & bite cells (schistocytes)
    - Episodic acute hemolytic anemia
  - Sickle cell disease
    - Autosomal recessive disorder
    - Disease: HgbSS
    - Trait: HgbS
- Common in AA; confers **protection against malaria**
- **Dactylitis MC 1st presentation** @ 6-9 mo
- **Oclusive crisis**: triggered by cold weather, hypoxia, infection, hydration, ETOH, pregnancy
  - Abrupt onset of pain (**acute chest syndrome, back abdominal and bone pain**)  
- **Sickled cells +/- Howell-Jolly bodies** on peripheral smear or HgbS on electrophoresis
- **Tx:**
  - Pain control: IV hydration + O2 1st step in crisis  
  - Hydroxyuria (reduces frequency of crises), folic acid
- Children need pneu, Hib and meningococcal vaccinations
- **Increased risk of bacterial sepsis**
  - **Hereditary spherocytosis**
    - **Autosomal dominant** intrinsic hemolytic anemia  
    - RBC membrane/cytoskeleton defect \(\rightarrow\) cell fragility
    - Patient will have acute hemolytic events – jaundice, **spleomegaly**, bilirubin cholelithiasis
    - **(+o) osmotic fragility test**
    - ↑ Retic, ↑ LDH, ↓ Haptoglobin, and ↑ Bilirubin (indirect) and presence of spherocytes
    - **Tx:** folic acid, supportive transfusion and **splenectomy** for moderate to severe cases
  - **Autoimmune hemolytic anemia (AIHA)**
    - 2 types
      - **Warm antibody:** IgG Ab
        - **Tx:** responds to **steroids** (1st line)
      - **Cold antibody:** IgM Ab
        - **Tx:** avoid cold exposure
    - A patient with SLE, CLL, prior blood transfusions, organ transplant or bone marrow transplant.
    - **(+o) Direct Coombs Test**
      - ↑ Retic, ↑ LDH, ↓ Haptoglobin, and ↑ Bilirubin (indirect)
  - **Paroxysmal nocturnal hemoglobinuria**
    - Rare, acquired
    - ↑ complement mediated RBC destruction + thrombosis
    - **Dark colored urine** during night or early AM, **venous thrombosis** of large vessels, **pancytopenia**
    - **Dx:** flow cytometry best screening test, coombs (-)
    - **Tx:** eculizumab, prednisone
  - **Anemia of chronic disease**
    - Infection, inflammation, autoimmune disorders
    - ↑ **hepcidin** produced in inflammatory states
    - Normal or ↓ MCV, ↓ TIBC, Normal or ↑ Ferritin
    - ↓ serum erythropoietin levels in anemia of renal failure

**Fatigue**
- Causes: hypothyroidism, **anemia**, depression, OSA, infection, DM, CHF, COPD, cancer, alcoholism, drugs (sedatives, BBs), somatoform disorder

**GI/NUTRITIONAL – 50%**

**Abdominal Pain**
- Numerous causes
- Don’t miss abdominal adhesions w/ postop abdominal pain

**Anorexia**
- Causes: malignancy, GI disorders (**malabsorption**, **pancreatic insufficiency**, **peptic ulcer**), hyperthyroidism, uncontrolled DM, intestinal ischemia, **dysphagia**, psychosocial, drug related (**NSAIDs**, antiepileptics, digoxin, SSRIs)

**Heartburn/Dyspepsia**
- Causes: **GERD MCC, hiatal hernia, gastritis, PUD, dyspepsia, esophagitis**, angina pectoris, **cholelithiasis, esophageal motility disorder**
Nausea/Vomiting
- Causes: infections (Norwalk, rotavirus, food poisoning, Hep A/B, meningitis), acute pancreatitis, cholecystitis, cholelithiasis, NSAIDs, oral abx, mechanical obstruction (GOO, PUD, malignancy, volvulus, adhesions, hernias, chron’s), dysmotility (gastroparesis), peritonitis (appendicitis, perforated viscus), vestibular disorders (labyrinthitis, etc), psychogenic

Jaundice
- Occurs with hyperbilirubinemia (too much bilirubin in blood)
- Bilirubin is formed from hemoglobin break down then carried in the bloodstream to the liver, where it binds with bile moves through the bile ducts into the digestive tract, so that it can be eliminated from the body.
- Most bilirubin is eliminated in stool, but a small amount is eliminated in urine.
- If bilirubin cannot be moved through the liver and bile ducts quickly enough, it builds up in the blood and is deposited in the skin the result is jaundice.
- Serious problems associated with jaundice: ascites, coagulopathy, hepatic encephalopathy, portal HTN
- MCC: hepatitis, alcoholic liver disease, gallstone, toxic reaction to medicine or herb
- Need to do a thorough workup to determine the etiology
- Obstructive jaundice (p 256)
  - Definition: jaundice from obstruction of bile flow to the duodenum
  - US is study of choice
  - Labs: ↑ alk phos, ↑ bili

Hematemesis
- Causes: PUD, esophageal varices, gastritis (NSAIDs, alcohol, stress), Mallory Weiss syndrome, portal hypertensive gastropathy, gastric cancer

Diarrhea
- Acute
  - Onset < 2 weeks
  - Noninflammatory
    - Watery, not bloody
    - Usually mild & self-limiting
    - Need diagnostic evaluation if lasts > 7d
    - NO fecal leukocytes
    - Supportive treatment
  - Inflammatory
    - Fever & bloody diarrhea (dysentery)
    - Usually caused by invasive or toxin producing bacteria
    - All need diagnostic evaluation – stool cx, O&P, c. diff toxin
    - Fecal leukocytes present
    - Supportive treatment unless severe, then treat w/ empiric abx (fluoroquinolones 1st line - ciprofloxacin)
  - General treatment: oral fluids w/ carbs & electrolytes, avoid high-fiber foods/fats/milk/caffeine/alcohol
  - Common causes:
    - Infectious:
      - Raw seafood: vibrio
      - Traveler’s diarrhea: E. coli MCC
      - Rapid onset (several hours after meal): staph aureus
    - Noninfectious: drug rxn (abx – c. diff), ulcerative colitis, chron’s disease, ischemic colitis, fecal impaction, laxative abuse, stress, malabsorption syndrome
- Chronic
  - Onset > 4 weeks
  - Osmotic
    - Malabsorption of nonabsorbable substances accumulation of fluid
    - Decreased diarrhea w/ fasting, increased osmotic gap, increased fecal fat
    - Bacterial overgrowth: whipples disease, tropical sprue
    - Malabsorption abnormalities: celiac sprue, lactose intolerance
o Secretory
  - Normal osmotic gap, large volume, no change in diarrhea w/ fasting
  - Hormonal: serotonin, calcitonin
  - Laxative abuse
o Inflammatory (UC, Chron’s)
o Motility Disorders: IBS, postsurgical
  - Tx options:
    - Opioid agonists: loperamide (Imodium), diphenoxylate/atropine (Lomotil)
    - Bismuth subsalicylate (pepto bismol)
    - Don’t give antimotility drugs to patients w/ invasive diarrhea!
• Protozoan
  o Giardia
    - Sources: contaminated water (boil H2O x 1 minute to kill cysts)
    - Sxs: frothy, greasy, foul diarrhea and malabsorption w/ cramping/bloating
    - Dx: trophozoites/cysts in stool
    - Tx: fluids, metronidazole
  o Amebiasis
    - Sources: Entamoeba histolytica transmitted by fecally contaminated soil/water & feco-oral
    - MC seen in travelers
    - Sxs: GI colitis, dysentery, amebic liver abscess
    - Dx: stool Q&P
    - Tx: fluid replacement, metronidazole
  o Cryptosporidium
    - MCC of chronic diarrhea in patients w/ AIDS
    - Feco-oral transmission
    - No proven treatment
  o Isospora belli
    - MC in homosexual men, patients w/ AIDS
    - Feco-oral transmission
    - Tx: TMP/SMX

Constipation
• Infrequent bowel movements (< 2/week), straining, hard stools, feeling of incomplete evacuation
• MC GI complaint
  - Etiologies: disordered movement of stool through colon/anus/rectum, slow colonic transit, drugs (verapamil, opioids), hirschsprung’s disease
• Post-operative causes: narcotics, immobility
  - Tx: ortho bowel routine (docusate sodium daily, dicacodyl suppository if no bowel movement occurs, fleet enema if suppository is ineffective
• Bristol stool form scale:
  - Type 1: separate hard lumps
  - Type 2: sausage shaped but lumpy
  - Type 3: like a sausage but w/ cracks on surface
  - Type 4: like a sausage or snake, smooth and soft
  - Type 5: soft blobs w/ clear cut edges
  - Type 6: fluffy pieces w/ ragged edges, mushy stool
  - Type 7: watery, no solid pieces, entirely liquid
• Patients who are older than 50 with new onset constipation should be evaluated for colon cancer
• Tx:
  - Increase fiber (20-25 grams per day), exercise and water in diet
  - Bulk-forming laxatives (Citrucel, benefiber) 1st line then osmotic laxatives (miralax, lactulose)

Obstipation
• Definition: severe or complete constipation
• Causes: intussusception, malignancy, chronic constipation, fecal impaction, hernia, intestinal inflammation, polyps, adhesions, medications
Melena
- Definition: black tarry stool
- Causes: upper GI bleed, lower GI bleed
- Iron or bismuth subsalicylate ingestion causes false melena

Hematochezia (12-5)
- Definition: red or maroon-colored stool
- Causes: lower GI bleed, massive upper GI bleed

Esophageal Strictures (p 452)
- GERD MCC
- Ingested agents can cause strictures
  - Oven cleaner, drain cleaner, batteries, sodium hydroxide tablets
  - Dx: EGD to level of injury
  - Tx: NPO + IVF + H2 blocker, corticosteroids or abx
    - DON’T induce emesis
  - Increases risk of SCC → need f/u endoscopies q other year
- Sxs: Solid food dysphagia in pt w/ hx of GERD
- Esophageal web: thin membranes in the mid-upper esophagus
  - May be congenital or acquired
  - Plummer-Vinson - esophageal webs + dysphagia + iron deficiency anemia
- Schatzki ring: diaphragm-like mucosal ring that forms at the esophagogastric junction (the B ring)
  - MC type of esophageal ring
  - MC associated w/ sliding hiatal hernias
  - If the lumen of this ring becomes too small, symptoms occur
- Dx: barium swallow
- Tx: endoscopic dilation

Esophageal Cancer (p 452) (4-10)
- Squamous cell
  - MC worldwide
  - Older patients
  - MC in upper 1/3 of esophagus
- Adenocarcinoma
  - MC in US
  - Younger patients
  - MC in lower 1/3 of esophagus (@ GE junction)
- RF: tobacco, alcohol, GE reflux, barrett’s, radiation
- Sxs: dysphagia from solid foods to liquids along w/ weight loss, reflux and hematemesis
- Dx: upper endoscopy + biopsy
- Tx: esophageal resection, radiation, chemo
- Prognosis typically poor as lymph node mets occur early

Hiatal Hernia (p 145) (4-5)
- Protrusion of upper portion of stomach into chest cavity d/t a diaphragm tear or weakness
- Type I:
  - MC type
  - Sliding hernia
  - Both the stomach and the GE junction herniate into the thorax via the esophageal hiatus
  - Most are asymptomatic; can have reflux, dysphagia, esophagitis
  - Dx: UGI series, manometry, EGD + biopsy for esophagitis
  - Tx: similar to GERD; some require surgery for persistent sxs
    - Surgery: laparoscopic nissen fundoplication → wrap fundus around LES and suture in place
• Type II:
  o Rolling hernia (paraesophageal)
  o Herniation of all or part of the stomach through the esophageal hiatus into the thorax without displacement of the GE junction
  o Complications: hemorrhage, incarceration, obstruction and strangulation
  o Tx: surgical repair b/c of high frequency of complications

PUD (p 45, 173) (5-2)
• 2ry to imbalance of decreased mucosal protective factors (gastric ulcers) & increased damaging factors (duodenal ulcers)
• MCC of upper GI bleeding
• H. pylori MCC, NSAIDs 2nd MCC, Zollinger-Ellison syndrome (refractory PUD)
• Sxs: dyspepsia (worse @ night), GI bleed
• Dx:
  o Endoscopy w/ biopsy gold standard for H. pylori and to r/o cancer
  o Others: urea breath test, H. pylori stool antigen, serologic Ab
• Tx:
  o H. pylori infection:
    ▪ Triple therapy: PPI (ie. Omeprazole) + clarithromycin + amoxicillin
    ▪ Quad therapy: PPI + bismuth subsalicylate + tetracycline + metronidazole
  o H. pylori (-): PPI/H2 blocker
  o Refractory: billroth II
    ▪ Antrectomy w/ gastroduodenostomy

<table>
<thead>
<tr>
<th></th>
<th>Duodenal Ulcers</th>
<th>Gastric Ulcers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Causative Factors</td>
<td>Increase in damaging factors (gastric acid, pepsin, H. pylori)</td>
<td>Decreased mucosal protective factors (↓mucus, bicarb, prostaglandins, NSAIDs)</td>
</tr>
<tr>
<td>Incidence</td>
<td>4x MC, almost always benign MC in duodenal bulb</td>
<td>More common to become malignant MC in antrum of stomach</td>
</tr>
<tr>
<td>Pain</td>
<td>Better w/ meals (duodenal decrease w/ food)</td>
<td>Worse w/ meals</td>
</tr>
<tr>
<td>Age</td>
<td>Younger patients</td>
<td>Older patients</td>
</tr>
</tbody>
</table>

Gastric Cancer (p 185) (5-5)
• Adenocarcinoma is MC worldwide
• MC occurs in males > 40 yo
• RF: H. pylori most important RF, salted/cured/smoked/pickled foods containing nitrates/nitrites
  o Blood type A is associated with gastric cancer
• Patients usually present late in disease
• Sxs: weight loss, early satiety, emesis, abdominal pain/fullness and dyspepsia
• Metastatic signs include
  o Virchow's node (Supraclavicular LN)
  o Sister Mary Joseph's node (Umbilical LN)
• Dx: upper endoscopy w/ biopsy
• Tx: surgical resection w/ wide margins + lymph node dissection +/- radiation & chemo (stage II & III)
  o Antrum of stomach: distal subtotal gastrectomy
  o Midbody/proximal stomach: total gastrectomy
• Poor prognosis

Pyloric Stenosis (p 380) (23-1)
• Diffuse hypertrophy & hyperplasia of pyloric sphincter muscle → outflow obstruction
• Projectile vomiting (nonbilious) occurring shortly after feeding in an infant < 3 mo old with a palpable "olive-like" mass (2cm) at the lateral edge of the RUQ.
• On ultrasound you will see a "double-track" (elongation and thickening of pylorus)
• May have hypochloremic hypokalemic metabolic alkalosis
• Tx: surgery, rehydration
Cholelithiasis (p 257) (7-1)

- **Gallstones** in the gallbladder (NO inflammation)
- **Precursor to cholecystitis**
- Types of stones
  - Cholesterol stones (MC)
  - Pigment stones (black/brown)
- **RF:** 5Fs (fat, fair, female, forty, fertile), OCPs
- **Most are asymptomatic**
- Sxs: episodic, abrupt RUQ/epigastric pain lasting 30 mins – hours; may be associated w/ nausea & precipitated by fatty foods or large meals
- **Dx:** US test of choice
- **Tx:**
  - Asymptomatic: observe, ursodeoxycholic acid
  - Symptomatic: cholecystectomy

Acute Cholecystitis (p 258) (7-2)

- Gallbladder obstruction by gallstone → inflammation of gallbladder
- The 5 F’s: Female, Fat, Forty, Fertile, and Fair
- **E. coli** MCC
- Sxs: unrelenting RUQ pain after high fat meal, right shoulder pain
  - (+) Murphy’s sign (RUQ pain with GB palpation on inspiration)
  - (+) Boas sign (referred pain to right shoulder/subscapular area → phrenic nerve irritation)
- **Dx:**
  - US is the preferred initial imaging: thickened gallbladder wall, distended gallbladder
  - HIDA scan is the best test (Gold Standard)
  - Increased WBCs
- **Tx:** NPO + IV fluids + abx (ceftriaxone + metronidazole) + cholecystectomy

Cholangitis (p 260) (7-3)

- Biliary tract infection 2ry to obstruction (gallstones, malignancy)
- Choledocholithiasis is the MCC
- MC d/t enteric organisms (E. coli MCC)
- **Charcot’s triad:** RUQ tenderness, jaundice, fever
- **Reynold’s pentad:** Charcot’s triad + altered mental status and hypotension
- **Dx:**
  - Labs: leukocytosis, ↑ alk phos w/ ↑ GGT, ↑ bili
  - ERCP gold standard
- **Tx:** ERCP decompression, abx

Choledocholithiasis (p 258) (7-1)

- **Gallstones in the common bile duct**
- Primary: formation of stones originating w/in the common bile duct
- Secondary: passage of gallstones from gallbladder into the common bile duct (MCC)
- Half are asymptomatic; if sxs – have biliary colic w/ RUQ tenderness
- **Dx:**
  - US initial test
  - ERCP diagnostic test of choice
- **Tx:** ERCP stone extraction preferred
- Complications: **acute pancreatitis** or cholangitis

Hepatic Carcinoma (p 243) (9-7)

- Hepatic malignancies are MC 2ry to mets (lung, breasts)
- Primary liver neoplasm = hepatocellular carcinoma
- RF: Cirrhosis, chronic hepatitis (Hep B, Hep C, Hep D), Aflatoxin exposure (from aspergillus)
- Sxs: abdominal pain, weight loss and painful hepatosplenomegaly
- Dx: US, CT scan, MRI
  - Tumor Marker: increased alpha-fetoprotein
- Tx: surgical resection if confined to a lobe & not associated w/ cirrhosis

### Pancreatitis (p 267) (8-2)

#### Acute
- Gallstones & ETOH MCC
- Acinar cell injury \(\rightarrow\) intracellular activation of pancreatic enzymes \(\rightarrow\) autodigestion of pancreas
- Sxs: epigastric pain (constant, boring) that **radiates to back:** pain **exacerbated by sitting/lying down,** relieved by leaning forward; N/V, fever
- PE: Grey Turner's sign (flank bruising), Cullen's sign (bruising near umbilicus)
- Dx:
  - Labs:
    - Leukocytosis, ↑ glucose, ↑ bilirubin, ↑ triglycerides, hypocalcemia
    - Lipase (more specific than amylase)
    - Amylase (> 3x UNL suggestive)
    - ALT ↑ 3-fold suggestive of gallstone pancreatitis
  - CT diagnostic test of choice
- Tx: IV fluids (best), analgesics, bowel rest
  - Abx NOT routinely used!
- Complication: pancreatic pseudocyst (a circumscribed collection of fluid rich in pancreatic enzymes, blood, and necrotic tissue)
- **Ranson's criteria** for poor prognosis:
  - Age > 55
  - Leukocyte: >16,000
  - Glucose: >200
  - LDH: >350
  - AST: >250
  - Calcium: <8.0

#### Chronic
- Chronic inflammation \(\rightarrow\) parenchymal destruction, fibrosis, & calcification \(\rightarrow\) **loss of exocrine** (lipase insufficiency \(\rightarrow\) steatorrhea) & sometimes endocrine (glucose intolerance \(\rightarrow\) diabetes) function
- ETOH abuse MCC in adults
- Cystic fibrosis MCC in children
- **Classic triad:** pancreatic calcification (plain abdominal x-ray), steatorrhea, and diabetes mellitus
- Dx:
  - CT scan has greatest sensitivity
  - Abdominal XR shows calcified pancreas
  - Amylase/lipase usually not elevated b/c of extensive pancreatic tissue loss
- Treatment: no alcohol, low-fat diet, oral pancreatic enzyme replacement

### Pancreatic Pseudocyst (p 273) (8-3)
- Encapsulated collection of pancreatic fluid
- It is a pseudocyst because the wall is formed by inflammatory fibrosis, not epithelial lining
- **RF:** chronic pancreatitis from alcohol > acute pancreatitis
- Sxs: epigastric pain/mass, emesis, mild fever, weight loss
  - Should suspect when a patient w/ acute pancreatitis fails to resolve pain
- Tx: drainage of cyst or observation

### Pancreatic Carcinoma (p 274) (8-5)
- **RF:** smoking, > 60 yo, chronic pancreatitis
- **MC ductal adenocarcinoma** located at head of pancreas
- **Painless jaundice** (from obstruction of common bile duct) is pathognomonic
- Sxs
  - Usually have mets at time of presentation (commonly to regional lymph nodes and liver)
  - Abdominal pain \(\rightarrow\) back pain, pruritis
- Courvoisier's sign: Jaundice and palpable non-tender gallbladder
- Trousseau sign of malignancy: migratory phlebitis
- Virchow's node (or signal node) is a lymph node in the left supraclavicular fossa (the area above the left clavicle) that is associated with pancreatic cancer

**Dx:**
- CT scan test of choice - 75% show tumor at the head of the pancreas, 25% at the tail
- Tumor Marker: CA 19-9
- Increased LFTs, direct bili and alk phos

**Tx:** Whipple procedure (remove antrum of stomach, part of duodenum, head of pancreas, gallbladder) + chemo/radiation
- The duodenum must be removed if the head of the pancreas is removed because they share the same blood supply
- Complications: delayed gastric emptying, anastomotic leak, fistula, wound infection

**Appendicitis (p 199) (6-3)**
- Obstruction of the appendix (MC from fecalith)
- Sxs: epigastric pain → then RLQ pain; N/V
- PE:
  - McBurney’s sign: pain w/ palpation of RLQ
  - Rovsing’s sign: RLQ pain with palpation of the LLQ
  - Obturator sign: RLQ pain upon flexion and internal rotation of right lower extremity
  - Psoas sign: RLQ pain with right hip extension
- Dx: CT scan, US, leukocytosis
- Tx: IVFs + abx + appendectomy

**IBD (p 235) (12-4)**

<table>
<thead>
<tr>
<th>Area Affected</th>
<th>Ulcerative Colitis</th>
<th>Crohn’s Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Limited to colon (begins in rectum and spreads proximally to colon; usually spares anus)</td>
<td>Any segment of the GI tract from mouth to anus</td>
</tr>
<tr>
<td></td>
<td>Rectum always involved</td>
<td>MC in terminal ileum → RLQ pain</td>
</tr>
<tr>
<td></td>
<td>More likely to become cancerous than crohn’s</td>
<td>Usually spares the rectum</td>
</tr>
<tr>
<td>Depth</td>
<td>Mucosa and submucosa only</td>
<td>Transmural</td>
</tr>
<tr>
<td>Clinical Manifestations</td>
<td>Abdominal pain: LLQ, MC, colicky</td>
<td>Abd pain: RLQ, MC, crampy</td>
</tr>
<tr>
<td></td>
<td>Tenesmus, urgency</td>
<td>Weight loss MC w/ crohn’s</td>
</tr>
<tr>
<td></td>
<td>Bloody diarrhea hallmark (stools w/ mucus/pus), hematochezia MC in UC</td>
<td>Diarrhea w/ no visible blood</td>
</tr>
<tr>
<td>Complications</td>
<td>Primary sclerosing cholangitis, colon cancer, toxic megacolon</td>
<td>Perianal disease: fistulas, strictures, abscesses, granulomas, Malabsorption: Fe &amp; B12 deficiency</td>
</tr>
<tr>
<td>Colonoscopy</td>
<td>Uniform inflammation → lead pipe</td>
<td>Skip lesions (normal areas interspersed between inflamed areas)</td>
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<tr>
<td></td>
<td>Noncurative</td>
<td>Noncurative</td>
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</table>

- Tx:
  - Aminosalicylates (mesalamine) → corticosteroids (prednisone) → immune modifying agents (methotrexate)
  - Ulcerative colitis
    - Steroids for flares (budesonide)
    - Infliximab, azathioprine, MTX, mercaptopurine
  - Chron’s
    - Mesalamine, hydrocortisone suppositories 1st line
    - Sulfasalazine 2nd line
    - Methotrexate and metronidazole (flagyl)
Small Bowel Carcinoma (6-12)

- MC in the duodenum or proximal jejunum
- RF: FAP, celiac sprue and Chron’s
- Sxs: depend on location but include bleeding, anemia, obstruction
- Tx: wide local resection, whipple procedure if mass in 1st or 2nd portion of duodenum

Toxic Megacolon

- Nonobstructive, extreme colon dilation > 6cm + signs of systemic toxicity
- Etiologies: ulcerative colitis (MC), Crohn’s, Hirschsprung’s, pseudomembranous colitis, enteritis
- Sxs: fever, abd pain, N/V/D, rectal bleeding tenesmus, electrolyte disorders
- PE: abd tenderness, rigidity, distention, tachycardia
- Dx: KUB shows dilated colon > 6 cm
- Tx: bowel decompression, NPO, broad spectrum abx, electrolyte repletion

Colorectal Carcinoma (p 211) (12-6)

- 3rd MCC of cancer-related death in US
- MCC of large bowel obstruction in adults
- Progression of adenomatous polyp into malignancy (adenocarcinoma)
- MC site of met spread → liver
- RF: FAP MCC, Lynch syndrome, > 50 yo, UC> Crohns, low fiber diet, red/processed meat, smoking
- More likely to be malignant: sessile, > 1 cm, villous
- Less likely to be malignant: Pedunculated, < 1 cm, tubular
- Sxs:
  - Right sided (proximal): lesions bleed
  - Left sided (distal): bowel obstruction, changes in stool diameter
- Dx:
  - Colonoscopy w/ biopsy test of choice
  - Barium enema: apple core lesion
  - Increased CEA
- Screening with colonoscopy begins at 50 then every 10 years until 85
  - Fecal occult blood testing - annually after age 50
  - Flexible sigmoidoscopy - every 5 years with FOB testing
  - Colonoscopy - every 10 years
- If 1st degree relative < 60 yo w/ colon cancer: screening begins @ 40 yo or 10 years before age at diagnosis AND every 5 years thereafter
- Tx:
  - Localized (stage 1-III): resection and adjuvant chemotherapy
  - Stage III and metastatic: chemo

Diverticular Disease (p 218) (12-2)

- Diverticula: outpouchings d/t herniation of mucosa into the wall of the colon along natural openings at the vasa recta of the colon (d/t high intraluminal pressure)
- MC location is the sigmoid colon
- Diverticulosis: uninflamed diverticula, usually asymptomatic
  - Associated w/ low fiber diet, constipation & obesity
  - MCC of acute lower GI bleeding
- Diverticulitis: inflamed diverticula 2ry to obstruction/infection
  - Sxs: constipation, LLQ pain, abd distention, fever, increased WBC, and generally don’t bleed
- Dx: CT (fat stranding and bowel wall thickening)
  - Should NOT perform colonoscopy acutely → need to wait 6 weeks for inflammation to go down to decrease the risk of perforation
- Tx:
  - Diverticulosis: high fiber diet
  - Diverticulitis: Metronidazole and Ciprofloxacin + clear liquid diet
Small Bowel Obstruction (p 193) (6-7)
- RF: post-surgical adhesions MCC, incarcerated hernias 2nd MCC, crohn's disease
- Closed loop (lumen occluded @ 2 points → decreased blood supply → strangulation & necrosis) vs open loop
- Complete (severe obstruction) vs partial
- Distal (presents w/ more abdominal distention) vs partial (presents w/ more vomiting)
- Sxs: vomiting of partially digested food, severe crampy abdominal pain, abd distension, high pitched hyperactive bowel sounds progressing to silent bowel sounds, visible peristalsis
- Dx: KUB shows dilated loops of bowel with air fluid levels with little or no gas in the colon
- Tx:
  - Nonstrangulated: NPO, NG tube placement, IV fluids
  - Strangulated: surgery (laparotomy and lysis of adhesions)

Large Bowel Obstruction (12-6)
- Medical emergency!
- Less common than SBO
- RF: malignancy MCC in US, volvulus MCC in developing world
- Sxs: lack of BM, flatulence, abd distention, N/V, change in caliber of stool
- Dx:
  - CT most sensitive test
  - Contrast enema: birds beak (volvulus) – C/I in peritonitis/perforation!
- Tx: IVFs, surgery

Volvulus (p 188, 220) (12-6)
- Twisting of any part of the bowel @ its mesenteric attachment site
- MC sigmoid colon & cecum
- Sxs: abd pain, distention, nausea, vomiting followed by inability to vomit, fever, tachycardia
- Won’t be able to pass an NGT
- Tx: endoscopic decompression initial tx, surgery 2nd line

Anal Fissures (p 228) (13-3)
- Painful linear tear/crack in distal anal canal
- RF: low fiber diet, constipation, anal trauma
- MC occurs at posterior midline (d/t lower blood flow)
- Sxs: severe painful rectal pain & bowel movements causing patient to refrain from having BM → leads to constipation, bright red blood per rectum
- PE: skin tags seen in chronic
- Tx:
  - Acute: supportive (sitz baths, high fiber diet, stool softeners), topical vasodilators 2nd line (nitroglycerine, nifedipine)
  - Chronic: botox injections or surgery (lateral internal sphincterotomy)

Anal Abscess (p 228) (13-3)
- Results from bacterial infection of anal ducts/glands
- MC staph aureus, e. coli,
- MC in posterior rectal wall
- Sxs: anorectal swelling, rectal pain that is worse w/ sitting, coughing and defecation
- Tx: I&D followed by warm water cleansing, analgesics, sitz baths, & high fiber diet
- 50% will develop a fistula in the 6 months after surgery

Anal Fistula (p 226) (13-3)
- A fistula from the rectum to the perianal skin
- Complication of a rectal abscess but also related to Chron’s disease
- Open tract between two epithelium-lined areas is associated with deeper anorectal abscesses
- Will produce anal discharge and pain when the tract becomes occluded
• Goodsall’s rule: fistulas originating **anterior** to a transverse line through the anus will course **straight** ahead and exit anteriorly whereas those exiting **posteriorly** have a **curved** tract.
• Tx: marsupialization of the fistula tract + wound care (sitz baths, dressing changes)

**Hemorrhoids (p 229) (13-2)**

• **Engorgement of venous plexus** originating from:
  - Superior hemorrhoid vein (**internal** hemorrhoids) proximal to the dentate line
  - Inferior hemorrhoid vein (**external** hemorrhoids) distal to the dentate line
• RF: increased venous pressure, **straining** w/ defecation, pregnancy, prolonged sitting
• Internal
  - Classification:
    - I: does not prolapse
    - II prolapses w/ defecation or straining; spontaneously reduces
    - III: prolapses w/ defecation or straining; requires manual reduction
    - IV: irreducible & may strangulate
  - Sxs: **intermittent rectal bleeding MC (NO pain)**
• External
  - Sxs: **perianal pain aggravated w/ defecation**
• Dx: visual inspection, DRE, FOBT
• Tx:
  - Conservative: high fiber diet, increased fluids, sitz baths, topical steroids, anal hygiene
  - Thrombosed external hemorrhoid: excision
  - Rubber band ligation MC used procedure
  - Hemorrhoidectomy rarely performed now d/t complications (exsanguination, infection, incontinence)

**Hernias (11-1)**

• **Inguinal** (p 140, 377)
  - Protrusion of abd contents through the inguinal canal
  - Indirect vs direct are determined by their relation to the inferior epigastric vessels
  - Direct
    - Protrudes **MEDIAL to the inferior epigastric vessels w/in Hesselbach’s triangle**
    - Does not reach the scrotum
    - RIP:
      - Rectus abdominis: medial
      - Inferior epigastric vessels: lateral
      - Poupart’s ligament: inferiorly
  - Indirect
    - **MC in young children and MC overall type of hernias in men and women**
    - Protrudes at the **internal inguinal ring** and may travel through the external ring and **into the scrotum**
    - Origin of sac is **LATERAL to inferior epigastric artery**
    - Often congenital d/t a **persistent patent process vaginalis**
• **Hiatal**
  - See above
• **Umbilical** (p 380)
  - Hernia through the umbilical ring
  - Very common, **generally is congenital** and appears at birth
  - Many resolve on their own by 2 yo and rarely require intervention
  - Refer to surgery if an umbilical hernia persists >5 yo
• **Femoral** (p 144)
  - Protrusion of contents of abd cavity through femoral canal **below the inguinal ligament** (medial to the femoral vessels)
  - **MC seen in women**
  - Often become strangulated or incarcerated → surgical repair often done
• **Incisional**
  - Often from previous abdominal surgery, obesity
  - Herniation through weakness in abd wall
• **Occur MC w/ vertical incisions and in obese patients**

**Terminology**
- **Incarcerated**: Hernia so occluded that it cannot be returned by manipulation, it may or may not become strangulated.
- **Strangulated**: Hernia becomes strangulated when the blood supply of its contents is seriously impaired.
- **Obstructed**: This is an irreducible hernia containing intestine that is obstructed from without or within, but there is no interference to the blood supply to the bowel.

**Bariatric Surgery (p 188) (5-8)**
- NIH recommends limiting to patients with BMI > 40, or > 35 if obesity complications are present
  - **Obesity** = BMI > 30
  - **Morbid obesity** = BMI > 35
- Medical conditions associated with obesity: sleep apnea, CAD, pulmonary disease, DM, venous stasis ulcers, infections, HTN, cancer (breast, colon)
- Results in significant reduction in deaths from obesity
- **Options**:
  - **Adjustable “lap band”**: laparoscopically placed band around the stomach with a SQ port to adjust constriction
    - Results in a smaller gastric reservoir
  - **Gastric bypass**: staple off small gastric pouch and then Roux-en-Y limb to the gastric pouch
    - Creates a small gastric reservoir → causes dumping sx when a patient eats too much food (food is dumped into the limb) → bypass of small bowel by Roux-en-Y limb
  - **Sleeve gastrectomy**: remove portion of stomach and place a gastric sleeve
- **Complications**:
  - Tachycardia is the MC sign of an anastomotic leak after a gastric bypass
  - **Petersen’s hernia**: internal herniation of small bowel through mesenteric defect from the Roux-en-Y limb

**PULMONOLOGY – 3%**

**SOB**
- Acute causes: asthma, pneumonia, pulmonary edema, pneumothorax, PE, metabolic acidosis, ARDS
- **Pulmonary causes**: asthma, COPD, restrictive lung disease, pneumonia, pneumothorax, PE, ARDS
- Cardiac causes: MI, CHF, valvular obstruction, arrhythmia, cardiac tamponade

**Hemoptysis (p 444)**
- Airway causes: bronchitis (MCC), bronchiectasis, bronchogenic carcinoma
- Pulmonary vasculature causes: LV failure, mitral stenosis, PE
- Pulmonary parenchyma causes: pneumonia, abscess, TB, aspergilloma, parasites, goodpasture’s syndrome, wegener’s granulomatosis, SLE
- Workup: CXR, bronchoscopy, CT arteriogram

**Weight Loss/Fatigue**
- Causes: depression, TB, hepatitis, cancer, alcoholism, uncontrolled DM, GI disorders (malabsorption, pancreatic insufficiency, peptic ulcer), hyperthyroidism, hypercalcemia, CHF, adrenal insufficiency

**Lung Carcinoma (p 440) (16-1)**
- **MCC of cancer deaths in men & women**
- **Cigarette smoking MCC**
- **METS to**: brain, bone, liver, lymph nodes & adrenals
- Right lobe > left lobe; upper lobes > lower lobes
- **Small Cell**
  - Smokers
  - Location: **central**
  - Usually mets at presentation
  - SIADH/hyponatremia MC w/ small cell
  - Very aggressive, does not respond well to surgery
  - Respond very well to chemo
• Non-Small Cell (MC)
  o Adenocarcinoma (MC)
    ▪ MC type in smokers, women & nonsmokers
    ▪ Location: peripheral
    ▪ Arises from mucus glands
    ▪ Tends to metastasize to distant areas and grows quickly
    ▪ Paraneoplastic syndrome: thrombophlebitis
  o Squamous cell
    ▪ Location: central
    ▪ Bronchial in origin
    ▪ May cause hemoptysis
    ▪ Associated w/ cavitary lesions, hypercalcemia, Pancoast syndrome
    ▪ Slow growth and late mets
    ▪ Elevated PTHrp
  o Large cell
    ▪ Rare
    ▪ Location: peripheral
    ▪ Paraneoplastic syndrome: gynecomastia
    ▪ Fast doubling rates
    ▪ Responds well to surgery
  • Sxs: asymptomatic, change in chronic cough, hemoptysis, CP, dyspnea, hoarseness, finger clubbing, anorexia, wt loss
  • Associated manifestations:
    o More likely to cause paraneoplastic syndromes such as hypercalcemia, SIADH, ectopic ACTH secretion, Lambert-Eaton myasthenic syndrome, and hypercoagulable states
    o SVC syndrome (facial/arm edema and swollen chest wall veins)
    o Pancoast tumor (tumor @ apex of lung → shoulder pain, Horner’s syndrome, brachial plexus compression)
    o Horner’s syndrome (unilateral miosis, ptosis and anhidrosis)
    o Carcinoid syndrome (flushing, diarrhea and telangiectasia)
  • Dx:
    o CXR & CT scan
    o Sputum cytology: for central lesions
    o Bronchoscopy: for central lesions
    o Needle biopsy: for peripheral lesions
  • Tx:
    o Non-small cell: surgical resection tx of choice (esp if localized to the chest)
    o Small cell: chemo tx of choice

Pleural Effusion (p 439)
  • Abnormal accumulation of fluid in the pleural space
    o Empyema: purulent/turbulent effusion
    o Parapneumonic: noninfected pleural effusion
    o Hemothorax: blood
    o Chylothorax: lymph
  • Exudate: (local pleural disease):
    oOccurs when local factors increase vascular permeability (infection/inflammation)
    o Contains: plasma proteins, WBCs, platelets, RBCs
  • Transudate:
    o Circulatory system fluid d/t either ↑ hydrostatic pressure or ↓ oncotic pressure
    o CHF MCC, nephrotic syndrome, cirrhosis
  • Usually asymptomatic
  • Sxs: dyspnea, pleuritic CP
  • PE: ↓ tactile fremitus, dullness to percussion and ↓ breath sounds over the effusion
  • Dx:
    o Lateral decubitus x-ray and upright films: blunting of costophrenic angle, mediastinal shift away from effusion
Thoracentesis test of choice

- Light’s criteria:
  - Exudate (any of the following):
    - ↑ protein ratio (> 0.5)
    - ↑ LDH (> 0.6)
    - Pleural fluid LDH > 2/3 upper limited of normal LDH
  - CT scan: confirm empyema

- Tx: thoracentesis gold standard
  - Don’t remove > 1.5 L during any one procedure
  - Chest tube pleural fluid drainage: if empyema (described below)
    - Pleural fluid pH < 7.2
    - Glucose < 40mg/dL
    - + gram stain of pleural fluid

Pneumothorax (p 439) (16-6)

- Air in the pleural space
- Increasingly positive pleural pressure causes collapse of the lung
- Spontaneous:
  - Primary: NO underlying lung disease
    - Tall thin males 10-30 years old who smoke
  - Secondary: underlying lung disease w/o trauma (COPD, asthma)
- Traumatic:
  - Iatrogenic: CPR, thoracentesis, PEEP, subclavian line placement
- Tension:
  - Penetrating injury, MC seen during trauma
  - Positive air pressure pushes lungs, trachea, great vessels & heart to the contralateral side
  - Life threatening
  - PE: tracheal shift to contralateral side, JVP, pulsus paradoxus, hypotension
- Open: sucking chest wound
- Sxs: CP – pleuritic, unilateral, nonexertional and sudden in onset; dyspnea
- PE: ↑ hyperresonance to percussion, ↓ fremitus, ↓ breath sounds
- Dx: CXR w/ expiratory view shows ↓ peripheral lung markings; tension pneumo is a clinical dx
- Tx:
  - Small, primary, spontaneous: observe x 6 hours then repeat CXR
    - Often resolves spontaneously w/in 10 days
  - Large/severe sx: chest tube
  - Tension: needle aspiration (2nd ICS @ MCL) followed by chest tube placement

Pneumonia (post-op) (1-17)

- RF: intubation/extubation, impaired consciousness, dysphagia, Trendelenburg position, emergent intubation on a full stomach
- Patients will present with fever, dyspnea, tachycardia, tachypnea, cough +/- sputum
- Typical: lobar pneumonia, sudden onset of fever, productive cough, rigors, tachycardia, tachypnea
  - S. Pneumoniae:
    - Rust colored sputum, common in patients with splenectomy
    - MCC of community acquired pneumonia
  - S. Aureus:
    - Salmon colored sputum, lobar, after influenza, MRSA treat with vancomycin
  - Pseudomonas:
    - Ventilators, Cystic fibrosis, patients become sick fast - treat with 2 antibiotics
    - Immunocompromised
    - MC in hospital acquired pneumonia
    - Green sputum
  - Klebsiella:
    - Alcohol abuse, currant jelly sputum, aspiration, cavitory lesions
• Haemophilus influenzae:
  ▪ **Smokers, post splenectomy, COPD, cystic fibrosis**
  ▪ 2nd MCC of CAP
• **Atypical:** diffuse patchy interstitial or reticulonodular infiltrates; low grade fever, dry cough, extrapulmonary sxs (myalgias, malaise, ST, HA, N/V/D)
  o Legionella:
    ▪ **Air conditioning**, aerosolized **water**, low NA+ (hyponatremia), **GI sxs** (diarrhea) & high fever
    ▪ No person-person transmission
  o Mycoplasma:
    ▪ **Young people** living in dorms, (+) cold agglutinins, bullous myringitis, walking pneumonia, low temp
    ▪ **MCC of atypical pneumonia**
  o Chlamydia pneumoniae:
    ▪ **College kids, sore throat**, long prodrome
  o Viruses
    ▪ **Anaerobes (aspiration pnemo)**
      o **Fetid sputum,** pulmonary abscess & empyema, MC in R lower lobe
      o Sxs: resp failure, chest pain, increased sputum production, fever, cough, mental status changes, tachycardia, cyanosis
      o Dx: infiltrate on CXR
      o Tx: bronchoscopy + abx if pneumonia develops + intubation if resp failure occurs + PEEP if ARDS develops
      o Prophylactic abx are NOT indicated for prophylaxis in aspiration pneumonia
  • **Dx:** CXR/CT scan, sputum cx
  ▪ Lobar pneumonia: suggests strep pneumo, H flu, Legionella
  ▪ Patchy infiltrates in multiple lung areas (bronchopneumonia): suggests staph aureus, gram negs, atypicals, viruses
  ▪ Fine dense granular infiltrates (interstitial pneumonia): suggests influenza, CMV, PCP
  ▪ Lung abscess: suggests anaerobes
  ▪ Nodular lesions: suggests fungal
• **Tx:**
  ▪ **CAP (outpatient):** macrolide or doxy 1st line; fluoroquin use if comorbid condition/recent abx use
  ▪ **CAP (inpatient):** B lactam + macrolide OR broad spectrum fluoroquin
  ▪ **HAP:** anti-pseudomonal (B lactam + fluoroquin)
  ▪ **Aspiration:** clindamycin or metronidazole or augmentin

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<td>Decreased</td>
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<tr>
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<td>HYPERRESONANCE</td>
<td>Decreased</td>
<td>Decreased</td>
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NEUROLOGY/NEUROSURGERY – 5%

**Change in Vision**
• Acute unilateral causes:
  o Transient: CRVO, retinal detachment, thromboembolism, uveitis
  o Persistent: acute angle closure glaucoma, CRAO, CRVO, retinal detachment, optic neuritis
• Acute bilateral causes:
  o Transient: migraine aura, CHF, hypertensive emergency, carotid artery stenosis, TIA
  o Persistent: occipital lobe ischemia, temporal arteritis, lymphoma, posterior ischemic neuropathy

**Change in Speech**
• Causes: ALS, brain injury, brain tumor, CP, Guillain-Barre, Huntington’s, lyme, MS, myasthenia gravis, parkinson’s, stroke

**Motor/Sensory Loss**
• Causes: TIA, stroke, traumatic brain injury, neuropathy, spinal cord lesions, brainstem lesions, brain aneurysm
Vascular Disorders

- **Carotid Stenosis (p 359) (14-1)**
  - **Sxs:** amaurosis fugax (temporary monocular blindness), TIA, CVA
  - **Dx:** carotid US/doppler, arteriogram gold standard
  - **Tx:**
    - When? Stenosis > 70% in asymptomatic patients or > 50% in symptomatic patients
    - Carotid endarterectomy → removal of diseased intima and media of the carotid artery
    - 1% risk of stroke during procedure
    - Complications: CVA, MI, hematoma, wound infection, hemorrhage, thrombosis, vagus or hypoglossal nerve injury
    - Give ASA postoperatively
    - MI is MCC of death in postop period

- **TIA (p 359)**
  - **An episode of neurologic dysfunction** due to focal brain, retinal, or spinal cord ischemia without acute infarction.
  - **Large artery low flow TIA** (stenosis) likely carotid stenosis of ICA or MCA causing short lived (minutes) decrease in flow to the brain
  - **Embolic TIA:** emboli often form elsewhere in body such as in the heart (a fib) (septic emboli from endocarditis)
  - **Sxs:**
    - Internal carotid artery: amaurosis fugax (monocular vision loss), weakness in the contralateral hand
    - ICA/MCA/ACA: cerebral hemisphere dysfunction; sudden headache, speech changes, confusion
    - PCA: somatosensory deficit
    - Vertebrobasilar: brainstem/cerebral symptoms (gait and proprioception)
  - **Dx:** CT w/o contrast, MRI more sensitive, carotid doppler to look for stenosis, CTA, MRA
  - **Tx:**
    - Carotid endarterectomy if large artery (internal or common carotid artery) & stenosis is > 70%
    - Aspirin within 24 hours → antiplatelet therapy (e.g., aspirin or clopidogrel or aspirin-dipyridamole) should be then initiated → antihypertensive and statin therapy initiated as well

- **Stroke (p 359)**
  - **Acute onset of focal neurologic deficits** resulting from - diminished blood flow (ischemic stroke) or hemorrhage (hemorrhagic stroke)
  - **Contralateral** paralysis, motor function.
  - **Right-sided symptoms = left side stroke; Left-sided symptoms = right side stroke.**
  - **Carotid/Ophthalmic:** Amaurosis fugax (monocular blind).
  - **MCA (MC):** Aphasia, neglect, hemiparesis, gaze preference, homonymous hemianopsia.
  - **ACA:** Leg paresis, hemiplegia, urinary incontinence.
  - **PCA:** homonymous hemianopsia.
  - **Basilar Artery:** Coma, cranial nerve palsies, apnea, drop attach, vertigo.
  - **Lacunar infarcts** occur in areas supplied by small perforating vessels and result from atherosclerosis, HTN, and diabetes: Silent, pure motor or sensory stroke. “Dysarthria-Clumsy hand syndrome”, ataxic hemiparesis.
  - **Dx:** CT without contrast for acute presentation
  - **Tx:**
    - For occlusive disease treat with IV tPA if within 3-4.5 hours of symptom onset
    - For embolic disease and hypercoagulable states give warfarin/aspirin once the hemorrhagic stroke has been ruled out
    - Endarterectomy if carotid > 70% occluded

Subarachnoid Hemorrhage (p 523)

- **Risks:** HTN & smoking MCC, ruptured berry aneurysm
- **Thunderclap HA, worst HA ever:** severe, acute onset reaching max intensity in minutes
- **N/V, altered mental status, photophobia, nuchal rigidity or sxs of ischemic stroke**
- **Subhyaloid retinal hemorrhage pathognomonic** (in absence of blunt trauma)
- **May have brief LOC, seizures**
- **May have a “warning leak” several days prior**
- **Dx:** non-contrast CT, LP if CT normal and strong suspicion (CSF shows elevated opening pressure, xanthochromia, elevated RBC count)
- **Tx:** control BP w/ CCB (systolic < 160), monitor GCS, admit to hospital
Epidural Hematoma (p 516) (3-2)
- Collection of blood between the skull and dura
- Transient LOC from an injury, period of lucency, then neurologic deterioration
- CT: lens-shaped, biconvex

Subdural Hematoma (p 517) (3-2)
- Blood collection under the dura
- Elderly patient with a history of multiple falls who is now presenting with neurological symptoms
- May be chronic, taking days to weeks to develop symptoms
- CT scan: Crescent shaped density in the brain

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<td><strong>LOCATION</strong></td>
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<tr>
<td>Arterial bleed MC between skull and dura (dural vessels)</td>
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<td><strong>MECHANISM</strong></td>
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<tr>
<td>MC after temporal bone fx (skull fx) → middle meningeal artery disruption</td>
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<tr>
<td><strong>CLINICAL MANIFESTATIONS</strong></td>
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<tr>
<td>Varies. Brief LOC → coma; HA, N/V, focal neuro sx, rhinorrhea (CSF fluid)</td>
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<tr>
<td><strong>DIAGNOSIS</strong></td>
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<tr>
<td>CT: convex/lenticular (lens shaped) bleed</td>
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<td><strong>MANAGEMENT</strong></td>
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<td>Observation if small</td>
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<td>If ↑ ICP: mannitol, hyperventilation, head elevation, shunt</td>
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<td><strong>Subdural Hematoma</strong> (Hemorrhage)</td>
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<tr>
<td>Venous bleed MC btw dura &amp; arachnoids d/t tearing of cortical bridging veins</td>
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<td><strong>MECHANISM</strong></td>
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<td>MC blunt trauma → causes bleeding on other side of injury (contra-coup)</td>
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<td>May have focal neuro sx</td>
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<td>CT: concave (crescent shaped) bleed</td>
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<td>Hematoma evacuation (if massive or &gt;/= 5mm midline shift) vs supportive</td>
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<td><strong>Subarachnoid Hemorrhage</strong> (SAH)</td>
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</tr>
<tr>
<td>Arterial bleed between arachnoid &amp; pia. Blood in fissures, ventricles, cisterns</td>
</tr>
<tr>
<td><strong>MECHANISM</strong></td>
</tr>
<tr>
<td>MC Berry aneurysm rupture, AVM</td>
</tr>
<tr>
<td><strong>CLINICAL MANIFESTATIONS</strong></td>
</tr>
<tr>
<td>Thunderclap sudden HA; N/V, meningeal sx (stiff neck, photophobia, delirium)</td>
</tr>
<tr>
<td>No focal neuro deficits</td>
</tr>
<tr>
<td><strong>DIAGNOSIS</strong></td>
</tr>
<tr>
<td>CT performed 1st, if neg → LP: xanthochromia, ↑ CSF pressure</td>
</tr>
<tr>
<td><strong>MANAGEMENT</strong></td>
</tr>
<tr>
<td>Supportive (bed rest, stool softeners, lower ICP)</td>
</tr>
<tr>
<td>+/- lower BP gradually (nicardipine)</td>
</tr>
<tr>
<td><strong>Intracerebral Hemorrhage</strong> (ICH)</td>
</tr>
<tr>
<td><strong>LOCATION</strong></td>
</tr>
<tr>
<td>Intraparenchymal from tearing of subependymal veins</td>
</tr>
<tr>
<td><strong>MECHANISM</strong></td>
</tr>
<tr>
<td>HTN, AVM, trauma, arteriovenous malformation</td>
</tr>
<tr>
<td><strong>CLINICAL MANIFESTATIONS</strong></td>
</tr>
<tr>
<td>HA, N/V, +/- LOC</td>
</tr>
<tr>
<td>Hemiplegia, hemiparesis</td>
</tr>
<tr>
<td><strong>DIAGNOSIS</strong></td>
</tr>
<tr>
<td>CT: intraparenchymal bleed</td>
</tr>
<tr>
<td>Do not perform LP if suspected b/c it may cause brain herniation</td>
</tr>
<tr>
<td><strong>MANAGEMENT</strong></td>
</tr>
<tr>
<td>Supportive: gradual BP reduction</td>
</tr>
<tr>
<td>+/- IV mannitol if ↑ ICP</td>
</tr>
<tr>
<td>+/- hematoma evacuation if mass effect</td>
</tr>
</tbody>
</table>

**UROLOGY/RENAL – 5%**

**Edema**
- LE edema causes: cirrhosis, low albumin (nephrotic syndrome, malnutrition), cellulitis, cardiovascular (CHF, pericardial effusion, valve disorders, venous insufficiency), drugs (CCBs, NSAIDs, thiazolidinediones), lymphatic obstruction

**Orthostatic Hypotension**
- Drop of > 20 mm Hg systolic, 10 mmHg diastolic, or both 2-5 minutes after change from supine to standing
- Supportive treatment: d/c HTN meds, increase fluids/salts, support stockings, avoid large meals, stand up slowly
Urinary Retention

- Causes: obstruction (stones, urethral stricture, mass, constipation, BPH, prostate cancer), medications (amphetamines, antihistamines, NSAIDs, antipsychotics), MS, parkinson’s, post-op related, paraphimosis, phimosis, cystitis, urethritis

Dysuria

- Causes: cystitis, urethritis, pyelonephritis, vaginitis, epididymitis, balanitis, prostatitis, interstitial cystitis, urethral syndrome, genital herpes, atrophic vaginitis, reactive arthritis

Fluid/Electrolyte Disorders

- See preop/postop care section

Acid/Base Disorders

- See preop/postop care section

Testicular Carcinoma (p 535) (25-3)

- **MC solid tumor in young men** 15-40 yo
- RF: cryptorchidism, caucasian
- **MC occurs on right side**
- **Germinal cell tumors** MC
  - Usually malignant
  - Seminoma
- **Nongerminal cell tumors**
  - Leydig & sertoli cell tumors
- Sxs: PAINLESS, firm testicular nodule, solid mass or enlargement
- Usually presents **unilaterally**
- Signs of mets: cough, GI, back pain, neuro signs, supraclavicular lymphadenopathy
- Dx: scrotal US, excisional biopsy, AFP (elevation r/o seminoma), b-HCG (may be elevated)
- Tx:
  - **Inguinal orchiectomy** with f/u of tumor markers
  - May need chemo or radiation
    - Stage I/II → radiation
    - Stage III → chemo
- **Prognosis:** high survival rate if caught early

Wilms Tumor (p 397) (23-14)

- Rare embryonal tumor of renal origin
- **Nephroblastoma** MC in children w/in 1st 5 years of life
- Associated with Beckwith-Wiedemann syndrome (umbilical defect, macroglossia, gigantism, visceromegaly)
- **MC abdominal malignancy in children**
- Child w/ PAINLESS, palpable unilateral abdominal mass w/ no other signs/sxs; commonly found during dressing or bathing
- Dx: US best initial test, CT w/ contrast
- Tx: nephrectomy + chemotherapy
- Lung MC site for mets

Bladder Cancer (p 531) (25-2)

- **Transitional cell carcinoma** MC type
- RF: smoking MC, dyes, age > 40, white males, meds (cyclophosphamide, pioglitazone)
- Sxs: PAINLESS gross or microscopic hematuria, urinary frequency/urgency, may be asymptomatic
- Dx: cystoscopy w/ biopsy
- Histology
  - Benign
    - Low-Grade Intraurothelial Neoplasia
    - Urothelial Papilloma & Inverted Papilloma → can have malignant potential
Malignant

- Carcinoma In Situ
- Squamous Cell Carcinoma
  - More common in areas of the world with schistosomal infections
  - Aggressive
- Adenocarcinoma
  - Aggressive
- Small Cell Carcinoma
  - Neuroendocrine in origin
  - Aggressive clinical course with poor prognosis
- Metastatic Disease
  - Commonly from the colon or rectum, prostate, or cervix
- Invasive Urothelial Cell Carcinoma
  - AKA transitional cell carcinoma
  - MC form of bladder cancer in US

- Tx: **most present early and respond well to treatment**
  - Localized/superficial: transurethral resection
  - Invasive disease: radical cystectomy (bladder, prostate, uterus, ovaries, anterior vaginal wall)
  - Recurrent bladder CA: BCG vaccine intravesicular (bacillus Calmette-Guerin)
- Prognosis: early disease >80% survival

Renal Cell Carcinoma (p 530) (25-2)

- Tumor of proximal convoluted renal tubule cells
- Characterized by lack of warning signs, variable presentations & resistance to chemo/XRT
- MC type of tumor originating in the kidney (95%)
- RF: male sex, tobacco, von Hippel-Lindau, PCKD
- Renal clear cell carcinoma MC type
- Most are asymptomatic and found incidentally on imaging study
- Classic triad: flank pain, hematuria, painless abdominal/renal mass
- Other sxs: L-sided varicocele, HTN, hypercalcemia
- Dx: CT scan
- Tx: radical nephrectomy (kidney and adrenal glands)
  - For metastatic spread: alpha-interferon
- Prognosis:
  - Good for cancers confined to renal capsule
  - 50-60% for tumors extending beyond capsule
  - 0-15% for node positive tumors

Chronic Renal Failure (shunts/access for dialysis)

- Shunt: artificially formed link between an artery and vein using a synthetic tube
- Arteriovenous (AV) Fistula: connection between patient’s own artery and vein
  - Preferred access for hemodialysis
- Central Venous Catheter: y shaped tube is threaded into a central vein (i.e. internal jugular, subclavian)

Renal Vascular Disease

1. Renal Artery Stenosis (p 363)
   - Narrowing of one or both renal arteries → decreased perfusion → activation of RAAS
   - MCC atherosclerosis or fibromuscular dysplasia
   - AKI after starting an ACEI
   - Sxs: Refractory HTN, new onset HTN in elderly patient
   - PE: May hear renal artery bruit
   - Dx: Renal angiography GOLD STANDARD → beads on a string
   - Tx: vascular procedures do not provide better outcomes than medical management; stenting improves outcome
   - ACEI contraindicated in patients w/ HTN from renovascular stenosis
2. **Nephrosclerosis**
   - MC chronic intrinsic renal vascular disease
     - Initially affects blood vessels, although eventually damages glomeruli and tubulointerstitium
     - Vascular, glomerular, and tubulointerstitial lesions develop w/ scarring
     - History of long standing HTN w/ retinopathy
   - Tx: control HTN

3. **Cholesterol Atheroembolic Kidney Disease**
   - Often d/t cholesterol crystals that break off atherosclerotic vascular plaques
   - MC after angiographic procedures (1-14 days later)
   - MC in males w/ hx of DM, HTN, and ischemic cardiac disease
   - Strongly associated w/ aortic aneurysm disease and renal artery stenosis
   - Sxs: fever, abdominal pain, wt loss, localized toe gangrene
   - Dx:
     - Transient eosinophilia, high sed rate, hypocomplementemia
     - May be diagnosis of exclusion
     - Kidney biopsy to confirm disease → microvessel occlusion w/ cholesterol crystals that leave a cleft in the vessel
   - Tx: none effective

---

**Nephrolithiasis (p 539) (25-3)**

- RF: decreased fluid intake MCC, M>F, meds (diuretics, antacids, chemo), gout, hypercalcemia, UTI
- 4 types:
  - Calcium oxalate MC stone (MC in men, seen in IBD)
  - Struvite stones (MC in women, seen with UTIs)
  - Uric acid (not seen on abdominal XR)
  - Cysteine
- Urine citrate – natural inhibitor of stones!
- Sxs: **flank pain radiating to groin, hematuria, CVA tenderness**
  - Proximal ureter → flank, CVA tenderness
  - Midureter → midabdominal
  - Distal ureter → groin pain
- Dx:
  - UA: microscopic or gross hematuria
    - pH < 5.5 = acid stones
    - pH > 6.5 = calcium stones
  - KUB: most are radiopaque
  - **Noncontrast CT MC initial test ordered**
- Tx: a-blockers (tamsulosin) or CCB (nifedipine) increase stone passage
  - Low probability of stone passage if > 6mm
  - Stones < 1.5 cm → shock wave lithotripsy
    - C/I in bleeding disorders and pregnancy
  - Stones > 1.5 cm (or staghorn/struvite) → percutaneous nephrolithotomy

---

**ENDOCRINOLOGY – 8%**

**Tremors**
- Causes: anxiety, essential tremor, parkinson’s, **hyperthyroidism**, hepatic encephalopathy, cerebellar tumor, wilson’s disease, drugs (caffeine, alcohol withdrawal, antipsychotics, lithium, metoclopramide, levothyroxine, TCAs)

**Fatigue**
- Causes: **hypothyroidism**, anemia, depression, OSA, infection, DM, CHF, COPD, cancer, alcoholism, drugs (sedatives, BBs), somatoform disorder

**Palpitations**
- Causes: arrhythmia, valvular regurg, exercise-induced, **thyrotoxicosis**, anemia, anxiety
Heat/Cold Intolerance
- Heat intolerance causes: anxiety, menopause, thyrotoxicosis, drugs (caffeine, amphetamines)
- Cold intolerance causes: hypothyroidism, raynaud’s, anorexia nervosa, pituitary neoplasm or dysfunction, SLE

Hyperparathyroidism (p 322) (18-5)
- All w/ ↑ PTH
- Primary: ↑ PTH caused by a PTH secreting parathyroid ADENOMA (MC than secondary)
  - Associated w/ patients taking lithium
- Secondary: ↑ PTH by a physiologic response to hypocalcemia or vit D deficiency
  - CKD MCC
- Sxs: Bones, stones, abdominal groans and psychiatric overtones (osteoarthritis, renal calculi, bone pain, GI sxs, depression, psychosis, fatigue)
- Labs: ↑ serum Ca, ↑ PTH, ↓ phosphate, hypercalciuria & hyperphosphaturia
- Tx:
  - Primary: IVFs, furosemide, remove adenoma
  - Secondary: supplement w/ Vit D & Calcium

Hyperthyroidism (p 318) (18-1)
- MCC graves disease (autoimmune against TSH receptor)
  - Diffuse goiter w/ a bruit, exophthalmos/proptosis, pretibial myxedema
  - Diffusely high radioactive iodine uptake
  - Only T3 elevated
  - Anti-thyrotropin antibodies
  - Tx: radioactive iodine MC therapy
- Thyroid storm if untreated → fever, tachycardia, delirium, a fib, N/V, psychosis
- Sxs: weight loss, anxiety, tachycardia, proptosis, heat intolerance, hyperreflexia, goiter
- Can have resting tremor or atrial fibrillation
- Dx:
  - Primary: ↓TSH, ↑ Free T4 and T3
  - Secondary: ↑ TSH and ↑ Free T4
- Tx: methimazole or PTU (drugs are hepatotoxic), radioactive iodine definitive (C/I in pregnancy), surgery, BBs
  - Use PTU in 1st trimester of pregnancy, methimazole in 2nd and 3rd trimesters

<table>
<thead>
<tr>
<th>TSH Result</th>
<th>Subsequent FT4 Result</th>
<th>Possible Diagnoses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal TSH</td>
<td></td>
<td>No further testing needed</td>
</tr>
<tr>
<td>↑ TSH (&gt; 5.0 mU/L)</td>
<td>↓ FT4</td>
<td>Primary hypothyroidism</td>
</tr>
<tr>
<td></td>
<td>Normal FT4</td>
<td>Subclinical hypothyroidism</td>
</tr>
<tr>
<td></td>
<td>↑ FT4</td>
<td>TSH-mediated hyperthyroidism</td>
</tr>
<tr>
<td>↓ TSH (&lt; 0.10 mU/L)</td>
<td>↓ FT4</td>
<td>2ry/3ry hypothyroidism</td>
</tr>
<tr>
<td></td>
<td>Normal FT4</td>
<td>If present, usually pituitary</td>
</tr>
<tr>
<td></td>
<td>↑ FT4</td>
<td>Subclinical hyperthyroidism</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Primary hyperthyroidism, thyrotoxicosis</td>
</tr>
</tbody>
</table>

Thyroid Nodules/Carcinoma (p 312, 314) (18-1)
- MCC is radiation exposure
- Papillary MC (Papillary is Popular)
- Young females (40-60yo)
- Roughly 5% of thyroid nodules are malignant
- May feel palpable thyroid nodule/mass (if > 1 cm), but most are euthyroid
- Papillary & follicular are well differentiated w/ better prognosis
- Thyroid adenoma is MC benign nodule
- Not associated with hypo/hyperthyroidism
- Characteristics suggesting malignancy: age < 20 or > 70, solid or complex, cold nodules, single nodule, nodule that grows with TSH replacement, hoarseness or obstruction symptoms, hx of neck or head radiation
• Dx: **US best initial test** → biopsy lesion > 1 cm → thyroid uptake scan
  - Cancerous will not take up iodine (cold nodule – lesion doesn’t make hormone)
  - Non-cancerous will take up hormone (hot nodule – lesion does make hormone)
  - **COLD = CANCER**: need fine needle aspiration
• Tx:
  - Follow low-risk nodules every 6 months with palpation and US
  - Surgical removal if concern for malignancy
• Surgical complications: recurrent laryngeal nerve damage, parathyroid damage

<table>
<thead>
<tr>
<th>THYROID CARCINOMA</th>
<th>Papillary</th>
<th>Follicular</th>
<th>Medullary</th>
<th>Anaplastic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>80% (MC)</td>
<td>10%</td>
<td>10%</td>
<td>&lt; 5%</td>
</tr>
<tr>
<td>Risk Factors</td>
<td>MC after radiation exposure</td>
<td>Increased with iodine deficiency</td>
<td><strong>MC associated w/ MEN2</strong> Not associated w/ radiation exposure</td>
<td>May occur many years after radiation exposure</td>
</tr>
<tr>
<td>Age</td>
<td>MC in young females</td>
<td>MC 40-60</td>
<td>MC 40-60</td>
<td>NC in males &gt;65y</td>
</tr>
<tr>
<td>Characteristics</td>
<td>Least aggressive</td>
<td>More aggressive</td>
<td>More aggressive</td>
<td>Most aggressive Rapid growth</td>
</tr>
<tr>
<td>METS</td>
<td>Local</td>
<td>Distant</td>
<td>Local early and distant late</td>
<td>Local &amp; distant May involve trachea</td>
</tr>
<tr>
<td>Prognosis</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Poorer Don’t take up iodine</td>
<td>Poor prognosis</td>
</tr>
<tr>
<td>Treatment</td>
<td>Subtotal/total thyroidectomy</td>
<td>Total thyroidectomy</td>
<td>Most are not responsive to surgery</td>
<td></td>
</tr>
</tbody>
</table>

**Adrenal Tumors (p 296) (18-11)**
- Usually discovered incidentally
- 25% hormonally active (cortisol or aldosterone producing adrenocortical adenoma or pheochromocytoma)
- 95% are unilateral adrenocortical adenomas (benign) and endocrine inactive (silent)
- 5% are primary adrenocortical carcinomas
  - ~50% are non-functioning; the rest can secrete hormones
  - Rare, most present w/ stage 3/4 of disease
  - Sxs:
    - Adults present w/ Cushing’s syndrome or mixed Cushing’s and virilization
    - Children present w/ virilization
  - Tx: require **total excision** (no FNA biopsy)
- MC malignant adrenal mass is metastasis from another solid tissue tumor

**Pheochromocytoma (p 297) (18-16)**
- Catecholamine secreting adrenal tumor of the medulla (chromaffin cells) - secretes norepinephrine and epinephrine autonomously and intermittently
- 10% tumor, 10% bilateral, 10% malignant, 10% in peds, 10% extraadrenal & 10% familial
- May be **associated w/ MEN 2**
- Sxs: 2ry HTN, Palpitations, Headaches, Excessive sweating (“PHE”)
- Dx:
  - ↑ 24-hour catecholamines including metabolites - ↑ metanephrine and ↑ vanillylmandelic acid (VMA)
  - MRI or CT of abdomen to visualize tumor
- Tx:
  - Medical: a-blockers (phenoxybenzamine → increases intravascular volume → vasoconstriction → volume depletion)
  - Surgical: **resect tumor** - complete adrenalectomy
Pain

- Breast pain causes: PMS, cyclic mastalgia, fibrocystic disease, pregnancy, breast feeding, breast abscess, menopause, breast cancer, fibroadenoma, trauma, estrogen replacement therapy, shingles, gynecomastia
- Pelvic pain causes:
  - Acute: ovarian torsion, tubo-ovarian abscess, ectopic pregnancy, PID, appendicitis, urinary calculi, primary dysmenorrhea, ruptured ovarian cyst, endometriosis, diverticulitis, cystitis
  - Chronic: endometriosis, adenomyosis, IBS, interstitial cystitis, somatization, pelvic adhesions, diverticulitis, constipation, prior PID, fibroids, ovarian tumor

Skin Changes

- Numerous causes

Nipple Discharge

- Causes: galactorrhea (pregnancy, postpartum, hyperprolactinemia), mammary duct ectasia, intraductal papilloma, breast cancer, oral contraceptives, fibrocystic disease, subareolar abscess

Adenopathy

- Causes: viral (EBV, hepatitis, herpes simplex, acute HIV), bacterial/fungal, chlamydial, parasitic, malignancy, drug hypersensitivity, hyperthyroidism

Fibroadenomas (p 291) (19-3)

- Benign tumor of breast consisting of stromal overgrowth that is 1-5 cm in diameter
- Considered a proliferative breast lesion, but majority of women at no increased risk of developing breast cancer
- Sxs: solid, mobile, well circumscribed nontender mass
- Dx: benign US features, negative needle aspiration looking for fluid
- Tx: core needle biopsy OR short-term f/u (3-6 mo) w/ repeat US and breast exam
- If increases in size → excision mandated to r/o malignant change and confirm dx

Fibrocystic Breast Disease (p 292) (19-3)

- Benign breast changes, very common
- Simple breast cysts MC
- MCC of cyclic mastalgia in women of reproductive age
- Hormonal imbalance → cyclical breast pain (varies w/ menstrual cycle)
- Histology
  - Nonproliferative: no increased risk of breast cancer
  - Proliferative: slightly increased risk of breast cancer
- Sxs: breast pain/tenderness, nonbloody green/brown discharge from nipples, increased pain premenstrually, appearing and disappearing masses, fluctuation in size
- Dx: mammogram 1st line w/ US usually, biopsy dominant lesions (FNA, core biopsy), cyst aspiration
- Tx: reassurance, supportive bra, warm/cold compresses, abstain from coffee/tea/chocolate
- Sxs subside with menopause

Breast Carcinoma (p 280) (19-6)

- MC cancer in women (excluding non-melanoma skin cancers)
- 2nd MCC of cancer death
- RF: female (MC), ovarian activity (more ovarian cycles), length of menstrual life (menarche onset < 13 yo, age @ 1st full term pregnancy > 30 yo, age at menopause > 55 yo)
- Protective factors: breast feeding > 16 months, parity > 5, exercise, BMI < 22, aspirin
- MC in upper outer quadrant
- Usually arises from ducts or lobules
- Carcinoma MC type (in-situ vs invasive)
**Types:**

<table>
<thead>
<tr>
<th>Types of Cancer</th>
<th>Overview</th>
<th>Presentation</th>
<th>Diagnosis/Management</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ductal Carcinoma in Situ (DCIS)</strong></td>
<td>- Considered a premalignant lesion → can develop infiltrating ductal carcinoma in same breast - Arises from ductal hyperplasia - Very early malignancy w/o basement membrane penetration</td>
<td>- Typically asymptomatic and discovered on mammogram as calcifications - Usually not palpable on PE - Microcalcifications on mammogram</td>
<td>- Core or open biopsy - Lumpectomy + radiation - Tamoxifen or aromatase inhibitor therapy for 5 years if receptor + tumor</td>
</tr>
<tr>
<td><strong>Invasive/Infiltrating Ductal Carcinoma</strong></td>
<td>- MC breast cancer (75%) - Worst and most invasive - Commonly metastasizes</td>
<td>- Pt typically postmenopausal - Spiculated margins on mammogram - Firm, fibrous, rock-hard mass w/ sharp margins</td>
<td>- Chemo</td>
</tr>
<tr>
<td><strong>Lobular Carcinoma in Situ</strong></td>
<td>- Considered a premalignant lesion → can develop carcinoma of either breast - Contains signet ring cells - Will progress to invasive lobular carcinoma in 10%</td>
<td>- Usually not palpable and hard to detect on mammogram - Often bilateral</td>
<td>- Close follow up - Tamoxifen can lower the risk of developing carcinoma</td>
</tr>
<tr>
<td><strong>Invasive/Infiltrating Lobular Carcinoma</strong></td>
<td>- 2nd MC breast cancer</td>
<td>- Orderly row of cells in stroma that are fluid and mobile - Often bilateral</td>
<td>- US assessment preferred over mammography</td>
</tr>
<tr>
<td><strong>Medullary Carcinoma</strong></td>
<td>- Fleshy, cellular, lymphocytic infiltrate - Good prognosis</td>
<td>- Linear crystallization pattern on mammogram</td>
<td></td>
</tr>
<tr>
<td><strong>Comedocarcinoma</strong></td>
<td>- Subtype of DCIS - Ductal caseating necrosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Paget’s Disease</strong></td>
<td>- Subtype of ductal carcinoma</td>
<td>- Eczematous lesion on nipple - May also be seen on vulva</td>
<td></td>
</tr>
</tbody>
</table>

**Sxs:**
- General sxs: PAINLESS, firm/hard mass w/ poorly defined margins
- Advanced carcinoma: edema, redness, nodularity of skin ulceration
- Inflammatory breast cancer: diffuse brawny induration of skin w/ erythematous edge and no palpable mass
  - Pain, warmth, thickened, “peu d’organge” skin
- Paget disease: nipple discharge, erosion, retraction, enlargement or itching

**Screening:**
- Mammogram
  - **USPSTF**
    - 40-49y: Every 2 years
    - 50-74y: Every 2 years
    - >/= 75y: None
  - **ACOG**
    - None unless desired by pt
    - Every year
    - Every year until 55yrs, then every 2 years
  - **ACS**
    - Start every year at 45yrs
    - Every year until 55yrs, then every 2 years

**Dx:**
- Biopsy of suspicious lesion (mass, microcalcification, stellate/spiculated mass)
- Pathology and genomic marker assay

**Tx:**
- Surgical management: lumpectomy, sentinel node biopsy, or mastectomy
- Chemo is typically 3-6 months and is initiated for visceral mets, failed endocrine therapy, or estrogen/progesterone receptor (-) tumors
- Endocrine therapy with tamoxifen (premenopausal) or aromatase inhibitors (postmenopausal)
  - Can cause endometrial cancer
- Radiation therapy as an adjuvant

**Surgical complications:** long thoracic nerve injury, lymphedema
Breast Mass
- Imaging needed for any woman w/ palpable dominant breast mass, regardless of age
  - <30 yo: US
  - >30 yo: mammogram

DERMATOLOGY – 5%

Rash
- Numerous causes

Redness/Erythema
- Causes: UV induced (sunburn), erythema nodusum, photosensitivity from medication, erythema multiforme, erythema infectiousum, erythema toxicum

Discharge
- Causes: impetigo, cellulitis, contact dermatitis, skin cancer

Drug Eruptions (post-op)
- Skin reactions are the MC adverse drug reactions
  - New medications within the preceding 6 weeks: all oral, parenteral, and topical agents, including over the counter drugs, vitamins, and herbal remedies
  - Most cutaneous reactions are self-limited
  - Pathophys
    - Type I:
      - IgE mediated – urticarial and angioedema
      - Common culprit meds: ASA, NSAIDs, PCN
    - Type II:
      - Cytotoxic, Ab mediated - fixed drug eruption that occurs in the same place each time
    - Type III:
      - Immune antibody antigen complex – systemic reaction
      - Common culprit meds: anticonvulsants, sulfonamides, allopurinol, NSAIDs, antivirals
    - Type IV (MC type):
      - Delayed (cell mediated)
      - Common culprit meds: PCNs, TMP-SMX, fluoroquinolones
      - Erythema multiforme
      - Exanthematous/morbilliform type of rash (bright red macules and papules that coalesce to from plaques)
  - Tx is mainly supportive
  - AVOID re-challenging drug as reaction is typically worse with re-exposure

Urticaria (post-op)
- Type 1 IgE mediated hypersensitivity reaction
- Surgical drug causes: codeine, morphine, and muscle relaxers used in anesthesia
- Blanchable, edematous, pink papules, wheals or plaques
- + Darier’s sign: localized urticarial where skin is rubbed
- Tx: avoid triggers, antihistamines, steroids

Cellulitis (20-11)
- Acute bacterial skin infection
- Characterized by pain, macular erythema, warmth, and swelling
- Margins are flat and not well demarcated
- Caused by staph and strep in adults; Hib or strep pneumo in children
- Dx: wound culture
- Tx: cephalexin, clindamycin, TMP/SMX (cover for MRSA)
  - Cat bite – augmentin or doxy
  - Puncture wound (cover for pseudomonas) - ciprofloxacin
Burns (p 166) (22-5)
- Rule of 9s (Head 9%, Each arm 9%, Chest 9%, Abdomen 9%, Each anterior leg 9%, Each posterior leg 9%, Upper back 9%, Lower back 9%, Genitals 1%)
- 1st degree (sunburn): erythema of involved tissue, skin blanches with pressure, skin may be tender
- 2nd degree (partial thickness): skin is red and blistered, very tender
- 3rd degree (full thickness): burned skin is tough and leathery, skin non-tender
- 4th degree: into the bone and muscle
- Minor burns:
  - < 10% TBSA in adults
  - < 5% TBSA in young/old
  - < 2% full thickness burn
  - Must not involve face, hands, perineum, feet, cross major joints, or be circumferential
- Major burns:
  - > 25% TBSA in adults
  - > 20% TBSA in young/old
  - >10% full thickness burn
  - Burns involving face, hands, perineum, feet, crossing major joints, or circumferential
- Tx: monitor ABCs, fluid replacement, sulfadiazine
  - Children w/ > 10% and adults w/ > 15% total body area surface burns need fluid resuscitation
    - Lactated Ringers - IV x 24 hours - 1/2 in 1st 8 hours the other in 1/2 in the remaining 16
  - Burn center referral: > 20% TBSA partial thickness, > 5% TBSA full thickness burn, burns involving the face/hands/feet/perineum, burns w/ inhalation injury, electrical burns

<table>
<thead>
<tr>
<th>Depth</th>
<th>Superficial</th>
<th>Superficial Partial Thickness</th>
<th>Deep Partial Thickness</th>
<th>Full Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidermis</td>
<td></td>
<td>Epidermis + superficial dermis</td>
<td>Epidermis into deep dermis</td>
<td>Enters throughout entire skin</td>
</tr>
<tr>
<td>Epidermis</td>
<td></td>
<td></td>
<td></td>
<td>Enters entire skin into underlying fat, muscle, bone</td>
</tr>
<tr>
<td>Appearance</td>
<td>Erythematous Dry</td>
<td>Erythematous, pink Moist, weeping Blistering</td>
<td>Red, yellow, pale white Dry Blistering</td>
<td>Waxy, white Leathery, dry</td>
</tr>
<tr>
<td>Sensation</td>
<td>Painful Tender to touch</td>
<td>Most painful of all burns Very tender to touch</td>
<td>Not usually painful +/- pain to pressure</td>
<td>Painless</td>
</tr>
<tr>
<td>Capillary Refill</td>
<td>Refill intact Blanches</td>
<td>Refill intact Blanches</td>
<td>Absent cap refill</td>
<td>Absent</td>
</tr>
<tr>
<td>Treatment</td>
<td>Keep clean + Neosporin + pain control</td>
<td>Remove blisters, apply abx ointment (Silvadene) + dressing, pain control</td>
<td>Early excision of eschar (w/in 1st week) and skin graft</td>
<td></td>
</tr>
<tr>
<td>Prognosis</td>
<td>Heals w/in 7 days No scarring</td>
<td>Heals w/in 14-21 days No scarring</td>
<td>3 weeks – 2 mo Scarring common</td>
<td>Months Does not spontaneously heal well</td>
</tr>
</tbody>
</table>

Pressure Ulcers
- Sacrum and hip MC affected
- Prevention: reposition every 2 hours
- Stage 1: erythema of localized area, non-blanching over bony surface
  - Tx: aggressive preventive measures, thin film dressings for protection
- Stage 2: partial loss of dermal layer, resulting in pink ulceration
  - Tx: occlusive dressing to maintain healing, hydrocolloids
• Stage 3: **full dermal loss** often exposing subcutaneous tissue and fat
  o Tx: debridement of necrotic tissue, absorptive dressings (calcium alginates, foams, hydrofibers) for exudative, occlusive dressings (hydrocolloids, hydrogels) for dry ulcers
• Stage 4: **full thickness ulceration exposing bone**, tendon or muscle; osteomyelitis often present

**Basal Cell Carcinoma (p 322) (20-6)**
• Small, raised, translucent/peary/waxy papule or plaque & **central ulceration w/ raised, rolled borders**
• MC presentation for basal cell carcinoma is a papule or nodule that may have a scab or erosion in addition the pearly papule, erythematous patch > 6 mm, or nonhealing ulcer, in sun-exposed areas (face, trunk, lower legs)
• **MC type of skin cancer in US**
  o Bleeds easily, associated with telangiectasias
  o Slow growing and very low incidence of metastasis but locally invasive and destructive
  o Fair skinned individuals w/ history of sun exposure
  o Dx: shave or punch biopsy
  o Tx: excise w/ clear margins (5 mm)

**Squamous Cell Carcinoma (p 332) (20-2)**
• Eroded, friable, hyperkeratotic papules, plaques, nodules
• Often arise w/in **pre-existing actinic keratosis**
• Bowen’s disease = squamous cell carcinoma in situ
• **2nd MC skin cancer**
  o Dx: shave or punch biopsy
  o Tx: excise w/ clear margins (5mm – 2 cm)

**Melanoma (p 334) (20-1)**
• Neoplastic disorder produced by malignant transformation of melanocytes (derived from neural crest cells)
• **ABCDE**: asymmetry, border (irregular), color variability, diameter (> 6 mm), elevation
• **MC on back for men and legs for women**
• High risk for metastasis and can spread to any site
• > 5 atypical moles increases risk of melanoma
• Prognosis associated w/ depth of lesion – less than 1mm correlates with low risk of metastasis
• **Clark classification system**
  o Level I: Confined to the epidermis (in situ)
  o Level II: Invasion into the papillary dermis
  o Level III: Penetration to the papillary- reticular interface
  o Level IV: Invasion into the reticular dermis
  o Level V: Penetration into subcutaneous fat
• **Types of melanoma**
  o In situ: no invasion has occurred, localized to epidermis
  o Superficial spreading:
    ▪ **MC type** (75%)
    ▪ MC on legs (women) and trunk (men)
    ▪ Occurs in both sun-exposed and non-sun-exposed areas
    ▪ Spreads superficially along top layers of skin before penetrating deep layers
    ▪ Raised borders and brown lesions with pinks, whites, grays or blues
  o Lentigo maligna (melanoma in situ):
    ▪ **MC in elderly**
    ▪ Least common & least aggressive type
    ▪ **Restricted to epidermis**
    ▪ MC on face, ears, arms, upper trunk
    ▪ Tan/brown lesions with very irregular borders
  o Amelanotic:
    ▪ **Nonpigmented**
    ▪ Innocent-appearing pink to red colored papules that enlarge to plaques and nodules
    ▪ Typically remains undiagnosed until later stages
- Acral lentiginous:
  - MC type in AA
  - Under the nails, soles/palms
  - Flat, irregular dark brown to black lesions
- Nodular:
  - Usually invasive at time of diagnosis
  - Vertical growth predominates
  - Most aggressive type and 2nd MC
  - Common on extremities
  - Mostly black, but some brown, gray, red or tan lesions that arise from nevi
- Avoid partial biopsy – excise with clear margins and capture entire depth (critical for staging)
  - Want to excise with 5mm margins
- USPSTF does NOT recommend routine skin cancer screening
- Sunscreen pearls: SPF > 30, reapply sunscreen every 2 hours

**ADDITIONAL PEARLS**

**Sutures**
- When to remove sutures:
  - Face: 3-5 days
  - Extremities: 10 days
  - Joints: 10-14 days
  - Back: 14 days
  - Abdomen: 7 days
- Patients on steroids should keep sutures in longer than normal

**Drains**
- Purpose of drains: withdrawal of fluids, apposition of tissues to remove a potential space, monitor fluid output
- Jackson-Pratt drain: closed drainage system attached to a suction bulb
- Penrose drain: open drainage system composed of a thin rubber hose; associated w/ increased infection rate in clean wounds

**Tubes**
- G-tube (gastrostomy tube): used for drainage or feeding
- J-tube (jejunostomy tube): used for feeding, may be used for a catheter
- Cholecystostomy tube: used to drain the gallbladder
- T-tube: tube placed in common bile duct with an ascending and descending limb that forms a “t”
- Chest tube (thoracostomy tube):
  - Inserted into the 4th or 5th intercostal space between the mid and anterior axillary lines
  - Placed OVER the rib to avoid vessels and nerves
  - A small stable PTX will drain ~ 1%/day

**Central Lines**
- Catheters placed into the major veins via subclavian, internal jugular or femoral vein approaches
- Major complications from placement: PTX, bleeding, malposition, dysrhythmias
- If you are unsuccessful in placing a central line you must get a CXR before trying on the other side to avoid a b/l PTX

**Fluids**
- Resuscitative fluid (postop): lactated ringers
- Maintenance: D5 ½ NS + KCl (K pulls insulin into cells)
  - 4:2:1 rule when calculating cc/hr
- Daily requirements:
  - 100ml/kg/d for first 10kg, 50ml/kg/d for next 10kg, 20ml/kg/d for all kg above 20
- Enteral feeds are best - keep gut mucosa intact and prevent bacterial translocation
- TPN is indicated if gut can't absorb nutrients 2/2 physical or functional loss
Surgical Anatomy PEARLS

- Drainage of left testicular vein: left renal vein
- Drainage of right testicular vein: IVC
- The gastroduodenal artery bleeds in bleeding ulcers
- Morrison’s pouch: hepatorenal recess
- Blood vessels in a rib: vein, artery, nerve (VAN)
- Order of femoral vessels: nerve, artery, vein, empty space, lymphatics (NAVEL)
- Ilioinguinal nerve is located on top of spermatic cord
- Calot’s triangle: cystic duct, common hepatic duct, cystic artery
- Cantle’s line separates the right and left lobes of the liver
- Gastrinoma triangle: junction of the 2nd and 3rd portions of the duodenum, cystic duct, and pancreatic neck
- Artery of adamkiewicz is responsible for anterior spinal syndrome
- McBurney’s point: 1/3 the distance from the anterior superior iliac spine to the umbilicus
- Submucosa is the strongest layer of the small bowel
- The esophagus and middle/distal rectum do not have a serosa
- Differences between jejunum and ileum:
  - Jejunum: long vasa rectae, large plicae circulares, thicker wall
  - Ileum: shorter vasa rectae, smaller plicae circulares, thinner wall
- Differences between colon and small bowel:
  - Colon: taeniae coli, haustra and appendices epiploicae
  - Small intestine: smooth
- Diaphragm extends to nipples in men (4th ICS)
- T10 is dermatome of umbilicus
- Major layers of arteries: adventitia (outer) → media → intima (inner)

Diagnostic Imaging 1st Lines

- Appendicitis: abd CT (US in kids and pregnancy)
- Chronic pancreatitis: ERCP
- Gallbladder: US
- Diverticulosis: barium enema
- Diverticulitis: CT scan
- Achalasia: barium swallow
- Zenker’s diverticulum: barium swallow
- UGI: endoscopy
- PE: pulmonary angiogram

Most Common Kinds of Cancer

- Liver → hepatocellular carcinoma
- Renal → renal cell carcinoma
- Small bowel → carcinoid tumors
- Bladder → transitional cell carcinoma
- Breast → infiltrating ductal carcinoma
- Thyroid → papillary adenocarcinoma

<table>
<thead>
<tr>
<th>Adenocarcinoma</th>
<th>Squamous Cell Carcinoma</th>
</tr>
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<tbody>
<tr>
<td>Colon</td>
<td>Esophageal</td>
</tr>
<tr>
<td>Gallbladder</td>
<td>Anal</td>
</tr>
<tr>
<td>Pancreas</td>
<td>Vulvar</td>
</tr>
<tr>
<td>Prostate</td>
<td></td>
</tr>
</tbody>
</table>

Meds & Surgery

- ASA, NSAIDs, VitE → stop 2 weeks prior
- Warfarin → stop 5 days prior
- Diabetics → take ½ morning dose of insulin
- CKD on dialysis → dialyze 24 hrs preop
- Stop smoking 8 weeks prior to surgery
Ventilation
- Settings:
  - Assist Control setting → set TV and rate but if pt take a breath, vent gives the volume
  - Pressure support → pt rules rate but a boost of pressure is given (important for weaning)
  - CPAP → pt must breath on own but pos pressure given all the time
  - PEEP → pressure given at the end of cycle to keep alveoli open (used in ARDS and CHF)
- Best tests to evaluate management = ABG
  - If PaO2 is low → increase FiO2
  - If PaO2 is high → decrease FiO2
  - If PaCO2 is low (high pH) → decrease rate or TV
  - If PaCO2 is high (low pH) → increase rate or TV
  - Which is more efficient? TV is more efficient to change (more air goes into function space vs. increasing rate is getting more air to dead space)

Cancer Markers
- AFP: hepatocellular carcinoma
- CEA: colon carcinoma
- CA 19-9: pancreatic carcinoma
- CA-125: ovarian carcinoma

7 Layers of the Abdominal Wall
- Skin
- SQ fat
- Scarpa’s fascia
- Muscle: external oblique → internal oblique → transversus abdominus
- Transversalis fascia
- Preperitoneal fat
- Peritoneum