

## MEDICAL KNOWLEDGE

### **Abdominal pain** (reference simple case 9, 12)

1. Describe the pathophysiology of the principle types of abdominal pain: parietal, visceral, vascular, referred.
2. Generate a prioritized differential of important and most likely causes of a patient's abdominal pain by recognizing specific history, physical exam, and laboratory findings that distinguish between the various conditions.
3. List symptoms and signs indicative of an acute/surgical abdomen.
4. Recommend a basic management plan for diverticulitis.
5. Recommend a basic management plan for pancreatitis.
6. Explain the indications and utility of hepatobiliary imaging studies including MRCP and ERCP (Note overlap with LFT's)

### **Acid base disorders** (reference lecture, simple case 26)

1. Identify and discuss the normal homeostatic mechanisms which maintain pH in the normal range
2. Describe the principles of the Henderson-Hasselbach equation.
3. Describe the effect on pH of:
  - a. Metabolic acidosis
  - b. Metabolic alkalosis
  - c. Respiratory acidosis
  - d. Respiratory alkalosis
4. Discuss the renal and/or respiratory adaptation to the abnormalities in (3) above.
5. Calculate the anion gap and explain its relevance to determining the cause of a metabolic acidosis.
6. Define and describe the pathophysiology of:
  - Simple and mixed acid-base disorders.
  - Respiratory acidosis and alkalosis.
  - Metabolic acidosis and alkalosis.
7. Discuss presenting symptoms and signs of the above disorders
8. List the differential and identify the most common causes of respiratory acidosis, respiratory alkalosis, non-anion gap metabolic acidosis, anion gap metabolic acidosis, and metabolic alkalosis.
9. Discuss how altered mental status can contribute to electrolyte disorders.
10. Discuss tests to use in the evaluation of fluid, electrolyte, and acid-base disorders.
11. List and discuss indications for obtaining an ABG

### **Acute renal failure** (reference case discussion, simple case 33)

1. Compare and contrast the distinction between the three major pathophysiologic etiologies for acute renal failure (ARF) based on history, urinalysis, urine studies, and radiological imaging:
  - a. Decreased renal perfusion (prerenal)
    - i. Hypovolemia
    - ii. Decreased cardiac output

- iii. Systemic vasodilation
    - iv. Renal vasoconstriction
  - b. Intrinsic renal disease (renal)
    - i. Vascular lesions
    - ii. Glomerular lesions
    - iii. Interstitial nephritis
    - iv. Intra-tubule deposition/obstruction
    - v. Acute tubular necrosis (ATN)
  - c. Acute renal obstruction (postrenal)
    - i. Urethral (e.g. tumors, calculi, clot, sloughed papillae, retroperitoneal fibrosis, lymphadenopathy)
    - ii. Bladder neck (e.g. tumors, calculi, prostatic hypertrophy or carcinoma, neurogenic)
    - iii. Urethral (e.g. stricture, tumors, obstructed indwelling catheters)
- 2. Describe the metabolic consequences of significant reductions in renal function.
- 3. Describe the indications for dialysis.
- 4. Calculate fractional excretion of sodium and apply it to distinguish between pre-renal and intrinsic renal disease.
- 5. Develop appropriate initial management plan for acute renal failure including volume management, dietary recommendations, drug dosage alterations, electrolyte monitoring, and indications for dialysis.
- 6. Interpret a urinalysis, including microscopic examination for casts, red blood cells, white blood cells, and crystals (note overlap with Renal Tests).
- 7. Calculate the anion gap and generate a differential diagnosis for metabolic acidosis. (note overlap with acid base disorders)
- 8. *Identify risk factors for contrast-induced nephropathy and recommend steps to prevent this complication.*

**Anemia/Complete Blood Count** (reference lecture, simple case 19)

1. Be able to define and describe classification of anemia based on red cell size:
  - a. Microcytic
    - i. Iron deficiency
    - ii. Thalassemic disorders
    - iii. Sideroblastic anemia
    - iv. Lead toxicity/poisoning
    - v. Anemia of chronic disease
  - b. Normocytic
    - i. Acute blood loss
    - ii. Hemolysis
    - iii. Anemia of chronic disease (e.g. infection, inflammation, malignancy)
    - iv. Chronic renal insufficiency/erythropoietin deficiency
    - v. Bone marrow suppression (e.g. bone marrow invasion, aplastic anemia)
    - vi. Hypothyroidism
    - vii. Testosterone deficiency

- viii. Early presentation of microcytic or macrocytic anemia (e.g. early iron deficiency anemia)
  - ix. Combined presentation of microcytic and macrocytic anemias.
- c. Macrocytic
- i. Ethanol abuse
  - ii. B12 deficiency
  - iii. Folate deficiency
  - iv. Drug-induced
  - v. Reticulocytosis
  - vi. Liver disease
  - vii. Myelodysplastic syndromes
  - viii. Hypothyroidism
2. Discuss the potential usefulness of the white blood cell count and platelet count when attempting to determine the cause of anemia.
  3. Discuss the meaning and utility of various components of the hemogram (e.g., hemoglobin, hematocrit, mean corpuscular volume, and red cell distribution width).
  4. Classify anemia into hypoproliferative and hyperproliferative categories using the reticulocyte count/index.
  5. Use information regarding the diagnostic utility of the various tests for iron deficiency (e.g., serum iron, total iron binding capacity, transferrin saturation, ferritin) when selecting a lab evaluation for iron deficiency.
  6. Identify key historical and physical exam findings in the anemia patient.
  7. Recognize common morphologic changes on a peripheral blood smear.
  8. Develop a further evaluation and management plan for a patient with anemia.

**Asthma** (reference case discussion)

1. Discuss the etiology, pathophysiology, and pathology of asthma.
2. Discuss the epidemiology, risk factors, symptoms, signs, and typical clinical course of asthma.
3. Prioritize common causes of acute exacerbations of asthma, allergic and non-allergic, including:
  - a. Acute infectious bronchitis
  - b. Pneumonia
  - c. Pulmonary edema
  - d. Poor air quality (e.g. ozone, pollutants, tobacco smoke)
  - e. Occupational exposures
  - f. Medical noncompliance
  - g. Grass and tree pollen
  - h. Animal dander
  - i. Cockroaches
  - j. Dust mites
  - k. Allergic rhinitis/post-nasal drip
  - l. Acute/chronic infectious sinusitis
  - m. Exercise
  - n. Anxiety/stress

- o. Smoking
- 4. Discuss the etiology, pathogenesis, evaluation and management of hypoxemia and hypercapnia in the context of asthma.
- 5. Discuss therapies for asthma, noting side effects, advantages, disadvantages, and side effects, for the following:
  - a. Beta-agonist bronchodilators
  - b. Anticholinergic bronchodilators
  - c. Leukotriene inhibitors
  - d. Mast cell stabilizers
  - e. Theophylline
  - f. Inhaled corticosteroids
  - g. Systemic corticosteroids
  - h. Antimicrobial agents
  - i. Supplemental oxygen
  - j. Immunotherapy
- 6. Identify the indications for and the efficacy of influenza and pneumococcal vaccines.

**Atrial Fibrillation** (reference case discussion)

1. Identify atrial fibrillation on an electrocardiogram.
2. Identify other supraventricular arrhythmias that may resemble atrial fibrillation.
3. Compare and contrast the differences, including etiologies, between paroxysmal, persistent and chronic atrial fibrillation.
4. Describe the hemodynamic consequences of new onset atrial fibrillation.
5. Develop a framework for management focusing on the three main therapeutic goals: anticoagulation, rate control, and rhythm control.
6. Compare and contrast the role of a rate control versus rhythm control strategy in a-fib.
7. Define the risk of stroke for the patient with persistent or paroxysmal atrial fibrillation.
8. Define the relative and absolute risk reduction of stroke for coumadin and aspirin.
9. Identify the different classes of antiarrhythmics, noting their advantages and disadvantages.
10. Describe the roles of nonpharmacologic therapies such as ablation and device therapy.
11. Develop a plan for safe, elective cardioversion in a patient with a-fib of unknown or >48 hours duration.

**Cardiac clinical correlation** (reference lecture)

1. Be able to define and describe the mechanism of generation, clinical significance and best listening areas on the chest of the following sounds:
  - a. S1 & S2 – including etiologies for increased and decreased intensities
  - b. S2 splitting patterns-including normal, wide, fixed, paradoxical
  - c. S3 & S4
  - d. Ejection clicks-early and mid (including MVP)
  - e. Opening snap
2. Describe the grading system for heart murmurs (I-VI/VI).

3. Compare and contrast the location, pattern of radiation, timing, pitch, shape, quality and response to common physiologic maneuvers and any associated change in carotid waveform with the following murmurs:
  - a. Aortic stenosis
  - b. Mitral stenosis
  - c. Aortic regurgitation
  - d. Mitral regurgitation
  - e. Hypertrophic cardiomyopathy
  - f. Ventricular septal defect
  - g. Atrial septal defect
  - h. Mitral valve prolapse
  - i. Pericardial rub

**Chest pain** (reference simple cases 1-4, Coronary artery disease)

1. Organize and prioritize a differential diagnosis of acute chest pain based on specific historical and physical exam findings.
  - a. Symptoms and signs of chest pain due to gastrointestinal disorders such as:
    - i. Esophageal disease (GERD, esophagitis, esophageal dysmotility)
    - ii. Biliary disease (cholecystitis, cholangitis)
    - iii. Peptic ulcer disease
    - iv. Pancreatitis
  - b. Symptoms and signs of chest pain due to pulmonary disorders such as:
    - i. Pneumonia
    - ii. Spontaneous pneumothorax
    - iii. Pleurisy
    - iv. Pulmonary embolism
    - v. Pulmonary hypertension/cor pulmonale
  - c. Symptoms and signs of chest pain due to musculoskeletal causes such as:
    - i. Costochondritis
    - ii. Rib fracture
    - iii. Myofascial pain syndromes
    - iv. Muscular strain
    - v. Herpes zoster
  - d. Symptoms and signs of chest pain due to psychogenic causes such as:
    - i. Panic disorders
    - ii. Hyperventilation
    - iii. Somatoform disorders
  - e. Physiologic basis and/or scientific evidence supporting each type of treatment, intervention or procedure commonly used in the management of patients who present with chest pain
  - f. Identify the symptoms and signs of chest pain characteristics of angina pectoris.
  - g. Symptoms and signs of chest pain due to other cardiac causes such as:
    - i. Atypical or variant angina (coronary vasospasm, Prinzmetal angina)
    - ii. Cocaine-induced chest pain
    - iii. Pericarditis

- iv. Aortic dissection
  - v. Valvular heart disease (aortic stenosis, mitral valve prolapse)
  - vi. *Non-ischemic cardiomyopathy*
  - vii. *Syndrome X*
2. Define and discuss the pathogenesis, signs, and symptoms of the acute coronary syndromes including unstable angina and acute myocardial infarction.
  3. List the cardiovascular risk factors and the primary and secondary prevention of ischemic heart disease (e.g. controlling hypertension and dyslipidemia, aggressive diabetes management, avoiding tobacco, and aspirin prophylaxis) (overlap with CAD #2).
  4. Develop an appropriate diagnostic and treatment plan—including recommended lifestyle modifications—for a patient presenting with acute coronary syndrome.
  5. Categorize the patients' symptoms as angina pectoris, atypical angina, or non-cardiac chest pain.
  6. Order appropriate laboratory and diagnostic studies based on patient demographics and the most likely etiologies of chest pain.
  7. Recommend primary and secondary prevention of ischemic heart disease through the reduction of cardiovascular risk factors (overlap with CAD #1).
  8. Prescribe appropriate anti-anginal medications when indicated and identify potential adverse reactions (overlap with CAD #11).

**Chronic obstructive pulmonary disease** (reference case discussion, simple case 28)

1. Be able to describe and define the common clinical presentations and diagnostic criteria for emphysema.
2. Describe and define the etiology, pathophysiology, and pathology for COPD.
3. Recommend appropriate laboratory evaluation for suspected COPD exacerbation.
4. Prioritize common causes of acute exacerbations of COPD (AECOPD), including:
  - a. Acute infectious bronchitis
  - b. Pneumonia
  - c. Pulmonary edema
  - d. Poor air quality (e.g. ozone, pollutants, tobacco smoke)
  - e. Occupational exposures
  - f. Medical noncompliance
5. Discuss the etiology, pathogenesis, evaluation and management of hypoxemia and hypercapnia in the context of COPD.
6. Describe and define therapies for COPD, noting advantages, disadvantages, and side effects, for the following:
  - a. Beta-agonist bronchodilators
  - b. Anticholinergic bronchodilators
  - c. Leukotriene inhibitors
  - d. Mast cell stabilizers
  - e. Theophylline
  - f. Inhaled corticosteroids
  - g. Systemic corticosteroids
  - h. Antimicrobial agents
  - i. Supplemental oxygen

- j. Immunotherapy
  - k. Smoking cessation
7. Describe and define the role of influenza and pneumococcal vaccine in the care of patients with obstructive airways disease

**Congestive heart failure** (reference case discussion, simple case 4)

1. Be able to describe and define the terms preload, contractility, and afterload and how these are affected in the heart with systolic dysfunction.
2. Be able to define and describe compensatory mechanisms of heart failure: cardiac remodeling, activation of endogenous neurohormonal systems, cytokine systems, adrenergic nervous system, renin angiotensin-aldosterone system, endothelin, tumor necrosis factor, and vasoactive peptides.
3. Interpret neck vein findings for jugular venous distention and abdominal jugular reflux.
4. Identify and translate auscultatory findings of the heart including rate, rhythm, S3/S4 and murmurs in a patient with heart failure (overlap with Cardiac Clinical Correlation).
5. Compare the differing etiologies and signs of left-sided vs right-sided heart failure.
6. Be able to define and describe the types of processes that cause systolic vs. diastolic dysfunction and how treatment is different.
7. Be able to define and describe the importance of age, gender and ethnicity on the prevalence and prognosis of HF.
8. Identify and explain the factors leading to symptomatic exacerbation of HF, including ischemia, arrhythmias, valvular disease, anemia, hypertension, thyroid disorders, non-compliance with medications and dietary restrictions, and use of nonsteroidal anti-inflammatory drugs.
9. Interpret B-type natriuretic peptide results.
10. Be able to define and describe the staging system for heart failure:
  - a. Stage A: high risk for HF but no structural heart disease is present
  - b. Stage B: structural heart disease is present but never any symptoms
  - c. Stage C: past or current symptoms associated with structural heart disease
  - d. Stage D: end-stage disease with requirements for specialized treatment
11. Assign a risk and prognosis to patients in NYHA Class I<II<III<IV without vasodilator or beta blocker therapy.
12. Be able to define and describe physiological basis and scientific evidence supporting each type of treatment, intervention or procedure commonly used in the management of patients who present with HF.
13. Outline a treatment plan for patients with compensated or decompensated CHF including pharmacologic management: diuretics, digoxin, vasodilators and beta blockers assign a risk reduction.

**Coronary artery disease** (reference case discussion and simple cases 1-4)

1. Identify risk factors for the development of coronary heart disease:
  - a. Age and gender
  - b. Family history of sudden death or premature CAD
  - c. Personal history of peripheral vascular or cerebrovascular disease

- d. Smoking
  - e. Lipid abnormalities (includes dietary history of saturated fat and cholesterol)
  - f. Diabetes mellitus
  - g. Hypertension
  - h. Obesity
  - i. Sedentary lifestyle
  - j. Cocaine use
  - k. Estrogen use
  - l. Chronic inflammation
2. Be able to define and describe the primary and secondary prevention of ischemic heart disease through the reduction of cardiovascular risk factors (e.g. controlling hypertension and dyslipidemia, aggressive diabetes management, avoiding tobacco, and aspirin prophylaxis). (note overlap with chest pain objectives)
  3. Identify factors that may be responsible for provoking or exacerbating symptoms of ischemic chest pain by:
    - a. Increasing myocardial oxygen demand
    - b. Tachycardia or tachyarrhythmia
    - c. Hypertension
    - d. Increased wall stress (aortic stenosis, cardiomyopathy)
    - e. Hyperthyroidism
    - f. Decreasing myocardial oxygen supply
    - g. Anemia
    - h. Hypoxemia
  4. Be able to define and describe the pathogenesis, signs and symptoms of the acute coronary syndromes:
    - a. Unstable angina
    - b. Non-ST-elevation myocardial infarction (NSTEMI)
    - c. ST-elevation myocardial infarction (STEMI)
  5. Be able to define and describe the typical clinical course of the acute coronary syndromes.
  6. Be able to define and describe the atypical presentations of cardiac ischemia/infarction (note overlap with chest pain)
  7. Be able to define and describe the ECG findings and macromolecular markers (myoglobin, CK-MB, troponin-I, troponin-T) of acute ischemia/MI.
  8. Be able to define and describe the utility of echocardiography in acute MI.
  9. Be able to define and describe the importance of monitoring for and immediate treatment of ventricular fibrillation in acute MI.
  10. Be able to define and describe the therapeutic options for acute MI and how they may differ for NSTEMI and STEMI, including:
    - a. Aspirin
    - b. Morphine
    - c. Nitroglycerine
    - d. Oxygen
    - e. Heparin
    - f. Antiplatelet agents (glycoprotein IIb/IIIa inhibitors)
    - g. Beta-blockers



- h. ACE-I/ARB
  - i. HMG-CoA reductase inhibitors
  - j. Thrombolytic agents
  - k. Emergent cardiac catheterization with percutaneous coronary intervention
11. Be able to define and describe the pathogenesis, signs and symptoms of the complications of acute MI, including arrhythmias, reduced ventricular function, cardiogenic shock, pericarditis, papillary muscle dysfunction/rupture, acute valvular dysfunction, and cardiac free wall rupture.
  12. Symptoms and signs of chest pain that are characteristic of angina pectoris (note overlap with chest pain)
  13. Symptoms and signs of chest pain due to other cardiac causes such as: (note overlap with chest pain):
    - a. Atypical or variant angina (coronary vasospasm, Prinzmetal angina)
    - b. Cocaine-induced chest pain
    - c. Pericarditis
    - d. Aortic dissection
    - e. Valvular heart disease (aortic stenosis, mitral valve prolapse)
    - f. Non-ischemic cardiomyopathy
    - g. Syndrome X

**Diabetes** (reference case discussion)

1. Define and discuss diagnostic criteria for impaired fasting glucose and impaired glucose tolerance.
2. Define and discuss diagnostic criteria for type I and type II diabetes mellitus, based on a history, physical examination, and laboratory testing.
3. Define and discuss pathophysiology, risk factors, and epidemiology of type I and type II diabetes mellitus.
4. Define and discuss presenting symptoms and signs of type I and type II diabetes mellitus.
5. Define and discuss presenting symptoms and signs of diabetic ketoacidosis (DKA) and nonketotic hyperglycemic (NKH).
6. Describe pathophysiology for the abnormal laboratory values in DKA and NKH including plasma sodium, potassium, and bicarbonate.
7. Identify precipitants of DKA and NKH.
8. Identify major causes of morbidity and mortality in diabetes mellitus (coronary artery disease, peripheral vascular disease, hypoglycemia, DKA, NKH coma, retinopathy, neuropathy—peripheral and autonomic, nephropathy, foot disorders, infections).
9. Identify laboratory tests needed to screen, diagnose, and follow diabetic patients including: glucose, electrolytes, blood urea nitrogen/creatinine, fasting lipid profile, HgA1c, urine microalbumin/creatinine ratio, urine dipstick for protein.
10. Compare and contrast non-pharmacologic and pharmacologic drugs and side effects noting advantages and disadvantages of treatment of diabetes mellitus to maintain acceptable levels of glycemic control, prevent target organ disease, and other associated complications.
11. Identify the specific components of the American Diabetes Association (ADA) dietary recommendations for type I and type II diabetes mellitus.

12. Identify basic management of diabetic ketoacidosis and nonketotic hyperglycemic states, including the similarities and differences in fluid and electrolyte replacement.
13. Describe basic management of blood glucoses in the hospitalized patient.
14. Outline the fundamental aspects of the American Diabetes Association (ADA) clinical practice recommendations and how they encourage high quality diabetes care.
16. Discuss basic management of hypertension and hyperlipidemia in the diabetic patient.

**Deep vein thrombosis/pulmonary embolism** (reference case discussion, simple case 30)

1. Define and describe risk factors for developing DVT, including:
  - a. Prior history of DVT/PE
  - b. Immobility/hospitalization
  - c. Increasing age
  - d. Obesity
  - e. Trauma
  - f. Smoking
  - g. Surgery
  - h. Cancer
  - i. Acute MI
  - j. Stroke and neurologic trauma
  - k. Coagulopathy
  - l. Pregnancy
  - m. Oral estrogens
2. Define and describe genetic considerations predisposing to venous thrombosis
3. Define and describe the symptoms and signs of DVT and PE
4. Discuss the diagnostic evaluation of DVT and PE; apply the conclusions of the PIOPED study.
5. Generate a prioritized differential diagnosis of DVT/PE based on specific physical findings using pre-test probability tools.
6. Describe the indications for and utility of various diagnostic tests and describe their interpretation including but not limited to spiral CT, V/Q, lower extremity dopplers, d-dimer.
7. Define and describe the differential diagnosis of DVT including the many causes of unilateral leg pain and swelling:
  - a. Venous stasis and the postphlebotic syndrome
  - b. Lymphedema
  - c. Cellulitis
  - d. Superficial thrombophlebitis
  - e. Ruptured popliteal cyst
  - f. Musculoskeletal injury
  - g. Arterial occlusive disorders
8. Define and describe the differential diagnosis of PE including the many causes of chest pain and dyspnea (overlap chest pain):
  - a. MI/unstable angina
  - b. Congestive heart failure
  - c. Pericarditis

- d. Pneumonia/bronchitis/COPD exacerbation
  - e. Asthma
  - f. Pulmonary hypertension
  - g. Pneumothorax
  - h. Musculoskeletal pain (e.g. rib fracture, costochondritis)
9. Define and describe, and develop an appropriate management plan for DVT/PE including, but not limited to the following:
    - a. Unfractionated heparin
    - b. Low-molecular-weight heparin
    - c. Warfarin
    - d. Thrombolytics
  10. Define and describe the risks, benefits and indications for inferior vena cava filters
  11. Define and describe the long-term sequelae of DVT and PE
  12. Define and describe methods of DVT/PE prophylaxis, their indications and efficacy, including:
    - a. Ambulation
    - b. Graded compression stockings
    - c. Pneumatic compression devices
    - d. Unfractionated heparin
    - e. Low-molecular-weight heparin
    - f. Warfarin

**Dyspnea** (reference simple case)

1. List the major pathologic states which cause dyspnea.
2. Describe the common causes of tachypnea.

**Fever** (reference simple case 35)

1. Define the criteria for fever of unknown origin (FUO).
2. Compare and contrast etiologies of fever in normal hosts and in special populations (e.g. patients with human immunodeficiency virus {HIV}, recent travel or immigration, intravenous drug use).
3. Obtain and present an age-appropriate patient history that helps differentiate among likely etiologies for fever.
4. Prioritize certain diagnostic and laboratory tests for fever.
5. Develop an appropriate treatment plan for patient with FUO.

**Gastrointestinal bleed** (reference case discussion, simple case 10)

1. Define hematemesis, melena and hematochezia.
2. Define and describe, and prioritize the common causes for and symptoms of upper and lower GI blood loss, including:
  - a. Esophagitis/esophageal erosions
  - b. Mallory Weiss tear
  - c. Peptic and duodenal ulcer disease

- d. Esophageal/gastric varices
  - e. Erosive gastritis
  - f. Arteriovenous malformations
  - g. Gastrointestinal tumors, benign and malignant
  - h. Diverticulosis
  - i. Ischemic colitis
  - j. Hemorrhoids
  - k. Anal fissures
3. Define and describe the distinguishing features of upper versus lower GI bleeding including but not limited to the following:
    - a. Recognize melena (usually indicating an upper GI source) is the most frequent cause of major GI bleeding, but all black stools are not melena.
    - b. Recognize hematochezia is usually a manifestation of lower GI bleeding but can be a manifestation of severe upper GI bleeding.
    - c. Recognize the most common cause of major upper GI bleeding is the peptic disorders. Diverticulosis is a common cause of major lower GI bleeding.
  4. Recommend laboratory and diagnostic tests to evaluate GI bleeding, which include (when appropriate): stool and gastric fluid tests for occult blood, CBC, PT/PTT, and colonoscopy.
    - a. Recognize that upper endoscopy (EGD) is the initial diagnostic test and therapeutic modality of choice in upper GI bleeding and has predictive value of rebleeding.
    - b. Recognize that colonoscopy (after cessation of bleeding and colonic cleansing) is the test of choice in lower GI bleeding.
  5. Develop an appropriate evaluation and treatment plan for patients with a GI bleed that includes:
    - a. Protecting the airway
    - b. Establishing adequate venous access
    - c. Administering crystalloid fluid resuscitation
    - d. Ordering blood and blood product transfusion
    - e. Determining when to obtain consultation from a gastroenterologist for upper endoscopy
  6. Define and describe the role of contributing factors in GI bleeding such as H. pylori infection; NSAIDs, alcohol, cigarette use, coagulopathies; and chronic liver disease.

**HIV** (reference case discussion, simple case 20)

1. Define and describe symptoms and signs of acute HIV seroconversion.
2. Define and describe CDC AIDS case definition
3. Define and describe Specific tests for HIV (e.g. HIV ELISA, confirmatory western blot, quantitative PCR) and their operating characteristics
4. Define and describe relationship of CD4 lymphocyte count to opportunistic infections as well as relationship between CD4 lymphocyte count and viral load to overall disease progression.

5. Define and describe the basic principles of highly active antiretroviral therapy (HAART), including the different classes of antiviral medications and their use, as well as common side effects and drug-drug interactions.
6. Define and describe basics of post-exposure prophylaxis.
7. Define and describe the marked importance of antiretroviral medication adherence and the potential consequences of erratic or poor adherence.
8. Define and describe vaccination recommendation for patients infected with HIV.
9. Define and describe indications for and utility and risks of prophylaxis of HIV-related opportunistic infections.
10. Define and describe pathogenesis, symptoms, signs, typical clinical course, and management of HIV-related opportunistic infections with a recognition of which are most common:
  - a. *Pneumocystis jiroveci*
  - b. Candidiasis (oral, esophageal, vaginal)
  - c. *Cryptococcus neoformans*
  - d. *Cryptosporidium parvum*
  - e. Cytomegalovirus infection (gastrointestinal, neurologic, retinal)
  - f. Varicella-zoster virus
  - g. *Isospora belli*
  - h. Microsporidiosis
  - i. *Mycobacterium avium* complex
  - j. *Mycobacterium tuberculosis*
  - k. *Toxoplasma gondii*
11. Define and describe symptoms and signs of the following HIV-related malignancies:
  - a. Kaposi's sarcoma
  - b. Non-Hodgkin's lymphoma
  - c. Cervical carcinoma
12. Define and describe common skin and oral manifestations of HIV infection and AIDS:
  - a. *Molluscum contagiosum*
  - b. *Cryptococcus neoformans*
  - c. Viral warts
  - d. Lipodystrophy
  - e. Herpes zoster
  - f. Seborrheic dermatitis
  - g. Buccal candidiasis
  - h. Oral hairy leukoplakia
13. Distinguish between common etiologies of fever of unknown origin (FUO) in immunocompetent patients and those infected with the human immunodeficiency virus (HIV) (overlap Fever)
14. List appropriate diagnostic tests for HIV-positive patient presenting with fever.

**Hyponatremia** (reference lecture)

1. Define and describe the effect of hyponatremia on the brain and the resultant presenting signs/symptoms.

2. Define and describe the importance of total body water distribution and its relationship to hyponatremia.
3. Discuss the approach to a patient with hyponatremia including pseudohyponatremia associated with hyperlipidemia or paraproteinemias
4. Discuss hyponatremia associated with hyperglycemia or mannitol administration
5. Define and describe the concept of free water clearance by the kidney
6. Define and describe the differential diagnosis and treatment of hyponatremia in the setting of volume depletion, euvoemia, and hypervolemia associated with:
  - a. Over-hydration – CHF, nephrotic syndrome or cirrhosis with ascites
  - b. Dehydration –
    - i. High urinary sodium – Addison’s disease, diuretic use, salt-losing nephropathies, cerebral salt wasting
    - ii. Low urinary sodium – extra-renal sodium and water loss
  - c. Euhydration – SIADH, hypothyroidism, psychogenic water drinking, sick cell syndrome, beer potomania, Tea and Toast syndrome, and exercise-induced hyponatremia
7. Define and describe the risks of too rapid or delayed therapy for hyponatremia.

**Infectious Disease Basics** (reference lecture, simple case 21, 24)

1. Define the concepts of bacteriostatic, bacteriocidal, MIC and MBC
2. Define the classes of antibiotics and know some specific antibiotics within each class
3. Define the classes of organisms that are commonly associated with the following organ systems: HEENT, pulmonary, cardiac, abdomen, lymph node, skin, bone, genitourinary
4. List reasons why a particular antibiotic regimen may fail
5. Define the concept of antibiotic synergy
6. Identify infectious diseases that are potentially life threatening
7. Define and describe the epidemiology, pathophysiology, microbiology, symptoms, signs, typical clinical course, and preventive strategies for the most common nosocomial infections, including:
  - a. Urinary tract infection
  - b. Pneumonia
  - c. Surgical site infection
  - d. Intravascular device-related bloodstream infections
  - e. Skin infections
  - f. Health care associated diarrhea
8. Define and describe the general clinical risk factors for nosocomial infection, including:
  - a. Immunocompromise
  - b. Immunosuppressive drugs
  - c. Extremes of age
  - d. Compromise of the skin and mucosal surfaces secondary to
    - i. Drugs
    - ii. Irradiation
    - iii. Trauma

- iv. Invasive diagnostic and therapeutic procedures
  - v. Invasive indwelling devices (e.g. intravenous catheter, bladder catheter, endotracheal tube, etc.)
9. Define and describe empiric antibiotic therapy for the most common nosocomial infections recognizing resistance patterns.
  10. Define and describe the epidemiology, pathophysiology, microbiology, symptoms, signs, typical clinical course, and preventive strategies for colonization or infection with the following organisms:
    - a. Vancomycin-resistant enterococci
    - b. Clostridium difficile
    - c. Methicillin-resistant Staphylococcus aureus (MRSA)
    - d. Multidrug-resistant Gram-negative bacteria
  11. Describe clinical presentation of sepsis syndromes
  12. Develop appropriate treatment plan for patients with fever including the selection of an initial, empiric treatment regimen for patients with life-threatening sepsis.
  13. Recommend appropriate empiric therapy based on an understanding of urinary tract infection pathogenesis and resistance patterns.
  14. Interpret a urinalysis (overlap with Renal Tests, Acute Renal Failure).
  15. *Demonstrate knowledge of cerebrospinal fluid analysis and its interpretation.*
  16. *Define and describe the major routes of nosocomial infection transmission, including:*
    - a. *Contact*
    - b. *Droplet*
    - c. *Airborne*
    - d. *Common vehicle*

**Immuno tests** (reference lecture)

1. Define and describe indications for performing an arthrocentesis and the results of synovial fluid analysis.
2. Describe the diagnostic approach to:
  - a. Rheumatoid arthritis
  - b. Spondyloarthropathies (reactive arthritis/Reiter's syndrome, ankylosing spondylitis, psoriatic arthritis)
  - c. Systemic lupus erythematosus
  - d. Systemic sclerosis
  - e. Raynaud's syndrome/phenomenon
  - f. Sjogren's syndrome
  - g. Temporal arteritis and polymyalgia rheumatica
  - h. Other systemic vasculitides
  - i. Polymyositis and dermatomyositis
  - j. Fibromyalgia
3. Laboratory interpretation: Be able to recommend when to order diagnostic and laboratory tests and be able to interpret them, both prior to and after initiating treatment based on the differential diagnosis. Laboratory and diagnostic tests should include, when appropriate:

- a. CBC with differential
- b. Synovial fluid analysis (Gram stain, culture, crystal exam, cell count with differential, and glucose)
- c. Uric acid
- d. ESR/CRP
- e. Rheumatoid factor/anti-CCP
- f. Antinuclear antibody test (ANA) and anti-DNA test

**Liver disease** (reference case discussion, simple case 11, 36)

1. Develop an approach to the patient with clinical jaundice.
2. Recognize the five serologic types of hepatitis (A,B,C,D and E), their primary mode of transmission, that only B, C and D can culminate in chronic hepatitis, and that liver biopsy is essential in establishing the diagnosis of chronic disease.
3. Recognize that active and passive immunization is available for hepatitis A and B only.
4. Recognize that treatment of chronic B and C disease is available with interferon and several oral agents.
5. Recognize some of the indications for hepatic transplantation.
6. Define and describe the symptoms, signs and complications of portal hypertension.
7. Define and describe the pathophysiology and common causes of ascites.
8. Identify causes of portal hypertension unrelated to liver disease.
9. Complete an abdominal exam, including evaluation for presence of ascites.
10. Define and describe the pathophysiologic manifestations, symptoms, signs, treatment, prognosis, and complications of alcohol-induced liver disease including but not limited to:
  - a. Spontaneous bacterial peritonitis
  - b. Hepatic encephalopathy
  - c. Hepatorenal syndrome
11. Define and describe the analysis of ascitic fluid and its use in the diagnostic evaluation of liver disease including analysis of the serum to ascites albumin gradient (SAAG).
12. Define and describe the epidemiology, pathophysiology, symptoms, signs, and typical clinical course of cholelithiasis and cholecystitis.
13. Define and describe the clinical syndrome of “ascending cholangitis” including its common causes and typical clinical course.
14. Understand pathophysiology of conjugated and unconjugated hyperbilirubinemia (Overlap with Liver Function Tests).
15. Describe the common types of liver diseases and their risk factors (including inherited and acquired).
16. Know when to order laboratory tests for evaluation of liver disease and when a liver biopsy might be indicated (Overlap with Liver Function Tests).
17. *Define and describe genetic considerations in liver disease (i.e. hemochromatosis, Wilson’s disease, alpha-1 antitrypsin deficiency, Gilbert’s syndrome)*
18. *Discuss the CAGE screening tool for alcohol abuse.*



### **Liver function test interpretation** (reference lecture)

1. Define and describe the biochemical/physiologic/mechanistic approach to and common causes of hyperbilirubinemia, including:
  - a. Increased production
  - b. Decreased hepatocyte uptake
  - c. Decreased conjugation
  - d. Decreased excretion from the hepatocyte
  - e. Decreased small duct transport (intrahepatic cholestasis)
  - f. Decreased large duct transport (extrahepatic cholestasis, obstructive jaundice)
2. Define and describe the use of serum markers of liver injury (e.g. AST, ALT, GGT, alk phos) and function (e.g. bilirubin, ALB, PT/INR) in the diagnostic evaluation of hepatobiliary disease
3. Define and describe the clinical significance of asymptomatic, isolated elevation of AST/ALT, GGT, and/or alk phos
4. Define and describe the common pathologic patterns of liver disease and their common causes, including:
  - a. Steatosis (fatty liver)
  - b. Hepatitis
  - c. Cirrhosis
  - d. Infiltrative
  - e. Intrahepatic cholestasis
  - f. Extrahepatic cholestasis (obstructive jaundice)
5. Define and describe the epidemiology, symptoms, signs, typical clinical course, and prevention of viral hepatitis (Overlap with Liver Disease)
6. Define and describe the distinctions between acute and chronic hepatitis (Overlap with Liver Disease)
7. Define and describe the epidemiology, symptoms, signs, and typical clinical course of autoimmune liver diseases such as autoimmune hepatitis, primary biliary cirrhosis, and primary sclerosing cholangitis.
8. Define and describe common causes of drug-induced liver injury.
9. Define and describe genetic considerations in liver disease (i.e. hemochromatosis, Wilson's disease, alpha-1 antitrypsin deficiency, Gilbert's syndrome)
10. Define and describe the epidemiology, pathophysiology, symptoms, signs, and typical clinical course of cholelithiasis and cholecystitis (note overlap with liver disease).
11. Define and describe the clinical syndrome of "ascending cholangitis" including its common causes and typical clinical course (note overlap with liver disease).
12. Define the indications for and utility of hepatobiliary imaging studies, including:
  - a. Ultrasound
  - b. Nuclear medicine studies
  - c. CT
  - d. MRI
  - e. Magnetic resonance cholangiopancreatography (MRCP)
  - f. Endoscopic retrograde cholangiopancreatography (ERCP)

**Lung cancer/pulmonary nodule** (reference case discussion)

1. Define and describe the risk factors for lung cancer.
2. Define, describe, and discuss characteristics of a pulmonary nodule(s) on CXR or CT that makes it more or less likely to be malignant.
3. Define and describe the general approach to the evaluation and management of a solitary pulmonary nodule including FNA, bronchoscopy, CT-guided biopsy, PET scan, open lung biopsy, lobectomy.
4. Define and describe paraneoplastic syndromes related to primary lung cancer.
5. Define and describe general treatment options for lung cancer.
6. Define and describe minimal pulmonary function requirements for lung cancer resection.
7. Define and describe the basic principles and general prognosis for patients with various stages of lung cancer.

**Mental status changes** (reference case discussion, simple case 25, 26)

1. Define or describe mental status changes and the syndromes of dementia and delirium (acute confusional state) as well as psychiatric illnesses that may present as changes in mental status.
2. Define or describe the major points of differentiation between dementia, delirium, and depression on history, physical examination, and mental status testing.
3. Define or describe the differential diagnosis for dementia, the major causes of dementing illnesses, and the work up for dementia.
4. Define or describe the major causes for delirium (acute confusional states) and the diagnostic evaluation of the delirious patient.
5. Define or describe that mental status changes are a common pathway of a variety of illnesses in older patients and that older people should not be assumed to be demented when they present with mental status changes.
6. Recognize the risk factors for developing altered mental status, including:
  - a. Dementia.
  - b. Advanced age.
  - c. Substance abuse.
  - d. Comorbid physical problems such as sleep deprivation, immobility, dehydration, pain, and sensory impairment.
  - e. ICU admission.
7. Discuss the pathophysiology, symptoms, and signs of the most common and most serious causes of altered mental status, including:
  - a. Metabolic causes (e.g. hyper/hyponatremia, hyper/hypoglycemia, hypercalcemia, hyper/hypothyroidism, hypoxia/hypercapnea, B12 deficiency, hepatic encephalopathy, uremic encephalopathy, drug/alcohol intoxication/withdrawal, and Wernicke's encephalopathy).
  - b. Structural lesions (e.g. primary or metastatic tumor, intracranial hemorrhage, subdural hematoma).
  - c. Vascular (e.g. cerebrovascular accident, transient ischemic attack, cerebral vasculitis)

- d. Infectious etiologies (e.g. encephalitis, meningitis, urosepsis, endocarditis, pneumonia, cellulites).
  - e. Seizures/ post-ictal state.
  - f. Hypertensive encephalopathy.
  - g. Low perfusion states (e.g. arrhythmias, MI, shock, acute blood loss, severe dehydration).
  - h. Miscellaneous causes (e.g. fecal impaction, postoperative state, sleep deprivation, urinary retention).
8. Develop a management plan for the most common causes of altered mental status including a diagnostic evaluation.
  9. Recognize the importance of thoroughly reviewing prescription medications over-the-counter drugs, and supplements and inquiring about substance abuse.
  10. Identify nonpharmacologic measures to reduce agitation and aggression, including:
    - a. Avoiding the use of physical restraints whenever possible.
    - b. Using reorientation techniques.
    - c. Assuring the patient has their devices to correct sensory deficits.
    - d. Promoting normal sleep and day/night awareness.
    - e. Preventing dehydration and electrolyte disturbances.
    - f. Avoiding medications which may worsen delirium whenever possible (e.g. anticholinergics, benzodiazepines, etc.).
  11. Identify the risks of using physical restraints.
  12. Define and describe the risk and benefits of using low-dose high potency antipsychotics for delirium associated agitation and aggression.
  13. *Define or describe that mental status changes are a common event in the care of patients with HIV related illness.*
  14. *Identify indications, contraindications, and complications of lumbar puncture.*

**Pneumonia** (reference case discussion, simple case 22)

1. Define and describe the epidemiology, pathophysiology, symptoms, signs, and typical clinical course of community-acquired, nosocomial, and aspiration pneumonia and pneumonia in the immunocompromised host.
2. Define and describe the conceptualization of “typical” and “atypical” pneumonia and its limitations.
3. Define and describe common pneumonia pathogens (viral, bacterial, mycobacterial, and fungal) in immunocompetent and immunocompromised hosts.
4. Define and describe identify patients who are at risk for impaired immunity.
5. Define and describe indications for hospitalization and ICU admission of patient with pneumonia.
6. Define and describe the antimicrobial treatments (e.g. antiviral, antibacterial, antimycobacterial, and antifungal) for community-acquired, nosocomial, and aspiration pneumonia, and pneumonia in the immunocompromised host.
7. Define and describe the implications of antimicrobial resistance.
8. Define and describe the pathogenesis, symptoms, and signs of the complications of acute bacterial pneumonia including: bacteremia, sepsis, parapneumonic effusion, empyema, meningitis, and metastatic microabscesses.

9. Define and describe the indications for and efficacy of influenza and pneumococcal vaccinations.
10. Define and describe the Centers for Medicare and Medicaid Services (CMS) and the Joint Commission on the Accreditation of Healthcare Organizations (JCAHO) quality measures for community-acquired pneumonia treatment.
11. Recognize bronchial breath sounds, rales (crackles), rhonchi and wheezes, signs of pulmonary consolidation, and pleural effusion on physical exam.
12. Recommend when to order diagnostic laboratory tests—including complete blood counts, sputum gram stain and culture, blood cultures, and arterial blood gases—how to interpret those tests, and how to recommend treatment based on these interpretations.

**Pulmonary tests** (reference lecture, simple case 28)

1. Distinguish between the various mechanisms of hypoxia
2. Describe how to calculate the A-a gradient
3. Describe and discuss the interplay between oxygen content, delivery and extraction
4. Identify the principles determining one's CO<sub>2</sub>
5. Describe the concept of Dead Space Ventilation
6. Interpret PFT's recognizing obstruction, restriction, and diffusion impairments and use them to recommend appropriate therapy.
7. Accurately interpret arterial blood gas (note overlap with acid-base disorders).
8. List major pathologic states causing dyspnea (note overlap with dyspnea).
9. Relate the utility of supplemental oxygen and the potential dangers of overly aggressive oxygen supplementation.
10. Recognize the various oxygen delivery devices.

**Renal tests** (reference lecture, simple case 23)

1. Interpret a urinalysis, including microscopic examination for casts, red blood cells, white blood cells, and crystals (Overlap with Acute Renal Failure).
2. Define and describe the distinction between the three major pathophysiologic etiologies for acute renal failure (ARF) based on urinalysis, urine studies, and radiological imaging:
  - a. Decreased renal perfusion (prerenal)
  - b. Intrinsic renal disease (renal)
  - c. Acute renal obstruction (postrenal)
3. Define and describe the significance for proteinuria in CKD.
4. *Define and describe the most common etiologies of chronic kidney disease (CKD) based on:*
  - a. *DM*
  - b. *Hypertension*
  - c. *Glomerulonephritis*
  - d. *Polycystic kidney disease*
  - e. *Autoimmune diseases (e.g. systemic lupus erythematosus)*
  - f. *The staging scheme for CKD*

5. Define and describe the pathophysiology of anemia in CKD.

**Rheumatological diseases** (reference lecture, simple case 32)

1. Define and describe a systematic approach to joint pain based on an understanding of pathophysiology to classify potential causes.
2. Define and describe the effect of the time course of symptoms on the potential causes of joint pain (acute vs. subacute vs. chronic).
3. Define and describe the difference between and pathophysiology of arthralgia vs. arthritis and mechanical vs. inflammatory joint pain.
4. Define and describe the distinguishing features of intra-articular and periarticular complaints (joint pain vs. bursitis and tendonitis).
5. Define and describe the effect of the features of joint involvement on the potential causes of joint pain (monoarticular vs. oligoarticular vs. polyarticular, symmetric vs. asymmetric, axial and/or appendicular, small vs. large joints, additive vs. migratory vs. intermittent).
6. Define and describe the indications for performing an arthrocentesis and the results of synovial fluid analysis
7. Define and describe the pathophysiology and common signs and symptoms of:
  - a. Osteoarthritis
  - b. Crystalline arthropathies
  - c. Septic arthritis
8. Define and describe the basic pathophysiology of autoimmunity and autoimmune diseases.
9. Define and describe typical clinical scenarios when systemic rheumatologic disorders should be considered:
  - a. Diffuse aches and pains
  - b. Generalized weakness/fatigue
  - c. Myalgias with or without weakness
  - d. Arthritis with systemic signs (e.g. fever, weight loss)
  - e. Arthritis with disorders of other systems (e.g. rash, cardiopulmonary symptoms, gastrointestinal symptoms, eye disease, renal disease, neurologic symptoms)
10. Discuss and describe the typical clinical and laboratory findings of rheumatoid arthritis, systemic lupus erythematosus (SLE), dermatomyositis, and systemic vasculitis (note overlap with immuno tests).
11. Compare and contrast the various causes of inflammatory polyarthritis.
12. Define and describe the common signs and symptoms of and diagnostic approach to:
  - a. Rheumatoid arthritis
  - b. Spondyloarthropathies (reactive arthritis/Reiter's syndrome, ankylosing spondylitis, psoriatic arthritis)
  - c. Systemic lupus erythematosus
  - d. Systemic sclerosis
  - e. Raynaud's syndrome/phenomenon
  - f. Sjogren's syndrome
  - g. Temporal arteritis and polymyalgia rheumatica

- h. Other systemic vasculitides
- i. Polymyositis and dermatomyositis
- j. Fibromyalgia

13. *Define and describe indications for and effectiveness of intra-articular steroid injections.*

14. *Define and describe treatment options for gout (e.g. colchicine, NSAIDs, steroids, uricosurics, xanthine oxidase inhibitors).*

**Substance Abuse** (reference simple case 9)

1. Take a substance abuse history and provide counseling in a non-judgmental manner.
2. Recognize the clinical presentations of substance abuse and recommend treatment.
3. Apply diagnostic criteria for alcohol abuse, dependence, and addiction.
4. Recommend basic prevention and treatment for alcohol withdrawal.
5. Identify the presenting signs and symptoms of intoxication and overdose of common substances of abuse.
6. Understand how homelessness can influence patient's access to illicit substances and interfere with ability to enable effective treatment.

**Syncope** (reference simple case 3)

1. List the common causes of syncope.
2. Recognize the important aspects of the history and physical exam in a patient with syncope.
3. Explain the approach to the evaluation and treatment of a patient with syncope.
4. Explain how atrial fibrillation, aortic stenosis and mitral stenosis may lead to syncope.
5. Identify atrial fibrillation on an electrocardiogram.(note overlap with atrial fib case)