MASTER THE BOARDS

Internal Medicine Board Review

Course Book 2013–2014

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Master the Boards Internal Medicine Board Review Course Book

2013–2014

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"I learned this, at least, by my experiment: That if one advances confidently in the direction of his dreams, and endeavors to live the life which he has imagined, he will meet with a success unexpected in common hours. He will put some things behind, will pass an invisible boundary; new, universal, and more liberal laws will begin to establish themselves around and within him; or the old laws be expanded, and interpreted in his favor in a more liberal sense, and he will live with the license of a higher order of beings. In proportion as he simplifies his life, the laws of the universe will appear less complex, and solitude will not be solitude, nor poverty poverty, nor weakness weakness. **If you have built castles in the air, your work need not be lost. Now put the foundations under them.**"

—Thoreau, *Walden*

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Contents

Chapter 1. Cardiology 1

Chapter 2. Gastroenterology 65

Chapter 3. Neurology 115

Chapter 4. Nephrology 167

Chapter 5. Endocrinology 215

Chapter 6. Hematology/Oncology 271

Chapter 7. Pulmonology/Critical Care 337

Chapter 8. General Internal Medicine 387

Chapter 9. Dermatology 411

Chapter 10. Rheumatology 419

Chapter 11. Infectious Diseases 467

Chapter 12. Statistics/Preventive Medicine/Ethics 531

Cardiology

1

ISCHEMIC HEART DISEASE

Case 1

44-year-old woman in office with intermittent substernal chest pain for last several weeks. Sometimes with exertion, sometimes at rest, no fixed pattern. She also complains of nausea. No past medical history.

1. Most common risk for coronary artery disease?

2. Worst risk factor for coronary disease?

3. What three features of chest pain on history or physical on the Boards tell you for sure the pain is *not* ischemic in nature?

4. Her initial EKG is normal. Next step in management?

   A. CKMB
   B. Troponin
   C. EKG
   D. Stress
   E. Holter

   Answer:

5. What in the question will tell you to answer "a thallium (nuclear) stress test"?

6. When is a dipyridamole, adenosine, or dobutamine stress test the answer?

7. What is the most accurate means of determining if she has Prinzmetal angina?

Summary: Case 1

The most common risk factor for coronary artery disease is hypertension. The other clear risk factors are diabetes, hyperlipidemia, an HDL <40, tobacco smoking, and a family history of premature coronary disease (age <55 in men, <65 in women). Although obesity is a general reason for an increase in all cause mortality, it is not a distinct risk for coronary disease by itself separate from the hypertension, diabetes, and hyperlipidemia that it causes. Many causes of chest pain that are not cardiac in nature are dyspnea, diaphoresis, and anxiety. The main ways to distinguish chest pain as definitely not being cardiac in nature on a board test are: pain that changes with position and/or respiration or pain associated with chest wall tenderness. When the patient cannot exercise, then you must use a pharmacologic method of simulating exercise. The dipyridamole (or adenosine) stress test and the dobutamine echo have the same sensitivity and specificity. The way to detect ischemia on a standard exercise tolerance test is by looking for ST-segment depression as you achieve >80% of the maximum heart rate. If the patient already has significant abnormalities of the ST segment on a baseline EKG, then you cannot use standard exercise stress testing to make your diagnosis. When the EKG has these abnormalities, your answer should be either a stress test using thallium or sesta-MIBI or echocardiography. All of these methods have the same sensitivity and specificity, and you cannot be asked to choose between them.

Prinzmetal angina occurs in younger patients who are often tobacco smokers who complain of chest pain that has no fixed relationship to exercise. The pain often occurs at rest and awakens the patient from sleep. Although these patients have ST-segment elevation, this finding by itself is not specific enough to diagnose Prinzmetal. If you see a case with ST-segment elevation, you must first treat the patient as if he had an acute infarction. The diagnosis can be specifically made only by coronary angiography. Stimulation of the vasospasm with acetylcholine helps confirm the diagnosis. Treatment of Prinzmetal is with nitroglycerin and calcium channel blockers. Beta blockers should be avoided.

1. Which is a contraindication to dipyridamole-thallium testing?

   A. Unilateral amputee
   B. Asthma
   C. Diabetes
   D. Peripheral arterial disease
   E. Obesity

   Answer:

2. Patient with duodenal ulcer by scope two months ago. Been on PPI for 2 months. Now with chest pain.

   A. Aspirin yes
   B. Aspirin no

   Answer:

Case 2

44-year-old woman in office complaining of intermittent substernal chest pain for several weeks. The pain happens sometimes with exertion and sometimes at rest, no fixed pattern. Also complains of nausea. Stress test is **abnormal**. No past medical history.

1. What is the next step in management?

   A. Aspirin
   B. Angiography
   C. Echocardiogram
   D. Nitrates
   E. Metoprolol

   Answer:

2. What will you do next for each of these?

LDL: 191	LDL: 161	LDL: 131	LDL: 101

   A. Diet and exercise
   B. Statin
   C. Niacin
   D. Cholestyramine
   E. Ezetimibe

   Answer:

3. Coronary artery disease equivalents?

4. Most common adverse effect of statins?

Note

Unstable Angina

- New pain
- Rest pain
- Worse pain

Summary: Case 2

This patient has an abnormal stress test, implying that the most important step is to start therapy for ischemic heart disease. The most common error with a case like this is to answer "Angiography" after the abnormal stress test. Although the angiogram is important in determining whether the stress test is a true positive, as well as determining whether coronary bypass is necessary, this test is not as important as starting therapy. You should emphasize the medications that will potentially impact mortality, such as aspirin and beta blockers. Nitrates should be given to any patient who has ischemic chest pain. Calcium channel blockers should be used for those who cannot tolerate beta blockers.

Note

Nuclear Isotopes

- Thallium
- Sestamibi
- Teboroxime

This patient should be started on a statin if the LDL is >100 mg/dL. These drugs are considered optional with an LDL between 70 and 100 mg/dL if there is CAD *and* continued smoking or diabetes. If two or more risk factors are present, then your answer should be statins if lifestyle modifications cannot get the LDL <130 mg/dL. The fact that this patient has no risk factors for ischemic disease does not matter because she has an abnormal stress test. The same is true if she has diabetes, aortic disease, carotid disease, or peripheral arterial disease. These are all considered the equivalent of having coronary disease. If there is no coronary disease or its equivalent, then you must look at the number of risk factors. If there is only one risk factor (such as hypertension, HDL <40 mg/dL, tobacco smoking, premature family history of disease, or age >45 in men, >55 in women) then you do not start statins until the LDL is above 190 mg/dL. If two of these risk factors are present, then statins are started above an LDL of 160 mg/dL. Although niacin, cholestyramine, ezetimibe, and fibric acid derivatives such as gemfibrozil all lower LDL and raise HDL, they do not have as much of an effect on reducing mortality as do the statins.

1. A 54-year-old man with a history of diabetes comes to the office for routine management. He is found to have an LDL of 137. His stress test is normal. What is the goal of therapy for his LDL?

   A. <70
   B. <100
   C. <130
   D. <160
   E. <190

   Answer:

2. Which has greatest risk of myositis when used in combination with a statin?

   A. Cholestyramine
   B. Niacin
   C. Ezetimibe
   D. Fibric acid derivatives

   Answer:

Case 3

68-year-old man comes to emergency department (ED) of a small rural hospital that has no cath lab with **1 hour** of crushing substernal chest pain after shoveling snow. The pain radiates to arm and jaw. He is sweating and nauseated. History of hypertension. Smokes cigarettes. EKG: 2 mm ST elevation V2–V4.

1. Best initial step?

   A. Oxygen
   B. Nitrates and morphine
   C. Aspirin
   D. Thrombolytics
   E. Metoprolol
   F. Transfer for angioplasty

   Answer:

2. What will you do if these treatments do not lead to resolution of the pain (i.e., if the best initial therapy fails)?

3. When are calcium blockers the answer?

4. When is lidocaine or amiodarone the answer?

5. Most accurate diagnostic step at **this** time?

   A. CK-MB
   B. Troponin
   C. Myoglobin
   D. LDH

   Answer:

6. What is the most common dysrhythmia to occur with reperfusion, and how will you treat it?

   A. Atrial fibrillation
   B. Atrial flutter
   C. Accelerated idioventricular rhythm
   D. Ventricular fibrillation
   E. Ventricular tachycardia
   F. Asystole

   Answer:

7. When is coronary artery bypass grafting (CABG) the answer?

   A. Left anterior descending lesion of >50%
   B. Right coronary of >70%
   C. Three vessels >70% stenotic
   D. Right coronary >70% and circumflex >70%

   Answer:

Summary: Case 3

The most important point to take into account on the examination is which measures will lower mortality in an infarction. These are aspirin, angioplasty, thrombolytics, beta blockers, ACE inhibitors if the ejection fraction is <40%, statins if the LDL is >100 mg/dL, and clopidogrel. Although clopidogrel is effective, this drug is currently recommended as the standard of care only if the patient cannot tolerate aspirin. Ventricular dysrhythmias developing within 48 hours of an acute infarction have no effect upon mortality. Calcium channel blockers have no definite effect upon lowering mortality after a myocardial infarction. They should be used only if the patient cannot tolerate beta blockers, such as in the case of severe asthma. Prophylactic anti-arrhythmic medications such as lidocaine do not offer a survival advantage as compared with simply monitoring the patient for serious ventricular arrhythmias and treating them as they arise. This is probably because lidocaine is occasionally pro-arrhythmic. Within the first 4 hours after the start of chest pain, the only enzyme that is routinely elevated is the myoglobin. A normal myoglobin at 4 hours has enormous negative predictive value, although it is nonspecific if it is elevated. The troponin offers greater specificity as compared with CK-MB levels. The troponin will also remain elevated for up to 2 weeks after an infarction, particularly if there is renal insufficiency. The most common arrhythmia after the use of thrombolytics is an accelerated idioventricular arrhythmia, but it does not need to be treated. A coronary artery bypass is used in the management of an acute myocardial infarction only if all the other modalities, including angioplasty, have been used and have been ineffective.

In general, angioplasty offers a greater survival advantage in the management of ST-segment elevation infarctions. Thrombolytics are preferred when the patient presents within the first 3 hours of the onset of chest pain or if the question indicates that the hospital is a small one that does not offer emergency angioplasty. If the patient presents after 3 hours, then transfer to a hospital where angioplasty is possible is preferred as long as the procedure can be performed within 2 hours.

1. Man comes with substernal chest pain and ST-segment elevation in II, III, aVF. He has received aspirin and metoprolol, and has undergone angioplasty. Which is most likely to lower his mortality?

   A. Oxygen
   B. Nitrates
   C. ACE inhibitors
   D. Statins
   E. Morphine
   F. Lidocaine

   Answer:

Case 4

68-year-old man comes to ED with 1 hour of crushing substernal chest pain after shoveling snow. The pain radiates to his arm and jaw. History of hypertension and smokes. EKG shows 2 mm of ST elevation in V2–V4. **Aspirin, metoprolol, and atorvastatin have been started**.

1. What will benefit the patient most?

   A. Prasugrel
   B. Spironolactone
   C. Abciximab
   D. Implantable defibrillator
   E. Nitroglycerin

   Answer:

Summary: Case 4

Absolute contraindications to the use of thrombolytics consist of a recent history (1 year) of nonhemorrhagic stroke or head trauma, intracranial mass, intracranial bleeding at any time in the past, active serious bleeding such as melena, or a risk of serious bleeding such as an aortic dissection. Relative contraindications to the use of thrombolytics are diabetic retinopathy (particularly with hemorrhages), pregnancy, a significantly elevated blood pressure above 180/110 mm Hg, active peptic ulcer disease, or if the patient uses warfarin and has an INR >2. An example of minor bleeding in which thrombolytics can still be used would be menstruation or heme-positive brown stool.

Although primary angioplasty is superior to thrombolytics if it can be performed rapidly (<90 minutes after the patient's arrival in the emergency department), the standard of care in the United States can still be considered thrombolytics if the patient presents within the first 3 hours after the onset of chest pain and there is no technically qualified angioplasty facility. Only 20% of hospitals in the country can do primary angioplasty. The strongest indication for the use of angioplasty with the initial management of a myocardial infarction is in those patients with a contraindication to the use of thrombolytics and in those in whom thrombolytics fail to result in reperfusion. Angioplasty is also superior to thrombolytics if the patient arrives in the emergency department several hours after the start of pain.

All patients with acute myocardial infarction should have either clopidogrel or prasugrel added to treatment. This is true even if angioplasty and stenting are not to be performed. Prasugrel has a greater risk of bleeding compared with clopidogrel.

1. 64-year-old man comes to ED 1 hour after he had 40 minutes of substernal chest pain. He had a nonhemorrhagic stroke 6 weeks ago and currently has a blood pressure of 182/108 mm Hg. EKG shows ST elevation in V2–V4. He has received aspirin and oxygen. Which is most appropriate in his management?

   A. Thrombolytics now
   B. Transfer for angioplasty
   C. Nitrates
   D. Coronary bypass surgery
   E. Add metoprolol and ACE inhibitors only
   F. Add metoprolol and ACE inhibitors, then give thrombolytics

   Answer:

Case 5

68-year-old man comes with 1 hour of crushing substernal chest pain after shoveling snow. He has a history of hypertension and smokes. His initial EKG shows a **new left bundle branch block**. You are not able to determine if there is ST-segment elevation.

1. What will you do next?

   A. Thrombolytics
   B. Abciximab
   C. Tirofiban
   D. Enoxaparin
   E. Argatroban

   Answer:

2. The patient undergoes reperfusion. Pain resolves. The next troponin several hours later is higher. What to do?

   A. Re-treat with thrombolytics
   B. Catheterize/PCI
   C. Nothing

   Answer:

Summary: Case 5

Cocaine blocks the reuptake of norepinephrine at the synapse. This results in the accumulation of norepinephrine with its powerful alpha-agonist activity. Cocaine-induced chest pain should be managed with the use of benzodiazepines and nitrates. Calcium channel blockers are sometimes used. It is important to avoid the use of beta blockers. When you block beta stimulation, you have an unopposed alpha activity, resulting in elevated blood pressure and myocardial work. Thrombolytics would be used only if there was an angiographically confirmed clot. The indication for the use of thrombolytics is the presence of at least 1 mm of ST-segment elevation in at least 2 electrically contiguous leads on the EKG in a patient presenting within 12 hours after the onset of chest pain. The other indication for the use of thrombolytics is the presence of a left bundle branch block (LBBB) that is not definitely known to be old.

1. Which decreases, the risk of atrial fibrillation most in coronary bypass surgery?

   A. Propranolol
   B. Digoxin
   C. Verapamil
   D. Diltiazem
   E. Ramipril

   Answer:

2. 24-year-old man comes with 30 minutes of chest pain after injecting cocaine. EKG is normal. What would you order first?

   A. Diltiazem
   B. Metoprolol
   C. Thrombolytics
   D. Angioplasty
   E. Angiography

   Answer:

3. Which of the following will most likely experience a benefit in mortality from calcium channel blockers?

   A. Hypertensive
   B. Asthmatic with coronary disease
   C. Person with cocaine-induced chest pain
   D. Person with Prinzmetal's (variant) angina

   Answer:

Case 6

68-year-old man comes to ED with 1 hour of crushing substernal chest pain radiating to his arm and jaw. He has never had chest pain before. EKG has 1 mm of ST depression (or normal) in V2–V4. Aspirin and clopidogrel have been started.

1. Next step?

   A. Ticlopidine
   B. IV unfractionated heparin
   C. Low molecular weight heparin
   D. Argatroban

   Answer:

2. His pain persists despite this. What will you do next?

   A. Thrombolytics
   B. Intra-aortic balloon pump
   C. Angiography
   D. Check troponin

   Answer:

Summary: Case 6

Glycoprotein IIb/IIIa inhibitors, such as eptifibatide and tirofiban, are antiplatelet medications that are best used in the management of severe cases of unstable angina. Their mortality benefit is best in those patients with a high risk for progression, such as those with ST-segment abnormalities, elevation in troponin levels, persistent pain; and in those with signs of congestive failure such as rales, an S_3 gallop, and a new or worsening murmur of mitral regurgitation. Clopidogrel should be added to those patients with non–ST-segment elevation myocardial infarctions who develop positive troponin levels.

Case 7

68-year-old man was admitted to your CCU earlier this evening with an inferior wall myocardial infarction. He received tPA, beta blockers, aspirin, nitrates, oxygen, morphine, and ACE inhibitors. You are now called because he has suddenly become confused. Blood pressure 70/40 mm Hg, pulse 40/min, respirations 16/min, and temperature 37.7°C (100°F) orally. His lungs are clear and he has canon "a" waves in his neck. He has a 3/6 systolic murmur, his extremities are nonedematous, and he is confused and disoriented on examination.

1. Most likely diagnosis?

2. Best initial therapy?

Summary: Case 7

When you see THIS in the case . . .	Then THIS is the diagnosis	Answer THIS as the test	And THIS as the treatment

Canon a waves are the exaggerated neck vein impulse caused by the contraction of the atrium against a closed tricuspid valve or against any form of increased right ventricular pressure or obstruction to flow. Canon a waves are found in complete heart block, ventricular tachycardia, ventricular pacemaker, tricuspid or pulmonic stenosis, pulmonary hypertension, and with SVT or junctional rhythms.

Absent a waves:	Atrial fibrillation
Prominent x descent:	Cardiac tamponade or constrictive pericarditis
Absent x descent:	Right ventricular infarction
Prominent v wave:	Tricuspid regurgitation
Prominent y descent:	Constrictive pericarditis

Right ventricular infarction complicates half of all cases of inferior wall (IW) myocardial infarctions. The clue to the diagnosis is the development of sudden hypotension in someone with IWMI. There will also be increased jugulovenous pressure (JVP) and clear lung fields. Kussmaul's sign (increasing JVP on inspiration) may also be present. The test is to do an EKG with right ventricular leads showing ST elevation. With hemodynamic monitoring, the right atrial pressure will be higher than the wedge pressure. The treatment is almost exclusively with fluids in addition to the usual medications for the treatment of myocardial infarction.

All of the complications of an acute myocardial infarction can present with hypotension. Only third-degree heart block will give you bradycardia, hypotension, and canon A waves in the neck. The best initial management of third-degree or complete heart block is with atropine if the patient is hypotensive. Although atropine may not help all patients, it is faster to administer and far more comfortable than a transcutaneous pacemaker. Even a hemodynamically stable patient with third-degree heart block must eventually be treated with a transvenous pacemaker.

Acute valve rupture can present with hypotension but should also result in tachycardia and congestion on lung examination. If the patient is not hypotensive, then afterload reduction with ACE inhibitors or nitroprusside should be used. If the patient has such severe disease that these medications cannot be used or are ineffective, then the patient should have an intra-aortic balloon pump placed in preparation for valve repair surgery.

1. 68-year-old man admitted with inferior wall myocardial infarction earlier this evening. He develops sudden onset of hypotension, tachycardia, distended neck veins, and clear lungs. No murmurs. BP unchanged during inspiration. He is given a bolus of normal saline. Next step in this patient?

   A. Right ventricular leads
   B. Echocardiography
   C. Swan-Ganz (right heart) catheterization
   D. Pericardiocentesis
   E. Surgical intervention

   Answer:

2. 72-year-old man admitted to hospital last week because of anterior wall myocardial infarction. He received aspirin, nitrates, metoprolol, atorvastatin, and trandolapril. On his fifth hospital day he develops recurrent chest pain and a new murmur at his left sternal border. Right heart catheterization shows an oxygen saturation in the right atrium of 75% and a saturation in the pulmonary artery of 92%. What is the most likely diagnosis?

   A. Tricuspid valve rupture
   B. Mitral valve rupture
   C. Ventricular septal rupture
   D. Atrial septal rupture
   E. Aortic valve rupture

   Answer:

3. Which of these increases with inspiration?

   A. Mitral regurgitation
   B. Mitral stenosis
   C. Tricuspid regurgitation
   D. Aortic stenosis
   E. Aortic regurgitation

   Answer:

Case 8

68-year-old man transferred from CCU 5 days ago after myocardial infarction becomes part of your service. No further chest pain or discomfort for last several days. Now ready for discharge.

1. What will you do prior to discharge?

   A. Echocardiogram
   B. Holter monitor
   C. Electrophysiology studies
   D. Exercise tolerance test

   Answer:

2. Is angiography necessary?

3. When will you answer coronary artery bypass grafting?

   A. Circumflex 99%, right coronary 85%
   B. Left main 40%
   C. Right coronary 90%, LAD 90% in a diabetic
   D. Circumflex 70% and left main 30%

   Answer:

4. Which will benefit him most?

   A. Tobacco cessation
   B. Pneumococcal vaccine
   C. Weight loss
   D. Relaxation methods

   Answer:

5. The patient's wife asks you if the patient is capable of having sex. What do you tell her?

Summary: Case 8

Stress testing prior to discharge is generally indicated in all patients after a myocardial infarction. A submaximal stress test can be performed at 5 days post-myocardial infarction or a maximal stress test at 2 weeks post-myocardial infarction. If ischemia is found, the patient should be offered angiography to see if coronary bypass will potentially lower mortality. If a patient continues to have ischemia postinfarction, there is no need to do the stress test and he should go straight to angiography. Coronary artery bypass grafting is the definite answer when the patient has left main coronary artery disease, or three-vessel disease. These are the circumstances in which CABG has been most clearly shown to lower mortality. The other indications for CABG are two-vessel disease with severely impaired left ventricular function and diabetics with two-vessel disease or worse. In general, all patients postinfarction should be discharged on aspirin, beta blockers, nitrates, and ACE inhibitors. The ACE inhibitor can be stopped at 6 weeks if there is no evidence of left ventricular systolic dysfunction.

1. Patient is being discharged after myocardial infarction. What will you discharge him on?

   A. Aspirin, clopidogrel, beta blockers, ACE inhibitors, statins
   B. Beta blockers, ACE inhibitors, warfarin
   C. Aspirin alone
   D. Aspirin, beta blockers, warfarin, prasugrel

   Answer:

2. What condition will cause orthodeoxia (desaturation while standing or sitting up)?

   A. Hepatopulmonary syndrome
   B. Ventricular septal defect
   C. Diaphragmatic paralysis
   D. Pulmonary embolism
   E. ARDS

   Answer:

3. Which of the following decreases level of digoxin in blood?

   A. Amiodarone
   B. Verapamil
   C. Amoxicillin
   D. Cholestyramine

   Answer:

4. You are starting a patient on amiodarone for atrial fibrillation. The patient is already on digoxin and warfarin. What would you recommend?

   A. Increase digoxin dose and decrease warfarin dose
   B. Increase digoxin dose and increase warfarin dose
   C. Decrease both digoxin and warfarin dose
   D. Decrease digoxin dose and increase warfarin dose

   Answer:

Hepatopulmonary syndrome is a complication of cirrhosis characterized by hypoxia and orthodeoxia. This is a right to left intrapulmonary shunt. It is lung disease and hypoxia on the basis of liver disease. Amiodarone will inhibit the metabolism of both digoxin and warfarin. When starting amiodarone, the doses of both digoxin and warfarin will likely need to be decreased.

Case 9

68-year-old man with angina is about to undergo coronary angiography. He has history of rash with use of dye in past.

1. What do you use to decrease the risk of an allergic reaction?

   A. Steroids
   B. Epinephrine
   C. Diphenhydramine
   D. Hydrocortisone and diphenhydramine
   E. Loratadine

   Answer:

2. A patient is about to undergo coronary artery bypass grafting. He will have a sternotomy and extra-corporeal cardiopulmonary bypass. What is the most common complication from this procedure?

   A. Stroke
   B. Sternotomy wound infection
   C. Neurocognitive dysfunction
   D. Myocardial infarction

   Answer:

Summary: Case 9

The most effective way to prevent contrast induced hypersensitivity reactions is to administer steroids and antihistamines. The most common complication of cardiopulmonary bypass, which is necessary for coronary artery surgery, is neurocognitive dysfunction. This is a subtle decrease in mental function that can be difficult to detect. The presumed mechanism of this dysfunction is impaired cerebral perfusion. There is no abnormality found on imaging of the brain because it is not a stroke.

CONGESTIVE HEART FAILURE

Case 1

64-year-old woman with history of myocardial infarction comes to ED with acute onset of shortness of breath over several hours. She can't remember what medications she is supposed to be using. She has a bag of potato chips in one hand and a slice of pepperoni pizza in the other. She has rales to her apices, an S_3 gallop, pedal edema that extends to her areola, ascites, and jugulovenous distension.

1. What will you do first for her?

   Oxygen, diuretics, sit the patient upright; morphine, nitrates

2. She is still short of breath. What will you do now?

   A. Digoxin
   B. Diltiazem
   C. Dobutamine
   D. Metoprolol

3. What is the most accurate means of assessing her ejection fraction?

4. What will you do differently if labs show her creatinine is 2.3 (normal 0.4–1.1)?

5. When are angiotensin II receptor blockers the answer?

   When the ACE inhibitors cannot be tolerated because of adverse effects, such as cough

6. What tests will make a difference in her **acute** management?

   A. Chest xray
   B. Echocardiogram
   C. Nuclear ventriculogram
   D. EKG
   E. BNP

Two days later, the patient has completely improved. She is 10 lb lighter and has no dyspnea.

7. What will you discharge her on?

   A. ACE, beta blocker, spironolactone, diuretic
   B. ACE, hydralazine, diuretic
   C. ARB, spironolactone, digoxin
   D. Digoxin, furosemide, ACE

Summary: Case 1

S_3 gallop certainly indicates congestive failure. What should you think of as the answer to "What is the most likely diagnosis?" in other circumstances? An S_3 gallop can be considered normal in a person under the age of 30. An S_3 also occurs with mitral regurgitation and tricuspid regurgitation.

Widely split S_2 is found with mitral regurgitation, ventricular septal defects, right bundle branch block, and right ventricular volume or pressure overload such as in left-to-right shunts, pulmonic stenosis, and pulmonary hypertension.

The majority of patients with acute pulmonary edema or a decompensation of congestive failure will respond to preload reduction and oxygen. Preload reduction is best accomplished with intravenous diuretics, morphine, and nitrates. This therapy would be the same in systolic as well as diastolic dysfunction. A small number of patients with systolic dysfunction will need acute therapy with intravenous dobutamine as an inotrope. Long-term therapy with the positive inotrope milrinone will only increase mortality and should not be used. This management as well as the use of ACE inhibitors does not differ in the setting of renal insufficiency. A creatinine as low as 2.3 in particular is not a contraindication to any of these medications. The shortness of breath and hypoxia are far more dangerous to patients than a theoretical risk of worsening renal insufficiency. Angiotensin receptor blockers such as losartan, valsartan, irbesartan, candesartan, or telmisartan are specifically the best answer when patients cannot tolerate the long-term use of ACE inhibitors because of adverse effects, such as cough.

Systolic dysfunction is best treated with ACE inhibitors and beta blockers because these are the two medications with the greatest mortality benefit. Spironolactone also lowers mortality. Diuretics are used in any patient with fluid overload, be it secondary to systolic or diastolic dysfunction. For those who are still symptomatic from systolic dysfunction despite these therapies, digoxin is used in order to decrease the rate of hospitalization and frequency of acute exacerbations and decompensation.

Diastolic dysfunction is best treated with beta blockers. Digoxin has no benefit. ACE inhibitors are of less certain benefit.

1. Which is associated with widely split S_2?
   A. Left bundle branch block
   B. Aortic stenosis
   C. Right bundle branch block
   D. Eisenmenger phenomenon
   E. Hypertrophic obstructive cardiomyopathy

   Answer:

2. An 18-year-old patient is seen for routine examination before playing basketball. There is paradoxical splitting of S_2 heard at the base and no murmur. What is the diagnosis?
   A. Left bundle branch block
   B. Right bundle branch block
   C. Pulmonic stenosis
   D. Mitral regurgitation

   Answer:

Case 2

36-year-old multiparous woman comes to office a few weeks after the delivery of her last child. She has developed progressive shortness of breath with rales and an S_3 gallop. Chest x-ray shows pulmonary vascular congestion with an enlarged heart. Echo: dilated heart, diminished systolic function throughout. No history of coronary artery disease, hypertension, alcohol use, or valvular heart disease.

1. Most likely diagnosis?

2. Best initial therapy?

   A. Lisinopril
   B. Furosemide, lisinopril
   C. Spironolactone, lisinopril, carvedilol, furosemide
   D. Carvedilol, furosemide

   Answer:

3. What is the best **long-term** therapy for this patient, and what is her prognosis?

   A. Beta blocker, spironolactone
   B. Furosemide, biventricular pacemaker
   C. If ejection fraction worsens, proceed to transplantation
   D. Hydralazine

   Answer:

Summary: Case 2

Peripartum cardiomyopathy is diagnosed in any patient presenting with congestive failure in her third trimester of pregnancy or within the first 6 months postpartum after excluding other causes of congestive failure. This is exclusively a systolic dysfunction with a dilated cardiomyopathy. The management is the same as systolic dysfunction in general, except that ACE inhibitors cannot be given during pregnancy because of potential teratogenicity. If the heart returns to normal size, as it often does eventually, then the prognosis is very good. If the heart remains dilated, then only a transplantation will eventually solve the problem.

1. 44-year-old man comes with congestive failure from idiopathic dilated cardiomyopathy. He has a left bundle branch block pattern with QRS duration of 140 m/sec. Echo shows left ventricular enlargement with an ejection fraction of 22%. He is already on an ACE inhibitor, spironolactone, and carvedilol. What will benefit him most?

   A. Add hydralazine and isosorbide dinitrate
   B. Biventricular pacemaker
   C. Implanted cardioverter
   D. Both biventricular pacemaker and implanted cardioverter

   Answer:

2. 63-year-old woman confused and disoriented. Pulse 110, BP 80/60 mm Hg, and a temperature 37.2°C (99°F) The hematocrit is 27%, WBC 12,000, BUN 40, creatinine 1.8, with normal chest x-ray. The Swan-Ganz catheter shows: right atrium 4 (nl 2–8), right ventricle 20/4 (nl 20–25/6–12), wedge 6 (nl 6–12), cardiac output 6 L/min (nl 3.6–5.2), and peripheral resistance 325 (nl 700–1,600). What is the most likely diagnosis?

   A. Massive pulmonary embolism
   B. Cardiac tamponade
   C. Septic shock
   D. Hypovolemic shock

   Answer:

3. BNP is elevated in:

   A. Diastolic dysfunction
   B. Systolic dysfunction
   C. Right heart failure from COPD
   D. Pulmonary emboli
   E. All of the above

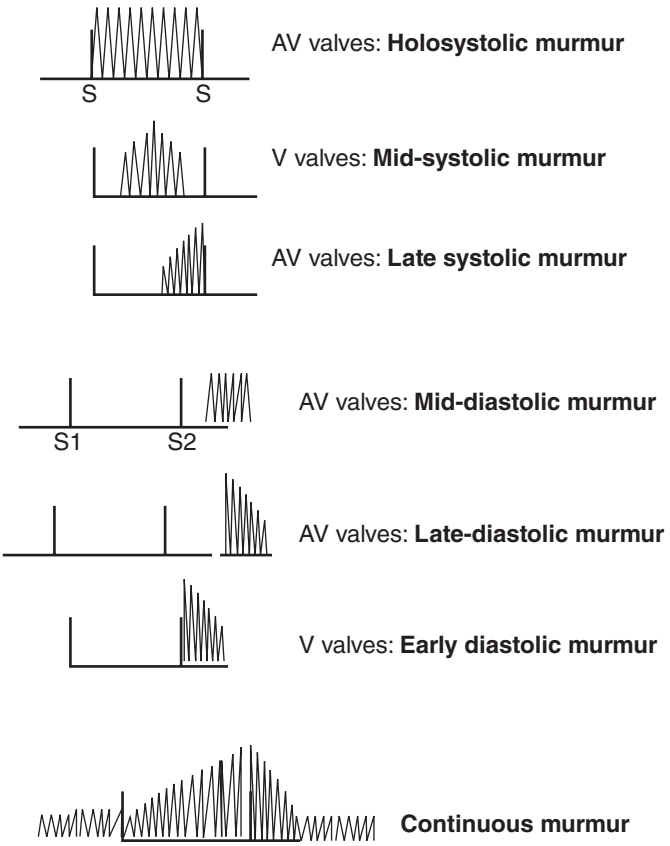
   Answer:

Note

Nesiritide does not lower mortality.

VALVULAR HEART DISEASE

Introduction to Auscultation



Case 1

27-year-old woman comes to office for mild dyspnea. She emigrated from South America several years ago. Respiratory rate 22/min, jugulovenous distention, and bilateral basilar rales. Cardiac examination reveals a loud S_1 and a high-pitched sound in diastole immediately followed by **a diastolic murmur at the apex**.

1. Most likely diagnosis?

2. What is the best initial test? What is the most accurate diagnostic test?

   Echocardiogram is always first. Cardiac angiography is more accurate and can give direct pressure measurements.

3. *What is the best initial therapy?*

Several months later the woman returns because of worsening dyspnea despite therapy. She is now 6 months pregnant.

4. What feature on cardiac exam would be indicative of worsening disease?

   A. Loud S1
   B. Systolic murmur
   C. Opening snap earlier
   D. Opening snap later

   Answer:

5. What is the best therapy for her now?

   A. Termination of pregnancy
   B. Mitral valve replacement
   C. Mitral balloon valvotomy now
   D. Mitral balloon valvotomy after delivery

   Answer:

6. What happens to blood return to heart with Valsalva maneuver?

   A. Increased thoracic pressure increases return
   B. Increased thoracic pressure decreases return
   C. Decreased thoracic pressure increases return

   Answer:

Summary: Case 1

Loud S_1 is caused by mitral stenosis, a short PR interval such as from WPW, tachycardia, and thyrotoxicosis. Anything that results in a premature (early) closure of the mitral valve makes the S_1 loud.

All forms of valvular heart disease present with symptoms of congestive failure when they finally become symptomatic. Mitral stenosis (MS) is especially characterized by the complications of having an enlarged atrium. These complications are atrial fibrillation, recurrent emboli, dysphagia from the pressure of the enlarged atrium against the esophagus, hoarseness from pressure on the recurrent laryngeal nerve, and jugulovenous distension. The echocardiogram is the best initial test for all forms of valvular heart disease. The cardiac angiogram is the most accurate test. The catheterization will allow the most accurate assessment of the exact valve diameter as well as a direct measurement of the pressure gradient across the valve. As MS worsens, the opening snap moves closer to S_2. The best initial therapy for MS is a balloon valvuloplasty.

1. Which is associated with fixed splitting of S_2?
   A. ASD
   B. VSD
   C. Mitral stenosis
   D. Aortic stenosis
   E. Mitral regurgitation

   Answer:

2. Which is most dangerous to a pregnant woman?
   A. Hypertrophic cardiomyopathy
   B. Mitral stenosis
   C. Mitral regurgitation
   D. Atrial septal defect without pulmonary hypertension

   Answer:

3. WPW has which of the following?
   A. Loud S_1
   B. Soft S_1
   C. Wide splitting of S_2
   D. Narrow splitting of S_2

   Answer:

Case 2

34-year-old woman in the office because of palpitations and chest pain. There is no syncope or lightheadedness with the palpitations. She cannot pinpoint any particular event that brings on the pain. She has a high-pitched sound in midsystole followed by a murmur. No rales and no jugulovenous distension.

1. Most likely diagnosis?

2. What would you do to confirm the diagnosis?

   Echocardiography

3. How will maneuvers such as Valsalva, squatting, and hand grip affect the murmur?

4. What therapy needed, if any?

   A. No treatment
   B. Verapamil
   C. Hydralazine
   D. Metoprolol
   E. Enalapril

   Answer:

5. Does this patient need endocarditis prophylaxis if she needs a dental filling or colonoscopy?

   A. Clindamycin
   B. Amoxicillin
   C. Nothing
   D. Ampicillin and gentamicin
   E. Antibiotic only if a biopsy is done

   Answer:

Summary: Case 2

Mitral valve prolapse (MVP) most commonly presents with atypical chest pain and palpitations. The best initial therapy is with beta blockers. Antibiotic prophylaxis is not needed even if the prolapse is severe enough to result in mitral regurgitation or a murmur. Dental fillings and colonoscopy, even with a biopsy, do not need prophylaxis. The murmur of MVP worsens whenever the heart decreases in size, and improves or becomes softer when the heart increases in size. Valsalva and standing decrease venous return to the heart. This will decrease cardiac size, and the degree of prolapse will increase or worsen. This leads to an earlier click and a greater intensity or loudness of the murmur. Amyl nitrate decreases afterload. The effect of amyl nitrate during auscultation is to increase the intensity of the murmurs of aortic stenosis, (IHSS) HOCM, and MVP. Amyl nitrate will decrease the murmurs of MR, AR, and VSD. Amyl nitrate is like giving an ACE inhibitor. ACE inhibitors help the treatment of MR, AR, and VSD, and therefore, amyl nitrate will help lessen the intensity of these murmurs. This will empty the heart more, and the MVP will again worsen. Hand grip or arterial cuff inflation increases afterload. The effect of hand grip is the opposite of everything described for amyl nitrate. Hand grip increases pressure on the brachial artery and increases afterload. Hand grip will worsen MR, AR, and VSD and improve AS, IHSS, and MVP. This will decrease cardiac emptying and increase cardiac size, which will decrease the intensity of the murmur of MVP.

1. Which of the following murmurs becomes worse with hand grip?

   A. Aortic stenosis
   B. Hypertrophic obstructive cardiomyopathy
   C. Mitral valve prolapse
   D. Aortic regurgitation

   Answer:

2. Which of the following will increase with phenylephrine?

   A. Aortic stenosis
   B. Hypertrophic obstructive cardiomyopathy
   C. Mitral valve prolapse
   D. Aortic regurgitation

   Answer:

Case 3

77-year-old man comes because of chest pain on exertion. Exam reveals 3/6 murmur at second right intercostal space radiating to carotid arteries. There is a paradoxically split S_2, S_4 gallop, and slow upstroke of the carotid arteries. EKG has an S wave in V_2 and an R wave in V_5 of 20 mm each. Cardiac enzymes are normal, and the patient is ready to leave the hospital the following day.

1. Most likely diagnosis?

2. Most accurate diagnostic test?

3. What will be the effect of hand grip, Valsalva, and leg raise on the murmur?

4. Worst prognostic factor for this patient?
   A. Angina
   B. Syncope
   C. Palpitations
   D. Congestive failure
   E. Atrial fibrillation

   Answer:

5. What treatment?

6. How would you manage this patient if he were asymptomatic and just had the murmur?

7. Most dangerous medical therapy?
   A. ACE inhibitor
   B. Spironolactone
   C. Beta blockers
   D. Amiodarone
   E. Digoxin

   Answer:

8. What is the utility of balloon valvuloplasty?

   It is only for those who refuse or cannot tolerate surgery.

Summary: Case 3

Aortic stenosis (AS) is most commonly caused by calcification of the valve as the patient ages. AS presents most commonly with angina. Syncope is not as common a presentation as angina. Angina occurs because there is an obstruction to the flow of blood into the coronary ostia. In addition, there is an increased oxygen demand because of left ventricular hypertrophy causing increased wall tension and more myocardial oxygen consumption. At least half of the patients with AS have concomitant coronary artery disease. The worst prognostic factor is the presence of congestive failure. Once the heart starts to dilate there is nothing that can be done to restore the heart to normal size. The most accurate diagnostic test is the angiogram. Only angiography allows an exact assessment of the pressure gradient across the valve.

Aortic stenosis is a disease that is managed almost exclusively by surgery. Preload reduction with diuretics can be used in small amounts in those with congestive failure but is difficult to manage because it can decrease cardiac output. ACE inhibitors can actually be dangerous because these patients do not have the ability to simply increase cardiac output in response to a decrease in afterload. ACE inhibitors can cause syncope. If symptoms of angina, syncope, or congestive failure develop from aortic stenosis, then valve replacement is needed. Balloon valvuloplasty is not effective and is only rarely used as a bridge to surgery or in patients too ill to undergo surgery. Asymptomatic patients should be followed with annual echocardiography.

Valsalva maneuver and sudden standing lead to a decrease in the intensity, or loudness, of the murmur, because there is less blood to go across the stenotic valve. This decreases the pressure gradient and decreases the intensity of the murmur. The opposite is true of leg raise and squatting. Hand grip is a maneuver that increases afterload by compressing the peripheral arteries. It will decrease the pressure gradient across the valve, and the murmur will decrease in intensity.

A narrow or paradoxically split S_2 is found whenever there is delayed closure of the aortic valve. This occurs in aortic stenosis, severe hypertension, IHSS (HOCM), and left bundle branch block.

Fixed splitting of the S_2 is found predominantly in atrial septal defects (ASD).

1. Which of the following patients is the most appropriate to receive sildenafil (Viagra®)?

   A. A patient with angina who is on isosorbide dinitrate and atenolol
   B. A patient with mitral regurgitation and a normal left ventricle
   C. An elderly man with aortic stenosis and left ventricular hypertrophy
   D. A patient with hypertrophic cardiomyopathy

   Answer:

2. Which of the following is associated with paradoxical splitting of S_2?

   A. Right bundle branch block
   B. Wolf-Parkinson-White
   C. First-degree AV block
   D. Second-degree AV block
   E. Left bundle branch block

   Answer:

3. 72-year-old man with syncope. Echocardiogram shows calcified aorta with an area of 0.5 cm_2. Peak systolic gradient is 90 mm Hg. Next best step?

   A. ACE inhibitor
   B. Nifedipine
   C. Venous compression trousers
   D. Coronary angiography
   E. Warfarin

   Answer:

4. 20-year-old male on college basketball team comes for routine exam. Heart rate 50/min, BP 110/70 mm Hg, soft S_3 gallop, and a grade 1 systolic ejection murmur over left sternal border. Murmur decreases in intensity with standing and Valsalva maneuver, and increases after exercise. EKG shows mild left ventricular hypertrophy and sinus pauses up to 1 second. Echo shows ejection fraction 64% and a minimal increase in wall thickness. What do you recommend to this patient?

   A. Do not participate in sports any longer
   B. Propranolol
   C. Pacemaker placement
   D. Implantable defibrillator
   E. No specific treatment

   Answer:

5. Old man with aortic stenosis has syncope leading to hip fracture. What's first?

   A. Fix hip
   B. Fix heart

   Answer:

Case 4

26-year-old medical student short of breath playing basketball. He had syncopal episode during one of the games. He has S_4 gallop and 3/6 systolic murmur at left sternal border that improves with hand grip and worsens with standing.

1. Most likely diagnosis?

2. Most common presentation of this disorder?

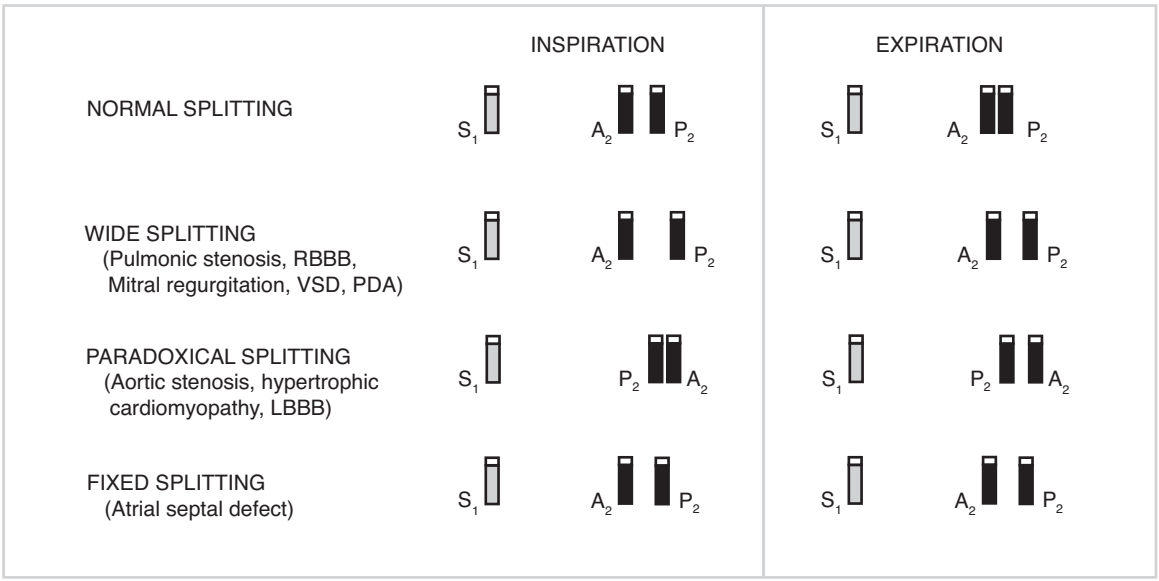
   A. Dyspnea
   B. Syncope
   C. Sudden death

   Answer:

3. Best initial therapy, and what to do if medical therapy fails?

Note

An S_4 gallop is a sign of a noncompliant stiff left ventricle. Fourth heart sounds are found when there is left ventricular hypertrophy, such as in hypertension, AS, or HOCM, or with ischemia.



Summary: Case 4

HOCM most commonly presents with shortness of breath secondary to decreased diastolic function of the heart. Although syncope and sudden death can occur, these are not as common as simple shortness of breath. The EKG should show signs of left ventricular hypertrophy. Overall, the most effective lifesaving therapy for HOCM is an implantable defibrillator in patients with a history of syncope and a family history of sudden death. The best initial medical therapy for HOCM is with negatively inotropic agents such as beta blockers or calcium channel blockers. These agents will decrease systolic emptying of the heart and will decrease the degree of obstruction of the left ventricular outflow tract. The beta blockers are particularly effective because of their effect on heart rate. As the heart rate slows, there is increased diastolic filling. This decreases the degree of obstruction. If these agents are not effective, then a catheter can be placed into the septal perforator arteries and small amounts of absolute alcohol can be infused, causing small infarctions. These small infarctions will decrease the outflow tract obstruction. If medical and catheter-directed therapy are not effective, surgical myomectomy is a final resort. Surgery for HOCM is only used if all else fails.

1. Which decreases with amyl nitrate?

   A. Mitral regurgitation
   B. Aortic stenosis
   C. Hypertrophic obstructive cardiomyopathy
   D. Mitral valve prolapse

   Answer:

2. A 32-year-old man is admitted to the telemetry unit after a syncopal episode. He has dyspnea on exertion for 10 years. Uncle died at age 50 of sudden death. Echo shows hypertrophic obstructive cardiomyopathy. After 24 hours of continuous cardiac monitoring, no rhythm disturbance is revealed. What is the most beneficial therapy?

   A. Implantable cardioverter defibrillator
   B. Propranolol
   C. Verapamil
   D. Disopyramide
   E. Metoprolol

   Answer:

3. Which will increase with Valsalva maneuver and decrease with squatting?

   A. Mitral regurgitation
   B. Aortic regurgitation
   C. Hypertrophic obstructive cardiomyopathy
   D. Aortic stenosis

   Answer:

Case 5

A 36-year-old man comes to the hospital for a TIA. He has progressive dyspnea on exertion for the last few months. Temperature 38ºC (100.4ºF) orally. He has a diastolic murmur but no opening snap. The murmur changes dramatically with body position. He has elevated sedimentation rate.

1. Most likely diagnosis?

2. What test will you perform?

3. What therapy?

Summary: Case 5

A mid-diastolic murmur in a patient with shortness of breath and signs of embolic phenomena can be from mitral stenosis. Clots in the atrium can cause fever and an elevated sedimentation rate as well. The main way to distinguish between mitral stenosis and an atrial myxoma such as the patient described here is that there is no opening snap with an atrial myxoma. In addition, the murmur of a "tumor plop" changes prominently with a change in body position as the tumor flops around in the atrium. The only therapy of any significant benefit for an atrial myxoma is surgical removal of the lesion.

CONGENITAL CARDIAC ANOMALIES

Case 1

1. Which is true about congenital bicuspid aortic valve?

   A. Rate of aortic stenosis is same as normal valve
   B. Can lead to aortic regurgitation
   C. Endocarditis prophylaxis is needed
   D. Transthoracic echo will miss it
   E. No chest pain, syncope or dizziness occur

   Answer:

2. Which is most commonly associated with bicuspid aortic valve?

   A. Coarctation
   B. Mitral valve prolapse
   C. VSD

   Answer:

Summary: Congenital Cardiac Anomalies

Bicuspid aortic valve gives largely the same symptoms and is assessed with the same diagnostic tests as aortic stenosis. Patients develop chest pain, syncope, lightheadedness and signs of CHF. Aortic root dilation can occur leading to aortic regurgitation. Endocarditis prophylaxis is not needed. This is not a cyanotic congenital heart disease. Neither form of aortic disease has an effective medical therapy.

The major difference with bicuspid aortic valve is a much greater use of balloon valvuloplasty in younger patients. The only cure is valve replacement, but in younger patients catheter procedure can be effective before the valve calcifies.

1. 41-year-old patient, who is asymptomatic, comes for evaluation of a murmur. The patient has mitral valve prolapse with mitral regurgitation. The ejection fraction is 50%; and the left ventricular end systolic diameter is 52 mm. There is no coronary artery disease. What is the best management for this patient?

   A. Repeat the echo in 6 months
   B. Diuretics and ACE inhibitors
   C. Digoxin
   D. Nifedipine
   E. Refer for valve replacement

   Answer:

Note

Mitral regurgitation (MR) and aortic regurgitation (AR) are medically treated, predominantly with vasodilator therapy such as ACE inhibitors or nifedipine. These drugs decrease the rate of progression of left ventricular dilation. Asymptomatic patients are managed by observing them with annual echocardiography. Surgical repair or replacement is performed for any symptomatic patient. It is also performed in asymptomatic patients if there is echocardiographic evidence of the development of left ventricular dysfunction.

- For MR, surgical criteria is a left ventricular (LV) end systolic diameter (ESD) of >40 mm or an ejection fraction (EF) <60%.
- For AR, it is an LVESD of >55 mm or an EF <55%.

2. 63-year-old man with 3/6 systolic murmur at apex that radiates to the axilla. No symptoms. Echo shows mitral regurgitation with an ejection fraction of 52% and a left ventricular end-systolic diameter of 48 mm. What would you recommend?

   A. Valve replacement
   B. Lifelong warfarin
   C. Aspirin
   D. Digoxin
   E. No therapy necessary

   Answer:

3. Which is most dangerous to a pregnant woman?

   A. Eisenmenger syndrome
   B. Aortic regurgitation
   C. Aortic stenosis
   D. Mitral valve prolapse
   E. Previous peripartum cardiomyopathy with persistent left ventricular dysfunction

   Answer:

4. Patient with atrial septal defect comes for evaluation. She is asymptomatic and has a pulmonary/systemic flow ratio of 1.3:1. What would you recommend?

   A. Never become pregnant
   B. Okay to become pregnant
   C. Have surgical closure, then become pregnant

   Answer:

5. Patient on long-term total parenteral nutrition develops a cardiomyopathy. Which is the most likely etiology?

   A. Magnesium deficiency
   B. Copper
   C. Selenium
   D. Zinc

   Answer:

PERICARDIAL DISEASE

Case 1

Man comes to ED with 1 day of chest pain. Pain worsens when he takes a deep breath and when he goes from a sitting position to lying down. Temperature of 38.6°C (101.2°F) orally.

1. Most likely diagnosis?

2. Most common causes of this problem?

3. Most specific finding on EKG?
   A. Sinus tachycardia
   B. ST-segment elevation
   C. PR depression
   D. T-wave flattening

   Answer:

4. What is the best initial therapy, and what will you do if he returns after several days because this has not been effective?

5. A patient comes with recurrent episodes of pericarditis. He has been treated with NSAIDs and steroids several times. What to do to prevent next one?
   A. Prednisone continuously
   B. Colchicine
   C. Cyclosporine

   Answer:

Summary: Case 1

Pericarditis is most commonly caused by a viral infection of the pericardium. When there is no other significant past medical history in the case, then the most likely cause is a virus. Any infection can cause pericarditis. Any inflammatory disorder such as uremia, radiation therapy, or connective tissue disorder can cause pericarditis as well, although SLE is probably the single most common cause. The best initial method of establishing a diagnosis is by observing diffuse ST-segment elevation in virtually all leads on the EKG. The most specific EKG finding for pericarditis is PR-segment depression. Therapy consists of correcting the underlying cause if one is found, such as tuberculosis. For viral pericarditis, the initial therapy is with NSAIDs. If NSAIDs and colchicine are a choice, then that should be the right answer. Colchicine definitely helps in addition to an NSAID. If these are not effective, then steroids should be used.

Note

Pericardial tamponade is caused by any form of pericarditis that leads to the accumulation of sufficient effusion fluid to compress the right ventricle or right atrium in diastole. The most specific clinical feature for tamponade is the development of a pulsus paradoxus. This is a >10 mm Hg drop in systolic blood pressure on inspiration. The EKG finding in tamponade is electrical alternans. Treatment is with pericardiocentesis and pericardial window placement.

Constrictive pericarditis can be caused by any chronic infection, inflammation, or cancer that involves the pericardium. Constrictive pericarditis is characterized by the signs found in right ventricular failure, such as edema, ascites, and hepatosplenomegaly. The most characteristic physical findings are the presence of Kussmaul's sign (increased JVP on inspiration) and a pericardial knock. The best initial test for constrictive pericarditis is a chest x-ray looking for calcifications and fibrosis. The most accurate diagnostic test is an MRI or a CT scan. There is no good medical therapy for constrictive pericarditis. The treatment is pericardial stripping.

1. Man who emigrated from Vietnam 25 years ago comes to office for progressively worsening edema, ascites, and shortness of breath. You find jugulovenous distention, edema, hepatosplenomegaly, and an extra heart sound in diastole. EKG shows low voltage. Chest x-ray shows calcifications over heart shadow. CT scan shows pericardial thickening. Which of is most likely in this patient?

   A. S_3
   B. S_4
   C. Pulsus paradoxus
   D. Kussmaul's sign
   E. Paradoxical split of S_2

   Answer:

2. Most effective therapy?

   A. Diuretics
   B. Thrombolytics
   C. Pericardiocentesis
   D. Surgery

   Answer:

3. Which of the following will show equalization of diastolic pressures on right heart catheterization?

   A. Constrictive pericarditis
   B. Right ventricular infarction
   C. Tricuspid valve rupture
   D. Ventricular septal rupture
   E. Atrial septal rupture

   Answer:

Case 2

Patient, in a motor vehicle accident, with shortness of breath, jugulovenous distention, hypotension, and tachycardia.

1. Most likely diagnosis?

2. Most specific physical finding?
   A. Hypotension
   B. S_4 gallop
   C. S_3 gallop
   D. Decrease in blood pressure of 10 mm Hg on inhalation
   E. Increase in jugulovenous pressure on inhalation

   Answer:

3. Most specific EKG finding?
   A. Sinus tachycardia
   B. Low voltage
   C. Electrical alternans
   D. ST-segment elevation
   E. PR-segment depression

   Answer:

4. Initial therapy?
   A. Diuretics
   B. Pericardial window
   C. Pericardiocentesis
   D. ACE inhibitor

   Answer:

Summary: Case 2

Tachycardia, hypotension, and jugulovenous distention are the triad consistent with pericardial tamponade. The motor vehicle accident is sufficient reason for tamponade. The most specific physical finding is pulsus paradoxus, which is a decrease is systolic blood pressure >10 mm Hg on inhalation. Kussmaul's sign is a rise in jugulovenous pressure on inhalation. This is more often found in constrictive pericarditis. The EKG finding most specific for pericardial tamponade is electrical alternans. This is the alternation between big and small QRS complexes based on how far the heart is from the anterior chest wall. Sinus tachycardia and low voltage can occur, but they are not specific for pericardial tamponade. PR-segment depression is the most specific EKG finding for pericarditis. Pericardiocentesis is the most important first therapy. A pericardial window is used later. Diuretics can be potentially fatal in pericardial tamponade.

1. Which of the following Swan-Ganz catheter values is most likely to be found in pericardial tamponade?

   A. Elevated wedge pressure, decreased cardiac output, increased systemic resistance
   B. Decreased wedge pressure, decreased cardiac output, increased systemic resistance
   C. Step up on oxygen saturation from the right atrium to the right ventricle
   D. Decreased wedge pressure, increased cardiac output, decreased systemic resistance
   E. Equalization of all diastolic pressures (right atrium, right ventricle, pulmonary artery, wedge)

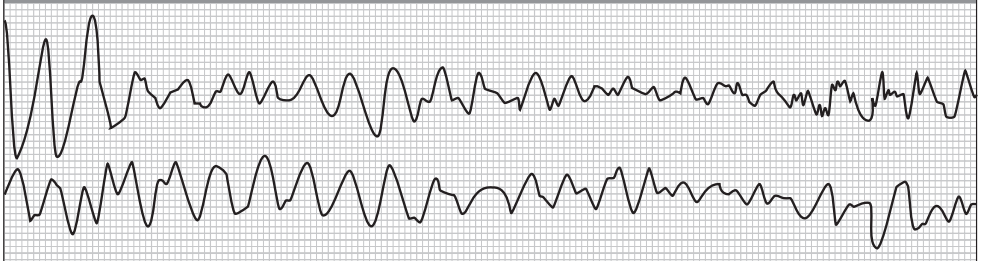
   Answer:

RHYTHM DISTURBANCES

Case 1

71-year-old man brought to ED with light-headedness and chest discomfort. As you are examining him, he loses consciousness and his pulse. CPR is initiated and an EKG is performed which shows ventricular fibrillation. Electrical shocks with 200, 300, and 360 joules are administered without effect.

Ventricular Fibrillation



Heart Rate	Rhythm	P Wave	PR Interval (in seconds)	QRS (in seconds)
300-600	Extremely irregular	Absent	N/A	Fibrillatory baseline

1. Next step in the management of this patient?

2. When will your answer be to use intracardiac medications?

   Never

3. When will your answer be thoracotomy?

   Never

4. What will you do if this initial therapy is not effective?

5. Patient's EKG becomes normal. CK-MB and troponin drawn before beginning of ventricular fibrillation are elevated. Echocardiogram reveals ejection fraction 54%. He remains in sinus rhythm.

   Which of the following would you use upon discharge to manage this patient's rhythm disturbance?

   A. Amiodarone
   B. Procainamide
   C. Pacemaker
   D. Automatic implantable cardioverter defibrillator (AICD)
   E. Beta blockers

   Answer:

Summary: Case 1

The use of prophylactic anti-arrhythmic medications in those with acute coronary syndromes is not effective. Pacemakers will not help with ventricular fibrillation. The AICD is specifically not useful in serious dysrhythmias associated with acute ischemia. AICDs are for those with hemodynamically significant VT or VF not effectively treated with medical therapy, or for those in whom it can be induced on electrophysiological studies despite the use of medications. Beta blockers are the best suppressive medication for ischemia-related rhythm disturbances after the patient has been converted back to sinus rhythm.

Ventricular fibrillation is always treated initially with electrical defibrillation. If three attempts at defibrillation are not effective, then either epinephrine or vasopressin should be used prior to the next attempt at defibrillation. If this is not effective, then amiodarone or lidocaine should be used next. If lidocaine and amiodarone are both in the answer choices, you should choose amiodarone. Bretylium, intracardiac medications, and thoracotomy are not effective and are always wrong answers when they are in a question.

1. 63-year-old woman sitting in ER has stopped breathing. EKG is found to be in ventricular fibrillation. No spontaneous respirations and is not breathing. What would you do first?

   A. Intubation
   B. Synchronized cardioversion
   C. Unsynchronized cardioversion
   D. Precordial thump

   Answer:

Case 2

63-year-old man brought to ED because of syncope. His wife initiated CPR. In the field, he was found to be in ventricular fibrillation and was successfully defibrillated with a single shock at 200 joules. In ED, he is alert and hemodynamically stable. He is started on both lidocaine and amiodarone. A repeat EKG, cardiac enzymes, and a thallium stress test the following day are all normal.

1. What would you do next?

   A. Electrophysiology study
   B. AICD
   C. Angiography
   D. AICD, if beta blockers fail

   Answer:

2. What is the most accurate and specific test to determine this patient's therapy for his rhythm disturbance?

   Electrophysiological testing to find inducible VT/VF

3. What event in hospital would signify the worst prognosis for this patient?

   Recurrence of the dysrhythmia while on medications

4. What finding on echocardiogram would indicate the worst prognosis?

   A. Apical hypokinesis
   B. Septal dyskinesis
   C. Decreased ejection fraction under 35%
   D. Mitral regurgitation
   E. Patent foramen ovale

   Answer:

5. Best therapy for this patient?

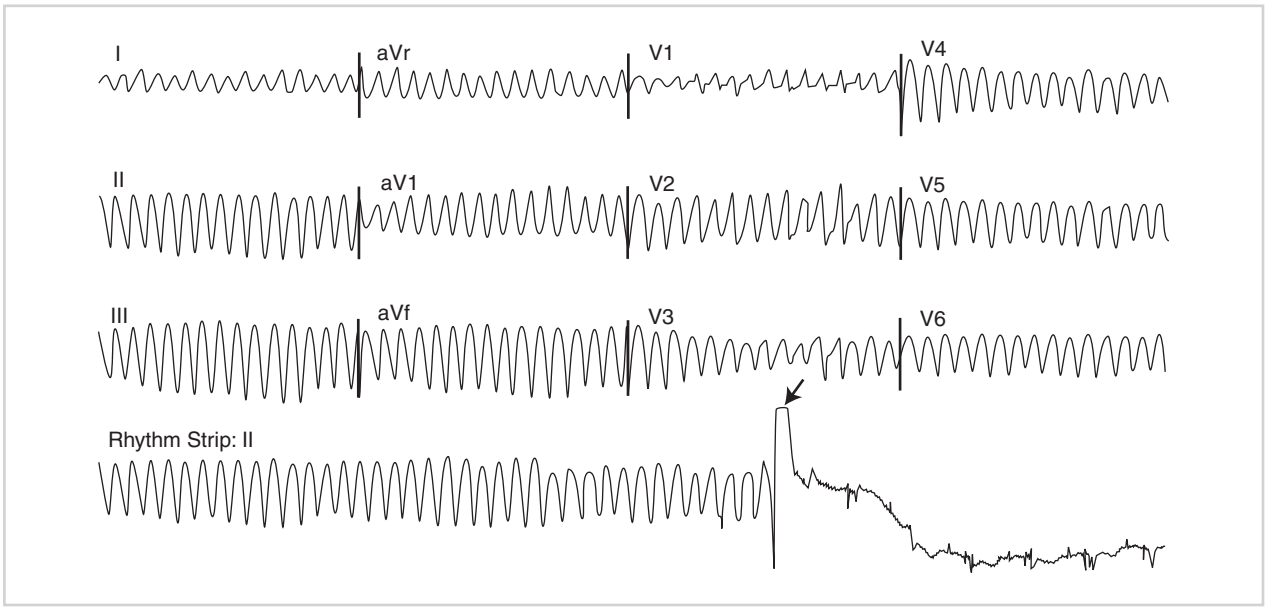
Summary: Case 2

If ventricular fibrillation or ventricular tachycardia occur in the first 48 hours after an infarction, no long-term anti-arrhythmic therapy is necessary beyond beta blockers. The point of the case described here is that if these rhythm disorders occur outside the setting of acute ischemia or a correctable cause, then they need an implantable defibrillator. Although an electrophysiology study is the most accurate diagnostic test, it is unnecessary for a patient like this one who has a clear case of unprovoked ventricular fibrillation. The same is true if the rhythm found were a hemodynamically unstable ventricular tachycardia. The worst prognostic factor is if the arrhythmia recurs while the patient is on anti-arrhythmic drugs. Because his arrhythmia has not recurred, the worst prognostic factor is the presence of myocardial disease with a low ejection fraction. In a case like this, however, he would need an implantable defibrillator (AICD) even if the ejection fraction is normal because he had unprovoked sudden death from ventricular fibrillation.

VENTRICULAR TACHYCARDIA

Case 1

A 74-year-old man has a syncopal episode in his apartment. He awakens spontaneously and is brought to the emergency department (ED). He has a history of hypertension and is on beta blockers. In the emergency department, he has another episode of sustained ventricular tachycardia but no symptoms beyond palpitations. His blood pressure (BP) is 114/78 mm Hg, respirations are 16/min, chest is clear, and mental status is normal.



1. What are the indications for immediate cardioversion in this man?

2. Best initial therapy?

   A. Synchronized cardioversion
   B. Unsynchronized cardioversion
   C. Amiodarone
   D. Sotalol

   Answer:

3. When will your answer be magnesium?

Summary: Case 1

The indications for electrical cardioversion in a patient with ventricular tachycardia are hypotension with a systolic blood pressure <90 mm Hg, congestive heart failure, altered mental status, and chest pain. When patients are hemodynamically stable and have sustained ventricular tachycardia, then they should be treated with either amiodarone or lidocaine. Magnesium is given to those with torsades de pointes or those who are identifiably hypomagnesemic. If all of these are in the answer, then choose amiodarone. An implantable defibrillator (AICD) should be placed in any patient with a hemodynamically significant case of ventricular tachycardia or in those who have sustained monomorphic ventricular tachycardia induced in the electrophysiology laboratory. An AICD is particularly beneficial for those patients who also have left ventricular dysfunction with a low ejection fraction and in those whose arrhythmia can still be induced despite the use of anti-arrhythmic medications.

Case 2

74-year-old man is converted to sinus rhythm from ventricular tachycardia with amiodarone. Echocardiogram shows an ejection fraction of 34% and left ventricular dysmotility. Cardiac enzymes and a coronary angiogram are normal.

1. What is the best therapy for this patient?

   A. Electrophysiology study
   B. TEE
   C. AICD
   D. Nuclear ventriculogram
   E Amiodarone alone

   Answer:

Summary: Case 2

Prolonged QT syndromes lead to an increased risk of torsades, syncope, and sudden death. A number of medications can prolong the QT, such as quinidine, dofetilide, ibutilide, and tricyclic antidepressants. When there is no specific toxic effect causing the prolonged QT, you should suspect a congenital prolonged QT syndrome. The treatment of choice in this case is beta blockers. Beta blockers and calcium channel blockers are the only anti-arrhythmic medications that have no pro-arrhythmic effect.

1. A 64-year-old woman is admitted for her third episode of syncope in the last 6 months. EKG, telemetry monitoring, echocardiogram, and examination are all normal. Electrophysiology studies are able to induce ventricular tachycardia that is sustained. What is the best therapy?

   A. Amiodarone
   B. Sotalol
   C. Dofetilide
   D. Implantable defibrillator

   Answer:

2. An 18-year-old, Asian man is **awakened by an alarm clock** and has syncope two minutes later. There is a right bundle branch block pattern on his EKG. What is the diagnosis?

ATRIAL ARRHYTHMIAS

Case 1

29-year-old senior medical resident comes to the emergency room with palpitations. He has been studying for the boards and has had 5 cups of coffee, 4 beers, 3 cheeseburgers, 2 "power drinks," and 1 Viagra. EKG shows supraventricular tachycardia at a rate of 160. BP 124/80 mm Hg.

1. What would you do first?

   A. Carotid sinus massage
   B. Intravenous heparin
   C. Adenosine
   D. Quinidine
   E. Disopyramide
   F. Cardioversion

   Answer:

2. What is next if this is unsuccessful?

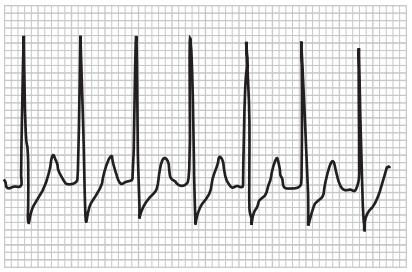
3. What other medications are acceptable to control the rate?

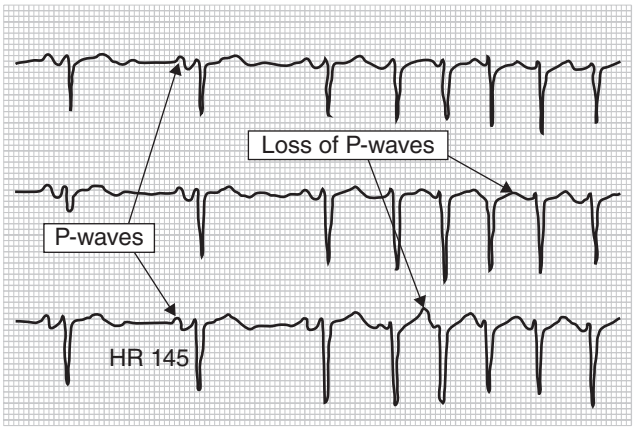
   Calcium channel blockers, beta blockers, and digoxin

4. If the SVT continues to be recurrent, what is the best long-term therapy?

5. If the case were changed to atrial flutter, how would the above answers differ?

Supraventricular Tachycardia



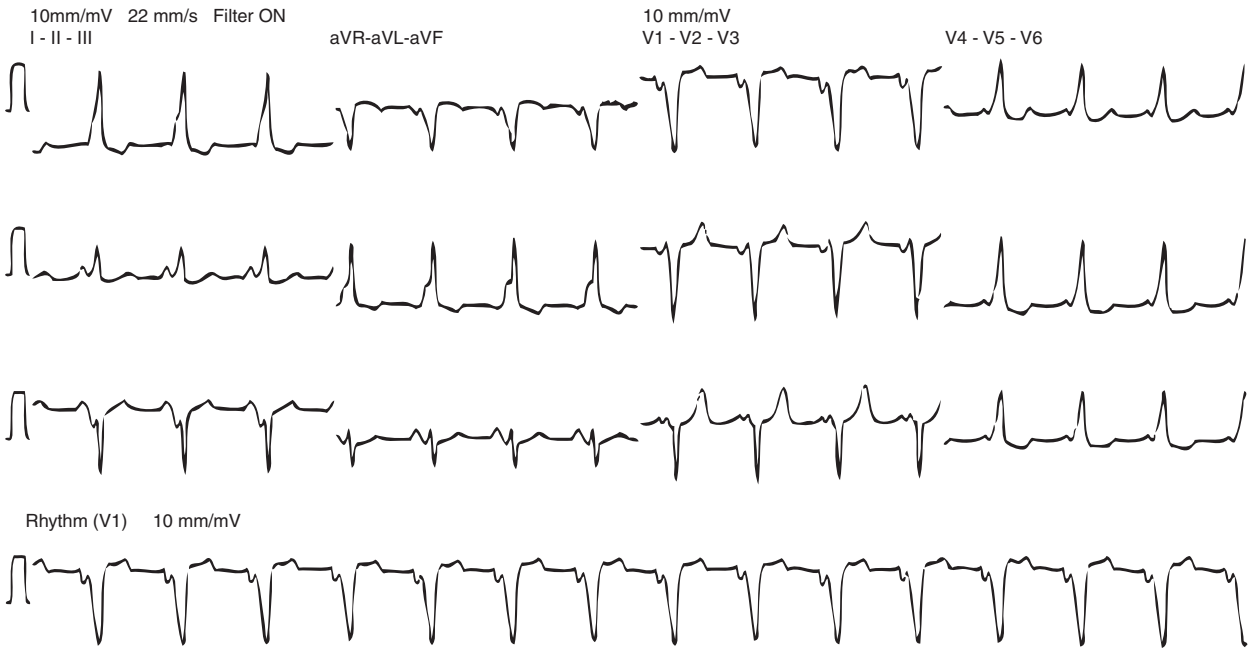


Summary: Case 1

There is a lot of overlap in the management of all forms of atrial arrhythmias. Any hemodynamically unstable patient should undergo synchronized cardioversion. You do not need to anticoagulate prior to cardioverting an unstable patient. If the patient is hemodynamically stable and has supraventricular tachycardia (SVT), an attempt should be made to perform vagal stimulation maneuvers such as carotid sinus massage. If these are unsuccessful, then the best next step in management is to use adenosine. Adenosine is a medication that is used exclusively in those with SVT. It is not useful for atrial fibrillation or flutter. If adenosine is ineffective, then AV nodal blocking agents should be used. This is the same for all forms of atrial tachycardias. Beta blockers, calcium channel blockers, and digoxin are all effective. Digoxin has the disadvantage of being the slowest in onset, the most toxic, and less effective with tachycardias that occur with exertion. The long-term management of SVT includes attempting to eradicate the pathway of AV nodal re-entry with catheter ablation.

Case 2

32-year-old woman with recurrent episodes of atrial dysrhythmias. On last visit to emergency department an intravenous infusion of diltiazem worsened her condition into hemodynamically unstable ventricular tachycardia that required cardioversion. Current EKG shows sinus rhythm with normal ST segments and PR interval of 0.08 seconds.



1. Most likely diagnosis?

2. What would you expect to find on auscultation?

3. What is the best medical therapy if this patient pops into SVT or hemodynamically stable ventricular tachycardia again?

4. Best long-term therapy?

5. Which drugs are contraindicated?

Summary: Case 2

Note

WPW by itself is not dangerous with exercise.

Pre-excitation syndromes present with a short PR segment. The most common is Wolf-Parkinson-White. WPW can lead to either SVT or ventricular tachycardia. Medications such as digoxin or calcium channel blockers can block conduction down the normal AV nodal pathway and increase conduction down the aberrant tract. This drives the patient into SVT or ventricular tachycardia. In a hemodynamically unstable patient the treatment is cardioversion. When the patient is hemodynamically stable, the best therapy is procainamide. This is because procainamide is effective in SVT and atrial fibrillation as well as ventricular tachycardia. Other agents that are effective are amiodarone, propafenone, sotalol, and flecainide. If all of these appear in the answer for WPW treatment, then the answer is procainamide. After the initial episode has resolved, long-term therapy involves ablation of the accessory tract with a catheter using radio-frequency waves.

Note

Multifocal atrial tachycardia is an atrial dysrhythmia that occurs almost exclusively secondary to chronic lung disease such as COPD. It is a narrow-complex tachycardia similar to wandering atrial pacemaker, except that the rate is rapid. You typically find at least 3 different P-wave morphologies. In the past it was commonly found with theophylline toxicity. The management is to treat the underlying pulmonary disease. The dysrhythmia is controlled acutely with verapamil, diltiazem, or beta blockers.

Case 3

76-year-old woman with hypertension and diabetes comes for a routine visit. She is maintained on a diuretic with good control of blood pressure. Heart rate is 118 and irregular. She firmly denies symptoms and had no idea that her rate was elevated or that her rhythm was irregular or for how long. EKG: atrial fibrillation at 118.

1. Best initial step in management?

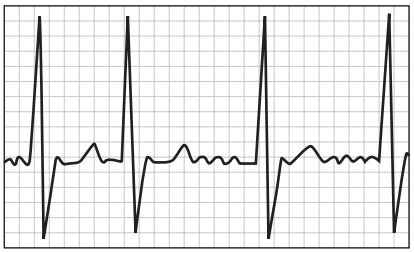
   Control the rate with beta blockers or calcium blockers. Because of her history of hypertension, beta blockers would be preferable.

2. After this is accomplished, what would you do next?

   Anticoagulation with dabigatran, warfarin, or rivaroxaban

3. Which cardioverting medications have the highest risk of torsades de pointes?

Atrial fibrillation



Summary: Case 3

The initial management of hemodynamically stable patients with rapid atrial fibrillation involves controlling the rate with beta blockers, calcium blockers, or digoxin. If all of these are given as answer choices, then you must look at the case for other disorders or comorbidities that are either an indication or a contraindication for these medications. For example, if there is asthma in the history, then the answer is not beta blockers. After the rate has been controlled, patients should either receive anticoagulation for 3 weeks prior to an elective cardioversion or undergo a transesophageal echocardiogram to exclude an atrial thrombus.

Rate control and long-term anticoagulation is equal or superior to control of the rhythm.

If cardioversion is performed, patients should receive anticoagulation with warfarin for 4 weeks to prevent a clot from forming as atrial function is restored. If the patient cannot successfully achieve or maintain a sinus rhythm, then long-term anticoagulation with warfarin is indicated to prevent emboli. Anticoagulation is not necessary prior to cardioversion if the atrial fibrillation has been present for less than 48 hours. Dofetilide and ibutilide are highly effective but also have the highest risk of developing torsades de pointes. The most effective medication for maintaining a patient in sinus rhythm after cardioversion is amiodarone. Routine rhythm conversion is not done.

CHADS = CHF, hypertension, age >75, diabetes, stroke

If the CHADS score is ≥2, use dabigatran, warfarin, or rivaroxaban.

Case 4

47-year-old gastroenterologist has been having palpitations. EKG shows atrial fibrillation with rate of 80. No past medical history, no diabetes, and no hypertension. Echo normal. When you discuss cardioversion by electricity or medications, he refuses and instructs you to do something to yourself that is anatomically impossible.

1. Best therapy for this patient?
   A. Electrical cardioversion
   B. Amiodarone
   C. Aspirin
   D. Heparin, then warfarin
   E. Warfarin

Answer:

Summary: Case 4

Note

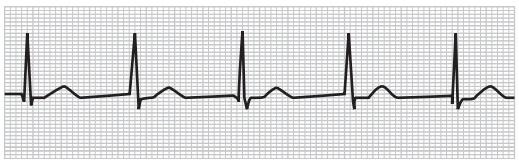
A. Fib for <48 hours needs no anticoagulation.

Warfarin is not necessary in those with "lone" atrial fibrillation. This is defined as occurring in those who are <75 with no history of stroke, transient ischemic attack, hypertension, diabetes, or structural heart disease on echocardiogram. These patients can be treated with aspirin alone. This patient has a CHADS score of 0.

CHADS of 0-1: aspirin only

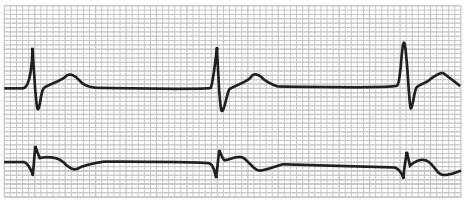
Dabigatran, rivaroxaban, and warfarin are used when CHADS score is ≥2. Dabigatran and rivaroxaban are as good or better than warfarin for non-valvular atrial fibrillation.

What is this?



A. Normal Sinus Rhythm
B. Supraventricular tachycardia (SVT)
C. Junctional rhythm

Junctional Rhythm



Answer:

Note

Junctional tachycardia is a narrow-complex tachyarrhythmia generally at a rate of 70 to 150. You recognize the disorder by finding inverted P wave in leads II, III, and aVF. These indicate retrograde conduction of the impulse up from the AV node backward toward the SA node. The most common cause is digoxin toxicity. Other causes are inferior wall infarctions, valve surgery, and myocarditis. Acute treatment is with beta blockers, and long-term management is to treat the underlying cause.

BRADYCARDIA

Case 1

54-year-old man comes to you in the office to discuss smoking cessation. You notice his pulse is 52. He says that you shouldn't worry about this because he runs marathons and climbs mountains. EKG shows Mobitz II second-degree heart block.

1. What is the most appropriate action?

   A. Nothing
   B. Atropine
   C. Pacemaker

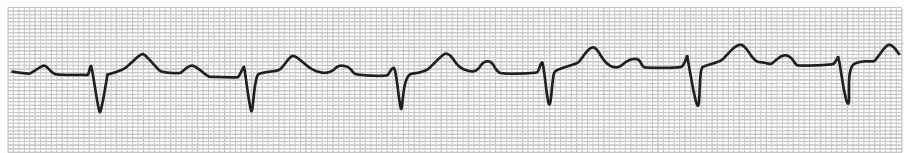
   Answer:

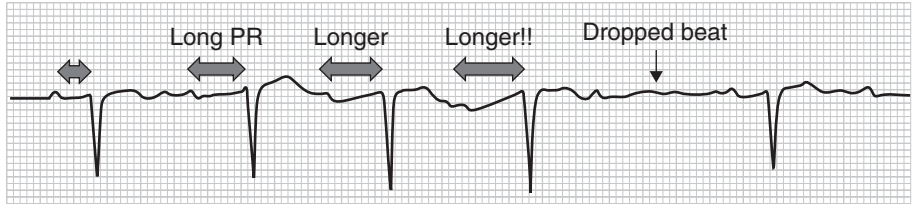
Summary: Case 1

If a patient has a slow heart rate and signs of hypoperfusion, the best initial step is always to administer atropine. If there is hypotension, syncope, near-syncope, or light-headedness, and there is bradycardia from any cause, atropine is the first thing to do because this is the fastest way to raise the heart rate. If atropine is not effective, then an external pacemaker is used. If the patient is asymptomatic and hemodynamically stable, you only need to treat third-degree heart block and Mobitz II second-degree heart block. Even if a patient is asymptomatic, a patient with a Mobitz II should have a permanent transvenous pacemaker placed anyway because of the high risk of syncope. The same is true of third-degree (complete) heart block.

Case 2

How would you manage a patient with the EKG shown below?

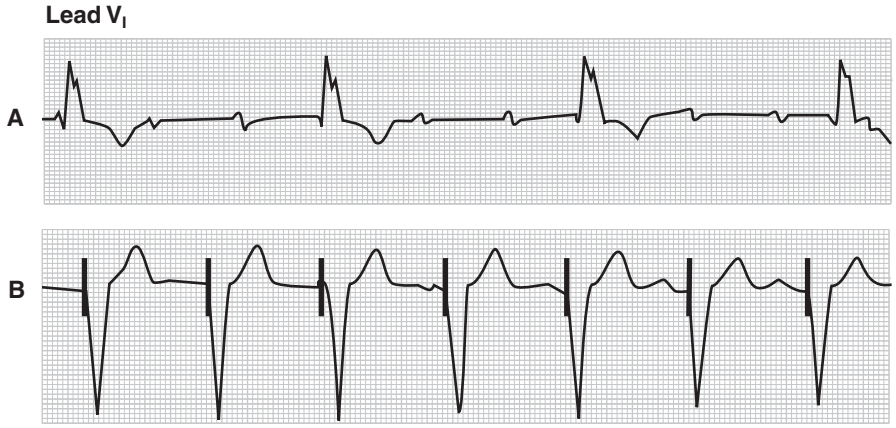




1. What is the diagnosis?

2. Treatment?

Case 3



1. What is seen in rhythm strip A, and what is the management?

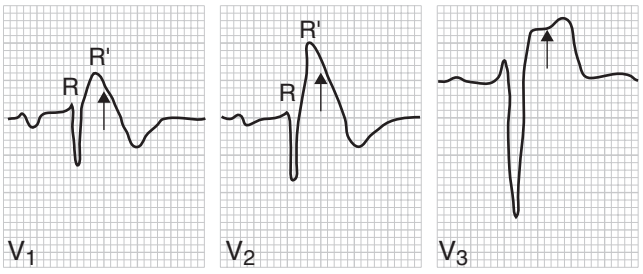
2. What is seen in rhythm strip B?

Case 4

Asian man, 38, had syncope. Shocked out of V. fib. Father died at 45. EKG below.

What is it?

Treatment?



Case 5

Treatment of symptomatic tachy-brady syndrome?

A. Pacemaker
B. AICD
C. Beta blockers and pacemaker
D. Ablation

Answer:

ENDOCARDITIS

Case 1

Injection-drug user in ED with fever. 2/6 systolic murmur. There are no Janeway lesions, Osler nodes, Roth spots, or splinter hemorrhages.

1. What is the best initial step in management?

2. Most likely organism?

3. Best empiric therapy?
   A. Ceftriaxone
   B. Ampicillin and gentamicin
   C. Vancomycin
   D. Vancomycin and gentamicin
   E. Oxacillin

   Answer:

4. **Strongest** indication for valve replacement?
   A. CHF
   B. Prosthetic
   C. Fungal
   D. Abscess
   E. Emboli

   Answer:

Summary: Case 1

Anyone who has a fever and a new murmur or a change in the character of a murmur should be suspected of having endocarditis. If the patient is an intravenous-drug user with a fever, you should suspect endocarditis even in the absence of a murmur. These patients develop acute endocarditis from *Staphylococcus aureus,* which is extremely damaging to the endothelial lining of the heart. Blood cultures are always the best initial step. The echocardiogram should never be done first. The transthoracic echocardiogram has only a 65% sensitivity at best for endocarditis. The best empiric therapy for endocarditis in patients who are injected-drug users is vancomycin and gentamicin because of the high frequency of methicillin-resistant *S. aureus*. If the organism is eventually found to be sensitive to oxacillin, then vancomycin should be switched to either oxacillin or nafcillin.

Case 2

72-year-old woman with fever of a few weeks' duration. You find murmur of mitral regurgitation that was clearly not there 2 months ago.

1. What will you treat her with if she grows *Strep. viridans* with MIC <0.1 (very low)?

2. What will you treat her with if she grows *Strep. viridans* that is less sensitive with an MIC between 0.1 and 0.5?

3. What will you do if she grows *Enterococcus*?

4. What will you do if she grows *Strep. bovi* or *Clostridium septicum*?

5. What will you treat her with if she has a prosthetic valve?

6. Most common cause of culture-negative endocarditis?

   A. HACEK
   B. *Coxiella*
   C. *Streptococcus viridans*
   D. *Staphylococcus*

   Answer:

7. Injection drug user with endocarditis of tricuspid valve on nafcillin and gentamicin for two weeks for a sensitive staphylococcus, continues to have fever and positive blood cultures. Shortness of breath develops. What is the next step?

   A. Switch to vancomycin
   B. Add rifampin
   C. Treat for two more weeks then replace the valve
   D. Replace the valve immediately

   Answer:

Note

Clostridium septicum is associated with colon cancer.

Summary: Case 2

The overall point in the therapy of endocarditis is that the first step is to decide what type of organism is present: *Strep.* versus sensitive *Staph.* versus resistant *Staph*. This guides us in knowing whether to base the regimen on penicillin, as in the case of *Strep. viridans* or *Strep. bovis*, or to base the regimen on oxacillin (or nafcillin) for a sensitive *Staph.* or vancomycin for a resistant *Staph*. In terms of streptococci, the more resistant the organism, the longer you need to give additional synergistic therapy with an aminoglycoside such as gentamicin. Sensitive *Strep. viridans* or *bovis* can be treated with penicillin or ampicillin as a single agent for 4 weeks. As the level of resistance rises to an MIC between 0.1 and 0.5, you add gentamicin for the first 2 weeks. As the MIC rises above 0.5 or if you have an enterococcus, then you extend the entire length of therapy to 6 weeks and use gentamicin the entire time. The best therapy for a sensitive *Staph. aureus* is always nafcillin or oxacillin. If the organism is sensitive, these drugs have a greater efficacy compared with vancomycin. Gentamicin is needed for only the first 5 days. If the patient has a resistant *Staph. aureus* or has *Staph. epidermidis*, then vancomycin is mandatory and gentamicin is not used for MRSA. Rifampin is added to the therapy of prosthetic valve endocarditis for greater tissue penetration into the vegetations. Sicker patients need more synergy.

Case 3

58-year-old woman is with fever and murmur is found to have endocarditis from viridans group *Streptococcus* in 3 of 3 blood cultures drawn. Patient placed on penicillin, 2 million units intravenously every 4 hours. Three days later patient feels better. White cell count dropped from 14,000 to 12,000. Fever lower, and 1 of 3 blood cultures grows the same *Streptococcus*.

1. What should you do?
   A. Switch to vancomycin
   B. Perform valve replacement surgery
   C. Repeat echocardiogram
   D. Add rifampin
   E. Continue the present therapy and repeat the culture in 3 to 4 days if the patient is still febrile

   Answer:

Summary: Case 3

A patient with endocarditis can remain febrile for as long as a week in as many as 75% of cases even after the start of effective therapy. The persistent fever after 3 days is not a reason for concern. This is why endocarditis is treated for 4 to 6 weeks. Endocarditis is a persistent infection, and the blood cultures can remain positive for a week as well. If the patient continues to have positive blood cultures after a week, you should consider repeating the echocardiogram to see if an abscess has formed.

Case 4

62-year-old man admitted for fever and endocarditis from viridans group *Streptococcus* with a mechanical prosthetic valve. He is maintained on warfarin with an INR of 2.8.

1. What would you do about the anticoagulation?

Summary: Case 4

The use of anticoagulation in patients with endocarditis is an area of great anxiety and concern because of the possibility of causing emboli. The only clear case in which warfarin should be continued is in the patient with the highest risk of thrombosis, such as a patient who has a mechanical heart valve.

Case 5

Patient with history of injection drug use with fever, cough, and hemoptysis. 2/6 murmur at lower left sternal border. Increases with inspiration. Chest x-ray shows nodules.

What is diagnosis?

Treatment?

Case 6

What are the appropriate prophylactic regimens for each of the following patients?

1. 45-year-old woman with mid-systolic click followed by murmur about to have several dental extractions.

2. 64-year-old man with prosthetic aortic valve about to have several dental fillings.

3. 72-year-old man with pacemaker and implanted defibrillator undergoing hemicolectomy.

4. A 33-year-old man with previous endocarditis secondary to injection-drug use who is about to have a skin biopsy of infected skin.

5. A 65-year-old man with hypertrophic obstructive cardiomyopathy who will have a prostate biopsy, cystoscopy, and urethral dilation with cystitis present.

6. A 72-year-old man who presents with previous quadruple bypass, an isolated click from mitral valve prolapse, and a secundum atrial septal defect, and who will now have a caesarian section.

Summary: Cases 5–6

Give prophylaxis if the patient *both* has a hemodynamically significant lesion **and** will undergo a procedure that produces bacteremia. Both elements are necessary. High-risk cardiac defects are prosthetic valves, previous endocarditis, cardiac transplant recipients, and complex cyanotic heart disease that has not been repaired. The following are **no longer** indicators for prophylaxis:

- aortic stenosis or regurgitation
- mitral stenosis or regurgitation
- mitral valve prolapse that produces regurgitation or a murmur
- IHSS (HOCM)
- ventricular septal defects, and
- noncyanotic congenital heart disease that has been surgically corrected. The secundum type of atrial septal defect does not need to be prophylaxed either.

Note

Pen allergic? Use clindamycin.

Bacteremia-causing procedures are: dental work that causes bleeding (not fillings) or respiratory tract surgery. **Prostate manipulation** such as a biopsy, TURP, urinary stricture dilation or urinary catheterization, sclerotherapy of varices, esophageal stricture dilation, or endoscopy are **no longer** indicators for prophylaxis. **Surgery of the respiratory and bowel mucosa** both **need** prophylaxis. Flexible endoscopy (even with biopsy), transesophageal echocardiography, and caesarian section **do not need** prophylaxis against endocarditis. For dental work, the best prophylaxis is still amoxicillin. In a patient allergic to penicillin, you can use clindamycin, azithromycin, or clarithromycin as well as first-generation cephalosporins. Bowel and urinary procedures in the presence of infection are an indication for ampicillin and gentamicin with high-risk lesions. If the patient is penicillin-allergic, then use vancomycin. Gentamicin is added for GI or urinary procedures and cardiac lesions at high risk of endocarditis, such as prosthetic valves.

Lesions that **DO NOT** need prophylaxis are:

- secundum ASD
- tricuspid regurgitation
- MVP with **only** a click
- repaired congenital disease
- previous coronary bypass
- pacemakers, and
- defibrillators

Procedures that **DO NOT** need prophylaxis are:

- fillings
- suture removal
- flexible endoscopy
- transesophageal echocardiography
- cardiac catheterization
- angioplasty, and
- female genitourinary procedures.

The bottom-line is that the vast majority of cardiac lesions no longer need prophylaxis. The only lesions needing prophylaxis are prosthetic valves, unrepaired complex cyanotic heart disease, and those with previous endocarditis. Aortic stenosis, aortic regurgitation, mitral stenosis, mitral regurgitation, hypertrophic cardiomyopathy, and mitral valve prolapse even with regurgitation no longer need prophylaxis.

PERIPHERAL ARTERIAL DISEASE (PAD)

Case 1

67-year-old man comes to office for mild soreness in his calves. The discomfort has been going on for several months moderate in intensity. Although it rarely makes him have to stop walking, the discomfort never occurs at rest. Examination normal. Pulse normal. History of tobacco smoking and diabetes. LDL 145. On an ACE inhibitor.

1. Initial test?

2. Most accurate diagnostic test?

   Angiography

3. What therapy will you start him on at this time?

   Aspirin, stop smoking, statins, cilostazol, and exercise

4. Single most effective therapy for PAD?

5. Best antiplatelet medication?

6. A patient has PAD and an MI. Which medication will benefit the patient?

   A. Diltiazem
   B. Metoprolol
   C. Nitroglycerin
   D. Furosemide

   Answer:

Summary: Case 1

Most patients with peripheral vascular (or arterial) disease have normal physical examinations. Although cool, pale skin, bruits, and the absence of pulses are highly specific, they are infrequently present. Pentoxifylline has limited therapeutic effect and is less effective than cilostazol. The best initial test is the ankle/brachial ratio. This should normally be greater than or equal to 1. Although Doppler has some utility, angiography is still the most accurate test. Therapy for peripheral arterial disease includes aspirin, exercise, comfortable footwear, smoking cessation, cilostazol, and occasionally pentoxifylline. Pentoxifylline has a rather minimal benefit, which is not always found in studies. Cilostazol is an antiplatelet medication that also has an antispasmodic effect. Cilostazol also stops the proliferation of vascular endothelial cells. Clopidogrel has a greater efficacy than pentoxifylline. The combination of aspirin and clopidogrel is more effective than either drug alone but has more adverse effects, such as bleeding. If medical therapy is ineffective, then bypass surgery is needed. Beta blockers are not contraindicated in patients with PAD who need them for coronary disease or CHF.

1. Greatest risk for peripheral arterial disease?

   A. Smoking
   B. Diabetes
   C. Hypertension
   D. Lack of exercise
   E. Hyperlipidemia
   F. Age

   Answer:

2. 28-year-old Asian woman with fever, myalgia, and diminished peripheral pulse. Most **accurate** diagnostic test?

   A. ESR
   B. Anti-endothelin antibodies
   C. Angiography
   D. Biopsy
   E. CT scan

   Answer:

AORTIC DISEASE

Case 1

64-year-old man comes to emergency department (ED) with sudden onset of substernal chest pain radiating to back. BP is 160/103 in right arm and 128/85 in left arm. Diastolic murmur at lower left sternal border. EKG is normal.

1. Best initial test?

2. Most accurate test?

3. Initial treatment?

4. Most effective therapy?

   Surgical repair of the defect, if necessary

Abdominal ultrasound shows a 3.5-cm pulsatile mass consistent with an aneurysm.

5. How will you best manage this patient?

Summary: Case 1

Acute dissection of an aortic aneurysm presents with chest pain. If the test wants you to be able to answer a diagnostic question, it has to give you a clue, such as radiation of the pain to the back, particularly in between the scapulae, or a widened mediastinum on chest x-ray. Overall, the most accurate test is an angiogram. Prior to the angiogram, there are several less invasive tests that can be performed, such as MRI, transesophageal echocardiogram, or CT angiogram. All of them have about the same sensitivity and specificity; and it is difficult to choose one over the other. Surgical repair is the most effective therapy. Initial therapy consists of beta blockers and nitroprusside. Beta blockers are particularly effective because they decrease pulse pressure and may retard progression of the dissection.

Abdominal aortic aneurysms are managed with surgical repair if they are wider than 5 cm. For aneurysms smaller than 5 cm, repeat ultrasonography should be performed once a year. You then operate when the aneurysm becomes larger than 5 cm. The rate of spontaneous rupture is very low in aneurysms under 5 cm.

Side Effects of Certain Drugs Used in Cardiology

Procainamide:	ANA positive lupus-like syndrome, wide QRS and torsades
Quinidine:	Hepatitis, thrombocytopenia, **hemolytic anemia**, **torsades**, **decreased digoxin excretion**
Phenytoin:	Heart block, ataxia, nystagmus, vertigo, seizures, rash, **pseudolymphoma**, **megaloblastic anemia**, peripheral neuropathy
Amiodarone:	Bradycardia, increased heart block, **increased digoxin concentration**, ventricular arrhythmias, **corneal micro-crystallization**, **hypo- and hyperthydroidism**, **pulmonary fibrosis**, hepatitis, and blue tint of exposed skin
Captopril:	**Loss of taste**, leucopenia, **cough**, urticaria
Sotalol:	Torsades, decreased LVF, bradycardia, and other side effects associated with beta blockers
Mexiletine:	Leukopenia, CNS and GI side effects
Plavix (Clopidogrel):	**TTP-like syndrome**
Nicotinic acid:	Hyperglycemia, hyperuricemia, liver dysfunctions, flushing

PREOPERATIVE EVALUATION

Case 1

68-year-old man being evaluated for hip replacement. Asymptomatic able to play golf twice a week. He had a myocardial infarction many years ago. Stress test 1 year ago was normal.

1. What would you recommend?
   A. Exercise tolerance test
   B. Stress thallium
   C. Dobutamine echocardiography
   D. Angiography
   E. No further evaluation necessary prior to surgery

Answer:

Case 2

58-year-old man for elective cholecystectomy. History of diabetes and hypertension.

1. Which is most likely to benefit during perioperative period?
   A. Nitroglycerin
   B. Aspirin
   C. Atenolol
   D. ACE inhibitors
   E. Angioplasty

Answer:

Case 3

Healthy man evaluated for elective hernia repair. Plays tennis regularly. EKG: left bundle branch block.

1. What would you recommend?
   A. Exercise tolerance test
   B. Stress thallium
   C. Dobutamine echocardiography
   D. Angiography
   E. No further evaluation necessary prior to surgery

Answer:

Case 4

74-year-old man to undergo carotid endarterectomy. Had coronary bypass 3 years ago. No chest pain since that time.

1. What would you recommend?
   A. Exercise tolerance test
   B. Stress thallium
   C. Dobutamine echocardiography
   D. Angiography
   E. No further evaluation necessary prior to surgery

Answer:

Case 5

88-year-old woman is admitted to with sigmoid volvulus. She is demented and cannot offer a history. After initial reduction by endoscopy, the volvulus recurs and colon is remarkably dilated.

1. What would you recommend?
   A. Exercise tolerance test
   B. Stress thallium
   C. Dobutamine echocardiography
   D. Angiography
   E. No further evaluation necessary prior to surgery

   Answer:

Perioperative Question

1. Which is the most important prognostic factor prior to surgery?
   A. Diabetes
   B. Hyperlipidemia
   C. S_3 gallop
   D. Tobacco use
   E. Myocardial infarction 5 years ago
   F. Ectopic beats
   G. Hypertension

   Answer:

Gastroenterology

2

DISEASES OF THE ESOPHAGUS

1. Dysphagia

   - Motility Disorders → Achalasia
     → Scleroderma
     → Diffuse Esophageal Spasm

   - Obstructive Disorder → Esophageal Carcinoma
     → Peptic Stricture
     → Esophageal Ring

56-year-old man presents with complaints of heartburn 3 × per week, awakening him from sleep. There is no dysphagia, odynophagia, or weight loss. He has been taking Tums "by the gallon." Despite taking over-the-counter famotidine (Pepcid®), he continues to have heartburn. He smokes one pack of cigarettes per day. The symptoms have been occurring for 5 years.

1. What is the Next best step in management?

   A. Barium swallow
   B. Upper endoscopy
   C. 24-hour pH
   D. Empiric PPI (proton pump inhibitor)

   Answer:

2. 56-year-old man undergoes upper endoscopy that shows erosive esophagitis and Barrett's esophagus. What is the risk of developing esophageal cancer over his lifetime?

   A. 1%
   B. 10%
   C. 20%
   D. 50%

   Answer:

3. What characteristic(s) of Barretts's esophagus affect the risk of developing esophageal adenocarcinoma?

   A. Frequency of heartburn
   B. Length of Barrett mucosa
   C. Lifespan of the patient
   D. Results of pathology
   E. All of the above

   Answer:

4. Can treatment with PPI reverse the epithelial change in Barretts?

   A. Yes
   B. No

   Which can it reverse?

   A. Dysplasia → metaplasia
   B. Metaplasia → normal mucosa

   Answer:

5. Barrett's screening

   How often do you screen patients who have Barretts?

   EGD + Barretts + →

   1 year later no (−) dysplasia + metaplasia →

   Low grade dysplasia → if still low grade again →

   Dysplasia → metaplasia

   High-grade dysplasia →

6. When is life expectancy normal in Barretts?

7. What is the best initial treatment?

   A. PPI twice a day
   B. PPI daily
   C. H-2 blocker, clarithromycin, and amoxicillin
   D. PPI daily and upper endoscopy every year indefinitely
   E. PPI daily and upper endoscopy in 2 to 3 years

   Answer:

8. After initiating therapy with omeprazole in a patient with "heartburn," the patient continues to have symptoms. What should you do to treat or to evaluate the heartburn?

   A. Barium swallow
   B. Upper endoscopy
   C. 24-hour pH
   D. Double the dose of the PPI

   Answer:

9. 38-year-old man now has dysphagia that is associated with severe substernal pain. The pain occurs regardless of eating. Diagnosis and treatment?

   A. Achalasia, do dilation
   B. Diffuse esophageal spasm, give nifedipine
   C. Scleroderma, use PPIs
   D. Esophageal carcinoma, perform surgery

   Answer:

10. Most likely etiology if dysphagia begins after 10 years of heartburn?

    A. Peptic (Schatzki) ring
    B. Scleroderma
    C. Squamous cell esophageal cancer
    D. Chagas esophagus

    Answer:

11. A patient with dysphagia undergoes a barium swallow which shows a tubular esophagus with a tight lower esophageal sphincter. Next test?

    A. Barium swallow
    B. Upper endoscopy
    C. 24-hour pH
    D. Manometry/motility study

    Answer:

12. Best test to evaluate dysphagia in a 43-year-old woman with a negative endoscopy and weight loss?

    A. Barium swallow
    B. Esophageal manometry/motility
    C. 24-hour esophageal pH
    D. Serum gastrin
    E. CT (computed tomography) scan of chest

    Answer:

13. Heartburn and regurgitation for the last 5 years in a 60-year-old man lead to which of the following?

    A. Adenocarcinoma of the esophagus
    B. Barrett esophagus
    C. Esophageal stricture
    D. Gastric outlet obstruction
    E. Esophageal ulcer

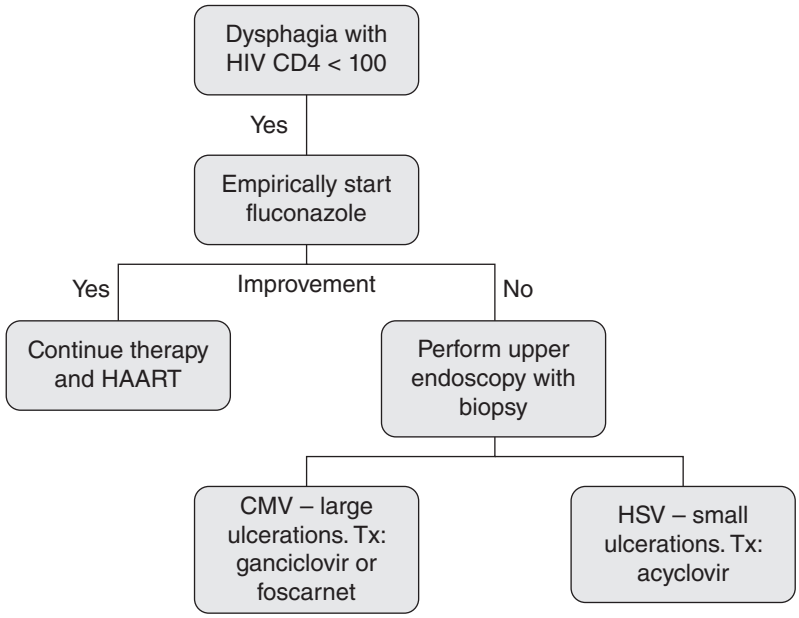
    Answer:

14. HIV+ with oral thrush presents with painful swallowing.

    Most likely diagnosis? →

    What is there is no improvement?

    Next Best Step? →



Answer:

15. What is the best diagnostic test to evaluate a 33-year-old man who is awakening every night with wheezing? There is no heartburn or history of asthma.

    A. Upper endoscopy
    B. Barium swallow
    C. 24-hour ambulatory pH
    D. Esophageal manometry
    E. Nuclear scan

    Answer:

16. 60-year-old woman with daily heartburn for 3 months failed to respond to a trial of proton pump inhibitor therapy. Upper endoscopy, reveals esophageal mucosa that is normal. The most appropriate diagnostic procedure is which of the following?

    A. Endoscopic biopsy
    B. Esophageal motility
    C. 24-hour ambulatory esophageal pH
    D. Upper GI (gastrointestinal) series (esophagography)

    Answer:

17. 45-year-old man has had dysphagia of increasing severity over the past year. He has recently lost 5 lb. The upper endoscopy shows distal erythema of the esophageal mucosa and resistance to the passage of the endoscope at the esophagogastric junction. No anatomic lesion is seen. Esophageal motility shows lack of peristalsis in the body of the esophagus and a high-pressure lower esophageal sphincter with incomplete relaxation with swallowing. Which one of the following treatments would **NOT** be appropriate for this patient?

    A. Pneumatic dilatation
    B. Botulinum toxin injection
    C. Surgical myotomy
    D. Anticholinergic agents
    E. Calcium channel blockers

    Answer:

18. 57-year-old male smoker and drinker has had dysphagia to solids worsening over 1 month, during which time he has lost 10 lb. The most appropriate initial diagnostic procedure would be which of the following?

    A. Barium swallow
    B. Endoscopy
    C. Esophageal motility
    D. 24-hour esophageal pH (ambulatory)

    Answer:

19. 45-year-old woman has a long history of dysphagia found to be due to esophageal "webs." She has a chronic anemia of unclear etiology. Over the last 6 months, she has had increased dysphagia and has lost 10 lb. An endoscopy is performed and a friable mass is seen. What is the most likely diagnosis?

    A. Squamous cell carcinoma
    B. Adenocarcinoma
    C. Benign stricture
    D. Reflux-associated ulcer

    Answer:

20. Patient with intermittent dysphagia and chest pain to solids and liquids presents to the office. He also states the difficulty swallowing is associated with chest pain.

    Most likely diagnosis? →
    Next best step? →
    What will manometry show? →
    Next step in management? →
    If no response →

21. Young patient states he had a lump of steak get stuck 3 times in the last 6 months. He states it always occurs with the first bite. Followed by regurgitation, followed by eating the rest of the meal normally.

    Most likely diagnosis? →
    Next best step? →

22. Patient with dysphagia has an EGD that shows no change in the anatomy of the lower esophagus.

    Most likely diagnosis? →

23. Young female presents with multiple food impactions over several months. EGD shows a furrowed appearance or concentric rings. Patient has multiple allergies.

    Most likely diagnosis? →
    Next best step? →
    Best management for eosinophilic esophagitis →

24. An:

    Older man with osteoporosis…
    Teenager on tetracycline…
    Old woman with gastroparesis…
    …Presents with complaints of dysphagia

Most likely diagnosis? →
Best counseling step →
Best step in management →

Medication-induced esophageal injury heal without intervention within a few days

If the patient presents with difficulty swallowing again…

Most likely diagnosis? →

Stricture formation after scarring from pill esophagitis

Next best step? →

Pneumatic dilation

Summary: Case 1

Upper endoscopy should be performed in all persons over age of 45–55 who complain of long-standing heartburn, especially if there are warning signs such as weight loss and dysphagia. There is an increased relative risk of Barrett esophagus and esophageal cancer in persons who have heartburn more than 3 times per week for over 5 years. Barrett esophagus poses a real risk for the development of adenocarcinoma of the distal esophagus; however, the risk is probably less than 0.5% per year. The risk is dependent on age, gender, race, length of mucosa involved, tobacco use, treatment, and histology (presence of dysplasia). The risk of squamous cell carcinoma is related to gender, alcohol use, tobacco use, history of caustic ingestion, achalasia, esophageal webs (Plummer-Vinson syndrome), and tylosis. The best test for confirming the diagnosis of GERD is a 24-hour pH. Only this test can verify the presence of acid reflux disease. Endoscopy will be normal in almost 50% of patients with heartburn secondary to GERD. Dysphagia to both solids and liquids in young persons is typically a motility disorder, such as scleroderma, multiple sclerosis, or Chagas esophagus. IBS, globus hystericus, and anxiety disorder should also be considered. In older persons, CNS events (stroke) are more common. Peptic rings, inflamed Schatzki rings, and complications of GERD should also be considered in persons with a long-standing history of heartburn. Achalasia should be considered in patients with dysphagia. The characteristic finding of (*1*) loss of normal contractility of the esophagus and (*2*) persistent tightening of the LES (lower esophageal sphincter) establishes the diagnosis. The gold standard for the evaluation of achalasia is the esophageal motility test. Treatment options include balloon dilatation, botulinum toxin, calcium channel blockers, and Heller myotomy.

GERD Breakdown

Symptoms:

Chest pain
Heartburn
Nocturnal cough
Asthma
Hoarseness
Loss of dental enamel

Note

Meds that cause pill esophagitis:

ASA
Bisphosphonates
Tetracyclines
KCl
Quinidine

Note

Situations that have higher pill retention rates

- Lack of an adequate liquid bolus and a long period in the recumbent position
- Ingestion of a pill immediately prior to sleep
- Age > 70 years and decreased peristaltic amplitudes
- Patients with cardiac disease, particularly following thoracotomy

Frequent throat clearing
GERD → Barretts → Adenocarcinoma

Treatment:

Weight loss
Head of bed elevation
Stop smoking
Dinner 3 hours before bedtime
PPIs superior to H2 blockers
Fundoplication surgery if no response to above

When do you do endoscopy in GERD?

GERD symptoms that don't improve with PPIs:

Odynophagia and weight loss
Symptoms >5 years
Age >50, male
Confirmed history of Barretts

1. Patient improves after 3 months of being on a PPI. Treat for life?

   Next best step?

2. 55-year-old male with hyperlipidemia and 25-year smoking history presents with 2 hours of chest pain that does not relieve with rest. Troponin negative × 3. Echo negative. Cath negative. No dysphagia.

   Most likely diagnosis?

   Next best step?

DISEASES OF THE STOMACH

Case 1

A 66-year-old man presents with vague epigastric "gnawing" discomfort that occasionally awakens him from sleep. There has been no melena, hematochezia, fever, chills, or weight loss. Past medical history includes asthma, a TIA, and peptic ulcer disease many years prior. Medications are aspirin and beclomethasone inhaler. Physical examination reveals a soft abdomen, mildly tender in the epigastrium. Abdominal ultrasound is normal.

1. What is the best initial test in the evaluation of this patient?

   A. Upper gastrointestinal series
   B. Upper endoscopy
   C. MRI (magnetic resonance imaging) of the abdomen
   D. CT scan with intravenous contrast
   E. Serology for *Helicobacter pylori*

   Answer:

Upper endoscopy shows a 1-cm ulcer in the gastric antrum.

2. How does the management of this endoscopic finding **differ** from a duodenal ulcer?

   A. Biopsies of the ulcer are needed.
   B. *Helicobacter pylori* evaluation is necessary.
   C. Repeat upper endoscopy will be needed after 6 weeks of treatment.
   D. Both A and C are true.

   Answer:

3. If the upper endoscopy showed multiple esophageal ulcers and duodenal ulcers in the second and third portions, what additional tests should be performed?

   A. Enteroscopy
   B. Serum gastrin level
   C. Small bowel series
   D. Serum salicylate level
   E. Capsule endoscopy

   Answer:

4. If biopsies show mucosa-associated lymphoid tissue (MALT) lymphoma, what is the best initial treatment?

   A. 5-FU/cisplatin
   B. Surgical resection
   C. Lansoprazole, amoxicillin, clarithromycin
   D. External beam radiation

   Answer:

5. If serum gastrin level is 498 pg/mL (normal 40–200 pg/mL), what is the best next step?

   A. Secretin stimulation test
   B. MRI of abdomen
   C. EUS (endoscopic ultrasound) of pancreas
   D. CT scan of abdomen

   Answer:

6. If serum gastrin level is 1,800 pg/mL (normal 40–200 pg/mL) and CT scan of abdomen with contrast is negative, what is the best next step?

   A. EUS and octreoscan (nuclear somatostatin receptor scintigraphy)
   B. Octreoscan
   C. MRI of abdomen
   D. CT scan without IV (intravenous) contrast
   E. EUS

   Answer:

7. For which one of the following conditions is therapy for *Helicobacter pylori* a proven benefit?

   A. NSAID-induced PUD
   B. Duodenal ulcers
   C. Non-ulcer dyspepsia
   D. Gastric cancer
   E. Gastroesophageal reflux disease

   Answer:

8. Which one of the following conditions is **not** a risk factor for developing a complication of NSAID-induced ulceration (bleeding, perforation, gastric outlet obstruction)?

   A. History of PUD
   B. Age over 75
   C. Concomitant corticosteroid use
   D. Cardiovascular disease
   E. *Helicobacter pylori* infection

   Answer:

9. In a patient in the medical intensive care unit, which one of the following disorders would be associated with a significant risk for hemorrhage from stress-related mucosal disease?

   A. MI with congestive cardiac failure
   B. Exacerbation of asthma not requiring mechanical ventilation
   C. Respiratory failure requiring mechanical ventilation
   D. Diabetic keotacidosis
   E. Acute renal failure

   Answer:

10. Which one of the following tests is the most objective means of documenting gastroparesis?

    A. Endoscopy
    B. Upper GI series
    C. Ultrasonography
    D. Nuclear medicine scintigraphy

    Answer:

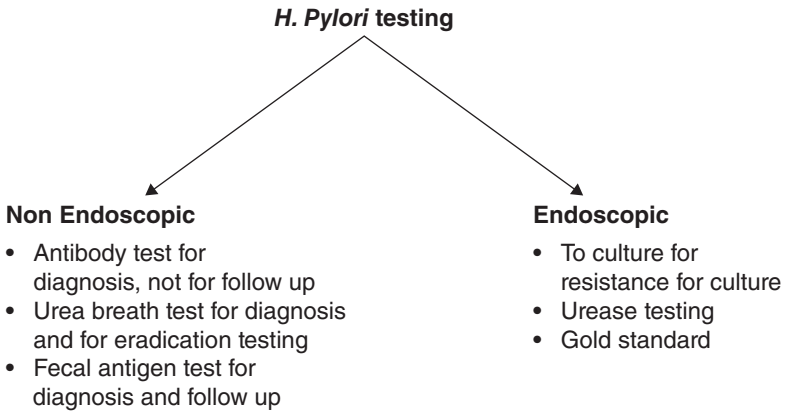
***H. Pylori* disease breakdown**

Gram negative, urease producing

Increased in 3rd world

Causes PUD (duodenal)

Gastric Malignancy → Maltoma



1. True or False – Erosive gastritis is caused by:

   NSAIDS T F

   ETOH T F

   Smoking T F

   Stress T F

Note

Treatment Regimens for *H. Pylori*:

PAC for 14 days
PPI
Amoxicillin
Clarithromycin

MOC for 14 days – PCN allergy
Metronidazole
Omeprazole
Clarithromycin

Treatment Failure

Tetracycline
Metronidazole
Bismuth salicylate
PPI

Note

Alarm symptoms:
Weight loss
Heme-positive stool
Odynophagia/Dysphagia

2. In which of the following situations is a PPI indicated?

   A. Major Surgery
   B. Burns
   C. Ventilator
   D. Head trauma
   E. All of the above

   Answer:

3. 42 year old male immigrant with peptic ulcer disease. What are the 3 most commonly tested causes?

   1. H. pylori
   2. NSAIDs
   3. Zollinger–Ellison Syndrome

   What 3 lifestyle habits prevent healing in PUD?

   1. Alcohol
   2. Diet
   3. Smoking
   4. Stress

4. 33 year old female has MALT lymphoma on biopsy.

   Most likely diagnosis? →
   Best step in management →
   After 2-3 months next best step →
   If still positive →

   Test for translocation (11:18)
   Followed by → radiation or resection

5. Non-Ulcer Dyspepsia

   56-year-old male with upper abdominal pain without weight loss, diarrhea, or change in bowel habits. Exam normal. EGD and bx negative for HP. No ulcers seen.

   Most likely diagnosis? →

   Best step in management →

   <50 and no alarm symptoms

   >50 or alarm symptoms

Summary: Case 1

Gastric carcinoma may appear as an ulcer and respond initially to treatment. This can result in a delay in the diagnosis, which profoundly influences care. Upper endoscopy should be performed in all persons over the age of 45 who complain of epigastric pain, especially if there are warning signs, such as weight loss, anemia, and early satiety. The risks for the development of peptic ulcer disease include *H. pylori*, aspirin (acetylsalicylic acid), NSAID (nonsteroidal anti-inflammatory drug) use, CNS (central nervous system) trauma/mass, burns, and severe stress (ventilators).

ZE (Zollinger-Ellison) syndrome is seen in patients with ulcer disease, typically involving the duodenum and esophagus. The secretin stimulation test is the best initial test in the evaluation of patients suspected of having ZE syndrome. Intravenous secretin will result in a persistent elevation, or even rise, in the gastrin level. The most common ulcer in ZE is a large single duodenal ulcer. However, ZE should be considered in all patients with severe acid–peptic disease and distal duodenal ulcers. A serum gastrin greater than 1,000 in the setting of the appropriate clinical symptoms is diagnostic of ZE. The workup then includes staging and identification of the lesion. The nuclear scan with octreotide can detect disease. Because the most common lesion is in the pancreas or duodenal wall, endoscopic ultrasound is a standard in identification of the gastrinoma. Aside from PUD (peptic ulcer disease), *H. pylori* is associated with gastric lymphoma and gastric cancer. Superficial MALT lymphoma can be treated initially with antibiotics directed at *H. pylori*. *H. pylori* treatment should include a PPI and two antibiotics (know metronidazole resistance for your area). The two antibiotics should include clarithromycin, amoxicillin, tetracycline, and/or metronidazole.

DIARRHEA

Enterotoxigenic	Invasive	Parasitic
• *E.coli*	• *C. jejuni*	• *Giardiasis*
• *Vibrio cholerae*	• *Salmonella*	• *Amebiasis*
• *C. perfringens*	• *Shigella*	• *Cryptosporidium*
• *B. cereus*	• *O157:H7*	• *Isospora*
• *S. aureus*	• *C. difficile*	
	• *Vibrio parahemolyticus*	
	• *Vibrio vulnificus*	

1. A 44-year-old woman presents with diarrhea. What is the most likely cause of her symptoms (include best test and treatment) under each of the following conditions? The symptoms began on a cruise ship 24 hours ago. There is associated nausea and vomiting.

   A. Rotavirus
   B. Norovirus
   C. *E. coli*
   D. *Campylobacter*
   E. *Staphylococcus*

   Answer:

   Treatment:

2. The woman works in a nursery school.

   A. Rotavirus
   B. Norovirus
   C. Enteroadherant (pathogenic) *E. coli*
   D. *Campylobacter*
   E. *Staphylococcus*

   Answer:

   Treatment:

3. The diarrhea is associated with left lower quadrant pain, blood, and fever.

   A. Rotavirus
   B. Norovirus
   C. *E. coli*
   D. *Campylobacter jejuni*
   E. *Staphylococcus* toxin

   Answer:

   Treatment:

4. The patient consumed potato salad at a picnic. The symptoms began with vomiting 6 hours after eating.

   A. Rotavirus
   B. Norovirus
   C. *E. coli*
   D. *Campylobacter jejuni*
   E. *Staphylococcus* toxin

   Answer:

   Treatment:

5. Sushi was consumed 2 days ago and blisters are forming on the patient's legs.

   A. Rotavirus
   B. *Vibrio* vulnificus
   C. *E. coli*
   D. *Campylobacter jejuni*
   E. *Staphylococcus* toxin

   Answer:

   Treatment:

6. The patient has recently returned from Mexico.

   A. *Vibrio* cholera
   B. Shigella
   C. Enterotoxigenic *E. coli*
   D. *Campylobacter jejuni*
   E. *Staphylococcus* toxin

   Answer:

   Treatment:

7. The patient has bloody bowel movements after consuming some raw (or undercooked) chopped meat.

   A. *Vibrio* cholera
   B. Shigella
   C. *E. coli* 0157:H7
   D. *Campylobacter jejuni*
   E. *Staphylococcus* toxin

   Answer:

   Treatment:

8. The patient consumed fried rice.

   A. *Bacillus cereus*
   B. *Listeria* monocytogenes
   C. *E. coli* 0157:H7
   D. *Campylobacter jejuni*
   E. *Staphylococcus* toxin

   Answer:

   Treatment:

9. The patient consumed old creamy pastries and now has pain in the RLQ (right lower quadrant).

   A. Malafia bubu
   B. *Bacillus cereus*
   C. Enterotoxigenic *E. coli*
   D. *Campylobacter jejuni*
   E. *Yersinia entercolitica*

   Answer:

   Treatment:

10. The patient also has diabetes, chronic bloating, and weight loss. She has two or three watery bowel movements per day that are often foul-smelling. The symptoms have been going on for over a year. She has recently been found to have an iron deficiency anemia.

    A. Celiac disease
    B. *Giardia lamblia*
    C. *Trophyerma whipplii*
    D. All of the above

    Answer:

    Treatment:

11. The patient has profuse watery diarrhea and a mass in her pancreas.

    A. VIPoma
    B. Glucagonoma
    C. Zollinger-Ellison syndrome
    D. A and C are consistent with this diagnosis.
    E. All of the above

    Answer:

    Treatment:

12. The patient has diabetes, hypertension, and family history of CAD (coronary artery disease). She is a smoker; and the diarrhea began 6 hours after crampy left upper quadrant pain. There is now scant red blood in the stool.

    A. Chronic intestinal ischemia
    B. Ischemic colitis
    C. Acute mesenteric ischemia

    Answer:

    Treatment:

13. A 50-year-old man presents to the emergency room with a 24-hour history of 8–10 episodes of liquid stools without blood. There is diffuse abdominal cramping that is relieved by each bowel movement. The patient denies tenesmus. His pulse is 91/min and blood pressure is 120/87 mm Hg. He is afebrile and not orthostatic. The best initial approach to this patient would be which of the following?

    A. Admit for observation
    B. IV hydration with lactated Ringer
    C. Empiric antibiotics with ciprofloxacin
    D. Reassurance with oral fluids
    E. Flexible sigmoidoscopy with biopsy of the rectosigmoid region

    Answer:

    Treatment:

14. Which of the following produces an inflammatory diarrhea (fecal leukocytes)?

    A. *Giardia lamblia*
    B. Norwalk agent
    C. *Staphylococcus aureus*
    D. *Clostridium difficile*
    E. *Vibrio cholerae*

    Answer:

    Treatment:

15. 67-year-old woman presents with diarrhea. She has a history of coronary artery disease. Last night, severe left-sided pain awoke her from sleep, and the diarrhea began 4 hours later. There is scant blood. Currently, there is no pain, fever, or chills. A colonoscopy last year was normal. Physical examination is unremarkable. The best next step would be which of the following?

    A. Angiogram
    B. MRA (magnetic resonance angiography)
    C. CT scan of the abdomen
    D. Clear liquids and observation

    Answer:

    Treatment:

Note

Strain of *C. difficile* that causes toxic megacolon is BINAP1 strain.

Note

PPI raises the risk of *C. difficile*.

16. Diarrhea and abdominal pain after exposure to antibiotics.

    Most likely diagnosis →

    Next best step →

    Best initial diagnostic step →

    Most accurate diagnostic step →

    Stool is + for *C. difficile* toxin; treated with metronidazole for 10 days and symptoms improve. 2 weeks after the treatment develops diarrhea and abdominal pain again.

    Next best step →

    Stool is + for *C. difficile* toxin; treated with metronidazole for 10 days and symptoms improve. 2 weeks after the treatment develops diarrhea and abdominal pain again.

    Next best step →

    Stool is + for *C. difficile* toxin; patient started on antibiotics but a day later patient has increased distension, tenderness, and lethargy. BP 88/50. HR 120. Lactate 16 mEq/L. X-ray shows ileus.

    Most likely diagnosis?

    Next best step? →

17. Best therapy to prevent *C. difficile* in a patient getting antibiotics for sinusitis or any disease?

18. After returning from a vacation in Colombia, a patient presents with non-bloody diarrhea, epigastric pain, iron-deficiency anemia, and eosinophilia.

    A. *E. coli*
    B. Giardia
    C. *Yersinia*
    D. *Strongyloides*
    E. *Cholera*

    Answer:

    Treatment:

19. Patient with AIDS has large volume non-bloody diarrhea. Organisms are seen on modified acid fast stain.

    A. *Cryptosporidium*
    B. Herpes
    C. CMV
    D. *E. coli*
    E. *Yersinia*

    Answer:

    Treatment:

20. Patient is found to have a mass in his liver.

    A. *Cryptosporidium*
    B. *Ascariasis*
    C. *E. Histolytica*
    D. Inflammatory bowel disease
    E. *E. coli*

    Answer:

    Treatment:

21. Patient with diarrhea, food intolerance, nausea and vomiting, and abdominal discomfort. Steatorrhea is present O&P workup is negative. Labs reveal peripheral eosinophilia+. What is the most likely diagnosis?

22. Young patient with abdominal pain described as crampy relieved by the passage of small amounts of stool and mucus. Occasionally she notes constipation. No nausea, vomiting, melena, hematochezia, or weight loss. Lab exams are normal.

    Most likely diagnosis? →

    Best treatment if:

    Diarrhea predominant →

    Constipation predominant →

23. Nursing student presents with chronic diarrhea. Stool workup reveals osmolality of 300. Stool Na is 50 and K is 40. NaOH turns the sample red. What is the most likely diagnosis?

    Most likely diagnosis →

    Next best step →

24. Diarrhea with RLQ pain, rash, and fecal leukocytes are positive.

    Most likely diagnosis →

    Treatment →

25. Patient with steatorrhea and laboratory shows hemoglobin of 9.0 and MCV of 104. A fecal occult blood test is negative. Abdominal CT scan which shows small bowel diverticula. What is the most likely diagnosis?

    Most likely diagnosis → Bacterial overgrowth

    Next best step →

26. Patient with iron deficiency anemia (low serum iron, high TIBC, low ferritin and microcytic indices). No alarm symptoms. EGD and colonoscopy are normal. Which of the following would help in diagnosis?

    Most likely diagnosis →

    Next best step →

    Which is the most specific antibody?

27. Patient with celiac disease responds well to this diet for the next 12 years. Now presents with diarrhea, abdominal pain and weight loss. What is the most likely diagnosis?

    Most likely diagnosis →

    Next best step →

    Patient with celiac disease now on gluten free diet for 3 months. Still with pain and weight loss. What is the most likely diagnosis?

Celiac Breakdown

- Bulky, greasy stool (steatorrhea) and weight loss, abdominal distention, presenting only with anemia
- Usually iron deficiency anemia, occasionally elevated PTT and/or transaminases
- Associated with auto-immune diseases: (Dermatitis herpetiformis, DM I, Hashimoto's thyroiditis and seizure disorders)
- Diagnostics: anti-tissue transglutaminase (most specific), + anti-endomysial, anti-gliadin or antibodies, villous atrophy on small bowel biopsy
- Treatment: Gluten-free diet (no wheat, barley, or rye)
- Long-term complications of malignancy (small bowel T-cell lymphoma), esophageal carcinoma

28. Recent travel to the 3rd world now has abdominal pain and diarrhea. Wheezing over the past year, which has been resistant to inhaled beta-agonists and steroids. + peripheral eosinophilia.

    Most likely diagnosis →

    Next best step →

29. A patient with weight loss, diarrhea, abdominal pain, and multiple joint pain that returned from India 5 months ago and lost 15 lbs over this time. Also has generalized lymphadenopathy. Small bowel biopsy shows dilated lymphatics and foamy macrophages with PAS+ granules. What is the most likely diagnosis?

    Most likely diagnosis →

    Next best step →

30. Whipple's Disease Breakdown

    - Caused by bacillus *Tropheryma whippelii*
    - Fever, diarrhea, weight loss, arthritis and occasionally neurological deficits
    - Exam: lymphadenopathy and arthritis; occasionally macular skin rash, various neurologic deficits and murmurs
    - Anemia, hypoalbuminemia, hypocarotenemia
    - Small bowel biopsy shows foamy mononuclear cells filled with periodic acid-Schiff staining material (PAS +), PCR for *Tropheryma whippelii*
    - Treatment: Penicillin and streptomycin; ceftriaxone and streptomycin for CNS disease) for 10-14 days then Bactrim for at least 1 year (cefixime or doxycycline if sulfonamide allergic)

Summary: Case 1

The most common causes of infectious diarrhea are noroviruses. Cultures are typically negative, and symptoms resolve relatively quickly. Bacterial pathogens can be divided between invasive and noninvasive. The noninvasive pathogens have classic characteristics, including nausea, vomiting, creamy foods *(Staphyloccocus)*; watery diarrhea (enterotoxigenic *E. coli*); diarrhea and pain in the RLQ *(Yersinia entercolitica)*; and consumption of fried rice *(B. cerius)*. The most common cause of invasive diarrhea in the United States is *Campylobacter jejuni*. Salmonella is less common. *E. coli* 1057:H7 presents as bloody diarrhea, typically associated with consumption of meat. Stool for culture and fecal leukocytes (Wright stain) establishes the diagnosis. Malabsorption can be documented by fecal fat and serum beta carotene. Chronic causes of diarrhea include small bowel disease (Giardia, celiac disease, abetalipoproteinemia, amyloid, Whipple disease), pancreatic disease (chronic pancreatitis), and inflammatory bowel disease. Small bowel biopsy in general establishes the diagnosis. Celiac disease, sprue, and gluten enteropathy refer to a common disease that presents with small-bowel malabsorption. Iron deficiency anemia is often found (and may be a presenting sign). Selective IgA deficiency and diabetes are commonly associated. Antiendomyseal and antigliadin antibodies are often positive (sensitivity and specificity over 90%). Small-bowel biopsies typically have flattened villi that grow to normal after institution of a gluten-free diet. Small-bowel lymphoma is associated with this disease. Ischemic colitis presents in patients at risk for CAD (*C. difficile*–associated diarrhea) with pain followed by diarrhea. Flexible sigmoidoscopy establishes the diagnosis by antimesenteric involvement of the colon.

Disorder	Diagnosis	Clues or Risk Factors
Microscopic colitis	Biopsies of colonic mucosa	Secretory diarrhea pattern; includes collagenous colitis, lymphocytic colitis
Ischemia	Colon or small bowel imaging and biopsies	Vascular disease, history of hematochezia, pain
Pancreatic insufficiency	Tests for excess fecal fat and pancreatic calcifications	Chronic pancreatitis, hyperglycemia, or history of pancreatic resection
Eosinophilic enteritis	Small bowel biopsy (full-thickness biopsy)	Eosinophilia, hypoalbuminemia
Enteral feedings	History	Classic osmotic diarrhea
Bile acid malabsorption	Diagnosis of exclusion, empiric response to cholestyramine	History of resection of <100 cm of distal small bowel
Bile acid deficiency	Diagnosis of exclusion, excess fecal fat	Cholestasis, resection of >100 cm of small bowel
Radiation exposure	History, small bowel and/or colon imaging	May begin years after exposure, strictures or hypervascular mucosa with characteristic biopsy findings
Dumping syndrome	History previous gastrectomy or gastric bypass surgery	Postprandial flushing, tachycardia, diaphoresis
Self-induced diarrhea	Tests for stool pH, sodium, potassium, and magnesium, history of excess laxative use	Melanosis coli, somatization or other psychiatric syndromes
Medications	History	Acarbose, abx (especially PCN, macrolides), antineoplastic agents, colchicine, laxatives, magnesium-based antacids, cathartics, PPI, etc.

SCREENING FOR COLON CANCER

Case 1

1. What is the best method of screening a 55-year-old woman with no symptoms?

   A. Colonoscopy and repeat examination if no polyps in 5 years
   B. Colonoscopy and repeat examination if no polyps in 10 years
   C. MRI of abdomen
   D. Stool occult cards, colonoscopy if positive
   E. Virtual colonoscopy

   Answer:

2. What method(s) is/are acceptable for screening for colon cancer?

   A. Colonoscopy
   B. Flexible sigmoidoscopy
   C. Stool occult cards
   D. Barium enema
   E. All are acceptable.

   Answer:

3. What other method is equally as effective as colonoscopy in the evaluation of an occult-positive stool?

   A. Virtual colonoscopy
   B. Flexible sigmoidoscopy and barium enema
   C. Flexible sigmoidoscopy
   D. Barium enema
   E. Nothing is equally as effective as colonoscopy in the evaluation of occult-positive stool.

   Answer:

4. If a 1-cm tubular adenoma is found on colonoscopy, when should the next colonoscopy be performed?

   A. 6 months
   B. 1 year
   C. 3–5 years
   D. 10 years

   Answer:

5. What is the best screening strategy for a 34-year-old woman whose father died of colon cancer at age 55?

   A. Colonoscopy every 5 years, beginning at age 40
   B. Colonoscopy every 10 years, beginning at age 50
   C. Colonoscopy every 5 years, beginning at age 45
   D. Colonoscopy every 2 years, beginning at age 40

   Answer:

6. What is the best screening strategy for a person with ulcerative colitis who has had disease present for 14 years?

   A. Colonoscopy with biopsies in 4 quadrants every 10 cm every 1 to 2 years
   B. Flexible sigmoidoscopy every year
   C. Colonoscopy every 5 years
   D. Colonoscopy every 10 years
   E. Annual barium enema

   Answer:

7. What is the best screening strategy for a 38-year-old man whose mother died of colon cancer at age 49, brother had a giant dysplastic polyp, and grandfather had colon cancer? His sister had uterine cancer at age 52.

   A. Colonoscopy every 5 years, beginning at age 39
   B. Flexible sigmoidoscopy annually, beginning at age 12
   C. Colonoscopy every 1 to 2 years, beginning at age 25 (therefore, now)
   D. Barium enema annually
   E. Colonoscopy every 3 to 5 years

   Answer:

8. What is the best screening strategy for the 12-year-old son of a 38-year-old woman who had colon cancer at age 20? The boy's 19-year-old brother, on a recent examination, was found to have multiple polyps.

   A. Colonoscopy every 1 to 2 years, beginning at age 25
   B. Flexible sigmoidoscopy every year, beginning at age 12 (now)
   C. Colonoscopy every 5 years, beginning at age 25
   D. Barium enema every 5 years
   E. Flexible sigmoidoscopy every year, beginning at age 30

   Answer:

Summary: Case 1

Colon cancer is preventable. All persons over the age of 50 should undergo a colonoscopy for screening for colon cancer every 10 years (best strategy). Fecal occult tests, barium enema, and flexible sigmoidoscopy are inferior tests but are considered acceptable screening tests. If there is a family history of colon cancer, every family member, regardless of age, should have a colonoscopy either at the age of 40 or at an age 10 years younger than the age at which the family member developed the disease, whichever is earlier. In these patients, the colonoscopy is repeated every 5 years. If a polyp is found, a surveillance colonoscopy should be performed after 3 to 5 years. All persons with ulcerative colitis/Crohn colitis should undergo annual colonoscopy *with biopsy* after 10 years of disease. Patients with Lynch syndrome (hereditary nonpolyposis colorectal cancer) should be screened every 2 years, beginning at age 25. Familial adenomatous polyposis should be considered in persons with family histories of colon cancer in their early 20s and 30s. Screening is with flexible sigmoidoscopy, beginning at age 12.

Colonic Polyps

- **Types**
  - **Hyperplastic – thickened mucosa not pre-malignant**
  - **Tubular adenoma and villous adenoma – premalignant**
  - **Risk of Ca in situ increases: Size > 2 cm, more villous, more sessile**
- **At Risk**
  - 5-10% of people older than 40 have colonic polyps
  - 1st degree relatives of polyp patients have a 5x increased risk of having polyps
- **Clinical**
  - Usually asymptomatic, hemoccult +, rarely gross bleed or obstruction
- **Diagnosis**
  - **Colonoscopy with removal**

Type	Number; Size	When to do Colonoscopy
Low risk – Tubular	Single < 1 cm	3-5 years
High risk – Villous	Multiple > 1 cm	1 year

INFLAMMATORY BOWEL DISEASE

Case 1

A 44-year-old woman presents with diarrhea, weight loss, fatigue, and RLQ pain over the last 2 weeks. She has 3 to 8 watery bowel movements per day with mucus, no melena, and no hematochezia. P.E. reveals low-grade fever, injected sclera, multiple aphthous ulcers, decreased bowel sounds, and tenderness in the RLQ. There are multiple erythematous lesions on her shins. Rectal examination reveals a small perirectal fistula.

1. Which finding is exclusively associated with Crohn disease?

   A. Low-grade fever
   B. RLQ pain
   C. Erythema nodosum
   D. Perirectal fistula
   E. Episcleritis

   Answer:

2. What is the best single test to determine the presence of Crohn disease (highest diagnostic yield)?

   A. Small-bowel series with air contrast (enteroclysis)
   B. Colonoscopy
   C. Flexible sigmoidoscopy
   D. MRI

   Answer:

3. Which dermatologic or ocular manifestation of Crohn disease does **not** correlate with activity of disease?

   A. Erythema nodosum
   B. Pyoderma gangrenosum
   C. Episcleritis
   D. Maculpapulosis

   Answer:

4. What medication should be initiated in this patient who has mild/moderate inflammatory bowel disease?

   A. Sulfasalazine
   B. Mesalamine
   C. Prednisolone
   D. Ciprofloxacin

   Answer:

5. If the patient does well on mesalamine and then relapses, what medication should be added?

   A. Sulfasalazine
   B. Mesalamine
   C. Prednisolone
   D. Ciprofloxacin

   Answer:

6. On tapering the prednisone, she has relapses. What medication should be initiated in this patient to avoid persistent use of steroids and to prevent relapses?

   A. Rifaxamin
   B. 6-Mercaptopurine/azathioprine
   C. Methotrexate
   D. Ciprofloxacin

   Answer:

7. If the alkaline phosphatase is found to be elevated, what do you suspect?

   A. Primary biliary cirrhosis
   B. Sclerosing cholangitis
   C. Biliary sludge
   D. Common bile duct stone
   E. Bone disease

   Answer:

8. Which extraintestinal manifestation of ulcerative colitis is **not** affected by early colectomy?

   A. Sclerosing cholangitis
   B. Metastatic colon cancer
   C. Small-joint arthritis
   D. Episcleritis
   E. Uveitis

   Answer:

9. Persons with Crohn disease involving the ileum are at risk for developing which of the following?

   A. Calcium oxalate kidney stones
   B. Cholesterol gallstones
   C. B_{12} deficiency
   D. Bile salt diarrhea
   E. All of the above

   Answer:

Note

Before starting anti-TNF must check PPD and hepatitis B serology

10. After being treated with mesalamine and azathioprine, a fistula to the perianal region develops. What medication(s) should be added to assist in healing the fistula?

    A. Infliximab, ciprofloxacin, and metronidazole
    B. Methotrexate
    C. Metronidazole
    D. 6-mercaptopurine and sulfasalazine
    E. Prednisolone

    Answer:

11. Which of the following statements about colorectal carcinoma associated with Crohn disease is true?

    A. It usually occurs in women.
    B. The frequency of carcinoma is similar in patients with extensive, long-standing, unresected Crohn colitis to those patients with extensive, long-standing ulcerative colitis.
    C. The right colon is involved in over 70% of cases.
    D. The mean age of patients with colorectal carcinoma is 35.
    E. The occurrence of the carcinoma is unrelated to the duration of the Crohn disease.

    Answer:

12. Which of the following does **not** occur after extensive ileal resection for Crohn disease?

    A. Nephrolithiasis
    B. Iron-deficiency anemia
    C. Cholelithiasis
    D. Megaloblastic anemia
    E. Bile salt diarrhea

    Answer:

13. Which medication is effective for inducing remission but is **not** effective in maintaining remission?

    A. Mesalamine
    B. Sulfasalazine
    C. Corticosteroids
    D. 6-Mercaptopurine
    E. Azathioprine

    Answer:

14. Which of the following is the most likely cause of a relapse of ulcerative colitis?

    A. Spicy food
    B. Raw vegetables
    C. NSAIDs
    D. Smoking

    Answer:

15. Reducing the risk of colorectal cancer in inflammatory bowel disease is related to which of the following?

    A. Surveillance colonoscopy with biopsy
    B. Vitamins
    C. Long-term steroids
    D. Annual barium enema

    Answer:

	CD	UC
ASCA	**Positive**	Negative
ANCA	Negative	**Positive**

Summary: Case 1

Inflammatory bowel disease (IBD) can present with chronic symptoms or acute symptoms (bowel obstruction, sudden onset of diarrhea). Erythema nodosum, aphthous ulcers, pyoderma gangrenosum, seronegative arthritis, episcleritis, and uveitis may all manifest. Because in most patients with ulcerative colitis the rectum is involved, a flexible sigmoidoscopy can assist in the evaluation. Although endoscopic appearance can be deceiving, architectural distortion of the crypts is a hallmark feature on biopsy. As the ileum is most often involved in patients with Crohn disease, a small-bowel series is preferred. Colonoscopy can evaluate the rectum and distal ileum (in most patients). Treatment should begin with mesalamine (5-ASA) in patients with mild to moderate disease. Steroids are added if there is no response, or if disease is severe. The drug 6-MP and its parent, azathioprine, are steroid-sparing medications used in patients who relapse. Efficacy is not reached for 2 to 3 months after initiation of treatment. Due to involvement of the terminal ileum, B_{12} deficiency, calcium oxalate stones, and gallstones can occur. Although surgery is curative in patients with ulcerative colitis, 50% of patients with Crohn disease will have a relapse within 5 years of surgery. Sclerosing cholangitis complicates IBD. Progression to cirrhosis and cholangiocarcinoma cannot be prevented by treatment of the underlying IBD (e.g., surgery). Metronidazole has been shown to be effective in perianal Crohn disease. Infliximab (Remicaide®) is effective in fistulizing Crohn disease.

UPPER GASTROINTESTINAL BLEEDING/ END-STAGE LIVER DISEASE

Case 1

74-year-old man presents with hematemesis and 3 watery, black bowel movements over one day. There has been 2 weeks of increasing fatigue and jaundice. He takes naproxen for headaches. Temperature 39°C (102.2°F), BP 100/60 mm Hg, pulse 120/min. Sclerae are yellow with decreased bowel sounds, tense ascites, and trace lower extremity edema. Lab results are:

WBC: 14,000	PT: 22 (INR 3) (elevated)
AST: 145	Platelets: 77,000 (low)
Albumin: 2.2 (low)	Bilirubin: 12.7 (markedly elevated)
HCT: 28	Alk phosphatase: 144
ALT: 66	

1. Which of the following is true?
   A. Octreotide should **not** be given until an endoscopy is peformed, verifying the presence of varices.
   B. The true hematocrit is likely around 20, and 2 units of blood should be given.
   C. Fresh frozen plasma should be given only if the bleeding continues.
   D. Antibiotics should **not** be given prophylactically.

   Answer:

2. After stabilization, paracentesis reveals WBC of 200 (80% PMNs), and albumin of 0.5. What does this indicate?
   A. Spontaneous bacterial peritonitis (SBP) is present.
   B. Portal hypertension is present.
   C. Hepatoma is likely present.
   D. Lifelong antibiotics to prevent SBP are necessary.
   E. B and D are correct.

   Answer:

3. Upper endoscopy reveals varices, which are treated by band ligation. A clean-based ulcer is identified. Which of the following is true?

   A. The risk of rebleeding from a clean-based ulcer is low (less than 5%).
   B. Metoprolol should be given on discharge to prevent a recurrent bleed from the varices.
   C. Sclerotherapy is superior to band ligation in the treatment of varices.
   D. Transjugular intrahepatic portal systemic shunting (TIPS) should be performed on discharge to prevent a recurrent bleed from the varices.

   Answer:

4. Three days after admission, the patient continues to have fever and jaundice. What medication should be started?

   A. Spironolactone
   B. Lactulose
   C. Metronidazole
   D. Prednisone

   Answer:

5. 45-year-old man with end-stage liver disease presents to your office after being hospitalized for bleeding varices. He was discharged 1 month ago. After band ligation was performed, pantoprazole was prescribed. His last endoscopy was at the hospital at the time of the last band ligation. He feels well, with no further episodes of bleeding. There is obvious ascites and lower extremity edema. Which of the following is recommended?

   A. Propranolol
   B. Spironolactone
   C. Furosemide
   D. Upper endoscopy with possible band ligation
   E. All of the above

   Answer:

6. 35-year-old accountant, otherwise healthy, presents after having 2 episodes of melena. In the emergency department, he is tachycardic. After 2 L of saline is given, an upper endoscopy is performed. The upper endoscopy reveals a clean-based, 1-cm ulcer in the antrum. The hematocrit is 35 after hydration, and vitals are normal. Rectal examination reveals dark brown stool, occult-positive. The next appropriate step in management would be which of the following?

   A. Admit to the intensive care unit
   B. Admit to a monitored floor
   C. Admit to a regular floor and repeat endoscopy the next morning
   D. Discharge the patient, to follow up as an outpatient, prescribe omeprazole, and avoid aspirin and nonsteroidals.

   Answer:

Summary: Case 1

Hemodynamic resuscitation is the most important aspect in the management of patients with gastrointestinal bleeding, and it must precede endoscopy. Correction of coagulopathy is also preferred. IV fluids, blood, and FFP (fresh frozen plasma) should be given initially. Octreotide is indicated in all patients with suspected variceal bleed. Intravenous PPI has clearly been shown to be effective in bleeding peptic ulcer disease. Due to obvious hemostatic effects, PPIs will likely be effective in patients with variceal bleeding. The endoscopic appearance of the ulcer guides treatment and determines prognosis:

Appearance	Risk of Rebleeding	Treatment
Clean base	5%	Oral meds/D/C
Flat spot	20%	Heater probe
Clot	20%	Remove clot
Visible vessel	50%	Heater probe
Spurting vessel	50%	Heater probe/injection

The serum-ascites albumin gradient (SAAG) differentiates ascites from malignancy and TB from portal HTN (hypertension). A SAAG greater than 1.1 is associated with portal HTN. SBP (spontaneous bacterial peritonitis) is defined by a PMN (polymorphonuclear neutrophilic leukocyte) count of greater than 250. Prophylaxis of recurrent SBP is recommended in patients with (*1*) prior SBP, (*2*) current variceal bleed, and/or (*3*) ascites protein less than 1 mg/dL. Prednisone is effective in treating severe alcoholic hepatitis (there are several formulas, however; focus on the patients with classic findings: a bilirubin >15 and PT [INR >2] that is significantly elevated). A low-salt (not low-protein) diet is indicated in patients with ESLD (end-stage liver disease) complicated by ascites. A nonselective beta blocker prevents first and recurrent bleeding in patients with varices (use of propranolol or nadolol in patients with known varices is a standard of care!).

PANCREAS

Case 1

44-year-old woman presents to the hospital with epigastric pain radiating to the back associated with nausea and vomiting. The pain began suddenly 3 hours ago. She has no fever, chills, or diarrhea.

BP 130/70, P 88, R 12

Abd: No bowel sounds, marked epigastric tenderness

WBC: 15,500

BUN, Creatinine: Normal

AST: 255 (elevated)

Bilirubin: 1.1

Amylase: 2,311 (elevated)

Alkaline phosphatase: 122

ALT: 244 (elevated)

1. Which of the following is/are true regarding the diagnosis?
   A. A serum lipase is needed to confirm the diagnosis.
   B. A CT is needed to confirm the diagnosis.
   C. Laboratory testing alone demonstrates pancreatitis.
   D. MRCP is needed to rule out a common bile duct stone.

   Answer:

2. Which of the following is true regarding severity in this patient?
   A. The patient has mild disease.
   B. The patient currently has mild disease but must be observed closely during the first 48 hours.
   C. The patient has severe disease.
   D. Necrotizing pancreatitis is definitely not present.

   Answer:

3. What does a purple discoloration of the skin on the left flank indicate?
   A. An intraperitoneal hemorrhage
   B. A retroperitoneal hemorrhage
   C. Necrotizing pancreatitis
   D. Interstitial pancreatitis

   Answer:

4. If the bilirubin is elevated, when should an ERCP (endoscopic retrograde cholangiopancreatography) be performed?

   A. If the alkaline phosphatase is found to elevated
   B. If the pancreatitis becomes severe
   C. If the patient develops signs and symptoms of biliary sepsis
   D. If the patient develops a significant amount of pancreatic necrosis

   Answer:

   Ultrasound shows numerous gallstones in the gallbladder, and the biliary tree is not dilated. After 3 days, the pain resolves, and amylase and LFTs (liver function tests) return to normal.

5. Which of the following recommendations is necessary?

   A. A cholecystectomy
   B. Avoidance of alcohol for life
   C. MRCP
   D. ERCP

   Answer:

6. Which medication(s) is/are likely to induce acute pancreatitis?

   A. Azathioprine
   B. DDI (didanosine)
   C. DDI and azathioprine
   D. Metformin

   Answer:

7. The most likely cause of acute idiopathic recurrent pancreatitis is which of the following?

   A. Sphincter of Oddi dysfunction
   B. Microlithiasis, biliary sludge
   C. Pancreas divisum
   D. Autoimmune pancreatitis
   E. Viral etiologies

   Answer:

Note

80% of pancreatitis caused by alcohol and gallstones.

Gallstones are the single MCC of acute pancreatitis.

Alcohol is the single MCC of chronic pancreatitis.

8. The best approach to a 38-year-old woman who has no history of pancreatitis or alcohol use and is found to have a 3.7-cm septated cyst in the tail of the pancreas on CT scan and endoscopic ultrasound is which of the following?

   A. Biopsy
   B. Distal pancreatectomy
   C. Internal drainage
   D. CA 19-9 level
   E. MRI of the pancreas with MRCP

   Answer:

9. The diagnosis of infected necrosis during an attack of acute pancreatitis is best made by which of the following?

   A. Clinical deterioration
   B. MRI
   C. Early surgical exploration
   D. Image-guided fine-needle aspiration of necrotic areas or fluid collections
   E. Contrast-enhanced CT scan

   Answer:

10. While riding a bicycle, a 22-year-old woman is thrown forward when she stops suddenly. She hits her abdomen. The next day she presents to the ER with severe pain. She has marked abdominal tenderness and an amylase of 2,120. The most likely diagnosis is which of the following?

    A. Ruptured spleen
    B. Traumatic pancreatitis
    C. Ruptured viscus
    D. Gastric ulcer

    Answer:

11. 55-year-old man with jaundice is found to have a 2-cm mass in the head of the pancreas, documented by MRI. EUS confirms that the lesion does not penetrate the portal vein, and there are no gallstones or common bile duct stones. There is no adenopathy, and the patient is otherwise healthy. He has no history of alcohol use and no other medical problems. What is the most appropriate management?

    A. ERCP/brushings and stent placement
    B. Pancreaticoduodenectomy (Whipple procedure)
    C. Repeat MRI in 3 months
    D. Repeat MRI in 6 months
    E. CT scan guided biopsy

    Answer:

12. 45-year-old woman presents with abdominal pain, amylase of 3,200, AST of 150. Bilirubin is normal. Alkaline phosphatase is slightly elevated. She denies alcohol use. Ultrasound of abdomen is normal. There are no dilated bile ducts. Her serum triglyceride level is 450. The most likely cause of the acute pancreatitis is which of the following?

    A. Hypertriglyceridemia
    B. A passed gallstone
    C. A medication
    D. A mass in the pancreas
    E. Alcohol

    Answer:

Risks for acute pancreatitis:

- I - Idiopathic
- G - Gallstones
- E - Ethanol (alcohol)
- T - Trauma
- S - Steroids
- M - Mumps
- A - Autoimmune (Polyarteritis nodosa)
- S - Scorpion venom
- H - Hyperlipidemia, hypothermia, hypercalcemia
- E - ERCP and emboli
- D - Drugs

	CD	UC
ASCA	**Positive**	Negative
ANCA	Negative	**Positive**

13. Elderly alcoholic 10 days after onset of pancreatitis with persistent fevers and high WBC count.

    Diagnosis:

    Treatment:

14. Elderly alcoholic presents 2 months after bout of pancreatitis. Has abdominal fullness. Palpable cystic mass on exam.

    Diagnosis:

    Treatment:

    If > 6 cm and > 6 weeks: Perform percutaneous drainage or endoscopic drainage IF PAINFUL

Case 2

34-year-old man presents for a narcotic prescription due to chronic pain, which he claims is chronic pancreatitis. He describes epigastric pain that is dull and radiates to the back. The pain began several years ago after a 10-year history of binge drinking. He has had no diarrhea or weight loss with no prior hospitalizations or surgeries. He takes pancrelipase. The abdomen reveals normal bowel sounds and is soft but tender in the epigastrium.

CBC: Normal	Electrolytes: Normal
BUN, Creatinine: Normal	LFTs: Normal
Albumin: Normal	Amylase: Normal

1. What is the most sensitive and specific test in the diagnosis of chronic pancreatitis?

   A. ERCP
   B. MRCP
   C. Endoscopic ultrasound (EUS)
   D. Secretin stimulation test
   E. X-ray

   Answer:

2. If chronic pancreatitis is present, what is the best method of treating chronic pain in the absence of diarrhea or dilated pancreatic ducts?

   A. EUS celiac axis block
   B. Pancreatic enzyme supplementation
   C. Antioxidants
   D. Narcotics

   Answer:

3. Which patient with pain from chronic pancreatitis would benefit most from surgery?

   A. The patient with an inflammatory mass in the head of the pancreas
   B. The patient with a dilated dorsal (Santorini) duct
   C. The patient with steatorrhea
   D. The patient with diabetes

   Answer:

4. A patient is diagnosed with **pancreatitis secondary to hypertriglyceridemia**. **He develops hypotension, renal failure, ARDS, and DIC**. He has received imipenem, is on a mechanical ventilator in the ICU, and has no evidence of gallstones or biliary obstruction.

   Diagnosis:

   Treatment:

5. A young patient presents with **nausea, vomiting, and severe epigastric pain radiating to the back** for the past couple hours. Intestinal perforation and infarction are ruled out and you suspect acute pancreatitis. Labs reveal **amylase of 190 U/dL**. What condition could falsely **depress the amylase levels**?

   → Hypertriglyceridemia

Summary: Cases 1 and 2

Acute pancreatitis is typically self-limited. However, one-fourth of patients develop severe disease. The amylase is not predictive of severity. Severity is defined by the presence of a Ranson score greater than 3 (after 48 hours) or the obvious development of organ failure. The most common causes of acute pancreatitis are alcohol, gallstones, triglycerides over 1,000, and medications. Gallstones are by far the most common cause. A cholecytectomy is recommended in all patients with acute pancreatitis and an ultrasound demonstrating gallstones. The cholecystectomy should typically occur prior to discharge due to the high risk of recurrence. ERCP is reserved for patients with dilated ducts and/or persistently elevated LFTs after an attack of pancreatitis. Noncontrast CT scan is helpful in diagnosis (if needed). IV CT scan is needed for the assessment of necrosis. Necrosis can be sterile or infected. Infected necrosis is a diagnosis made by fine-needle aspiration of pancreatic necrosis. Infected necrosis requires surgical debridement.

Chronic pancreatitis is often a difficult diagnosis to make early in the course of the disease. Pancreatic calcifications are only seen in one-third of patients on KUB (kidney, ureter, and bladder) and slightly more on CT scan. ERCP, EUS, and the secretin stimulation test are the best tests (sensitivity over 95%). Pancreatic enzymes have a limited role in treating pain but are effective in treating diarrhea (malabsorption). Surgical (Puestow lateral pancreatic jejunostomy) and endoscopic (stent placement) therapy are helpful in patients with dilated pancreatic ducts.

HEPATITIS

Case 1: Chronic Hepatitis

A 42-year-old woman is found to have abnormal liver function tests. She has mild fatigue. She denies a history of hepatitis. She received a blood transfusion in 1993 after undergoing a complicated hysterectomy. She takes no medications and consumes 1 or 2 beers per day. She denies IV drug abuse, tattoos, or sexual promiscuity.

Physical examination reveals a 155-lb (66-kg) woman who is 5 feet, 1 inch tall. BP is 130/70 mm Hg, pulse 88/min, and respirations 12. Physical exam is normal except for an enlarged liver. No jaundice.

CBC: Normal	Electrolytes: Normal
BUN, Creatinine: Normal	AST: 124 (elevated)
ALT: 99 (elevated)	Alkaline phosphatase: 122
Bilirubin: 1.1	Albumin: Normal

1. What tests should be submitted for analysis? What clinical characteristics suggest hemochromotosis, Wilson?

2. All tests are negative except for the hepatitis C antibody, which is positive. What is the best next test to confirm the diagnosis of chronic hepatitic C?

   A. ELISA (enzyme-linked immunosorbent assay) anti-hepatitis C antibody
   B. RIBA immunoblot
   C. Hepatitis C RNA branched chain assay (qualitative)
   D. Hepatitis C RNA PCR (quantitative)

   Answer:

3. Which factor poses the greatest risk for obtaining hepatitis C?

   A. Blood transfusion in 1993
   B. Sexual contact on 5 occasions with a person with hepatitis C
   C. Intravenous drug use in the 1980s
   D. Shellfish consumption

   Answer:

4. The patient's husband is hepatitis C-negative. They have been having unprotected intercourse for the last 10 years. What do you recommend?

   A. No sexual contact should occur until he is vaccinated.
   B. A barrier must be used, such as a condom.
   C. He should be tested monthly.
   D. No barrier is necessary, as the risk of transmission is less than 5% over his lifetime.

   Answer:

5. What is the best test to determine the degree of severity or stage of the disease?

   A. Genotype
   B. Liver biopsy
   C. Viral load
   D. Albumin

   Answer:

6. What test(s) can best predict the patient's response to treatment?

   A. Genotype
   B. Liver biopsy
   C. Viral load
   D. Liver function tests

   Answer:

7. What is the best treatment for chronic hepatitis C?

   A. Lamivudine
   B. Pegylated interferon and ribavirin
   C. Pegylated interferon
   D. Adefovir
   E. Boceprevir, interferon, and ribavirin

   Answer:

8. If the hepatitis B surface antigen is positive, what confirmatory test(s) is/are needed?

   A. Hepatitis B e antigen (HbeAg) and hepatitis B DNA
   B. Liver biopsy
   C. MRI
   D. Hepatitis B IgM
   E. Surface antibody and core antibody

   Answer:

9. If the hepatitis B e-antigen (HbeAg) is negative but the hepatitis B DNA is elevated to 2 million, why are the LFTs elevated?

   A. Steatohepatitis
   B. Pre-core mutant
   C. Hepatitis delta suprainfection
   D. Hepatitis E infection
   E. Hepatitis D infection

   Answer:

10. If the hepatitis B e-antigen (HbeAg) is positive, what are the treatment options?

   A. Lamivudine
   B. Interferon
   C. Adefovir
   D. Entecavir
   E. All are acceptable.

   Answer:

11. Who is most at risk of developing hepatocellular carcinoma?

   A. Person with hemochromotosis
   B. Person with hepatitis B
   C. Person with hepatitis C
   D. Person with alcoholism

   Answer:

12. If a person with chronic liver disease has a positive ANA, which of the following is needed?

   A. Anti-smooth muscle antibody
   B. Anti-LKM (anti–liver-kidney microsomal antibody)
   C. Ro and La antibodies
   D. Antimitochondrial antibodies

   Answer:

13. What is the best method of treatment if the ANA is positive?

   A. Prednisone
   B. Ursodeoxycholic acid
   C. Ribavirin
   D. Interferon

   Answer:

14. During the evaluation of an elevated ALT, a 45-year-old alcoholic man is found to have a serum iron concentration of 245 mg/dL (elevated) and a total iron saturation of 80%. The serum ferritin is 2,120 ng/mL. The physical examination shows no evidence of chronic liver disease. The best initial test would be which of the following?

    A. Liver biopsy with Prussian blue staining
    B. Test for HFE (hemochromatosis) gene mutation (C282Y and/or H63D)
    C. MRI for evaluation of iron overload
    D. Phlebotomy

    Answer:

15. In the evaluation of ascites, which of the following is true?

    A. LDH (lactate dehydrogenase) plays a role in determining exudates versus transudate.
    B. Albumin level in the ascites is important in determining whether portal hypertension is present.
    C. A neutrophil count over 150 is diagnostic for spontaneous bacterial peritonitis.
    D. If the PT is 20 (INR 2.8), paracentesis should be deferred until FFP is given.

    Answer:

16. Which of the following is true regarding chronic hepatitis C?

    A. The genotype of the virus should not be tested; it is experimental.
    B. The virus is not likely to be present in blood transfused in 1988.
    C. More than 25% of persons infected will manifest cirrhosis within 20 years after infection.
    D. Pneumococcal vaccine should be given; hepatitis A vaccine should be avoided.
    E. Interferon will decrease progression to end-stage liver disease and hepatocellular carcinoma.

    Answer:

17. Which of the following medications results in toxic hepatitis complicated by early fibrosis?

    A. Amiodarone
    B. Nitrofurantoin
    C. Cephalexin
    D. Isoniazide
    E. Ciprofloxacin

    Answer:

Summary: Case 1

Screening for hepatitis C occurs initially with an ELISA antibody. Approximately 80% of persons with a positive antibody have hepatitis C. This is confirmed by the presence of an HCV RNA. Qualitative tests are more sensitive than quantitative tests. Risk factors for transmission include blood transfusion, IV drug abuse, and sex. However, sexual transmission is difficult. In a couple who have had sex for years, the CDC does not recommend barrier precautions due to the low risk of transmission. However, patients are encouraged not to share razors or toothbrushes. The risk of progression is dependent on age, alcohol use, and liver biopsy findings. Only a liver biopsy (not the height of the enzymes) can determine the degree of activity of the virus and the stage of the disease. Treatment is most effective in patients who have a genotype other than 1. Unfortunately, most people in the United States have genotype 1. The standard of care is to use combined pegylated interferon with ribavirin. Cure rates (long-term eradication of virus) are seen in almost 50% of patients with genotype 1. In patients with chronic hepatitis B, treatment is needed only if the e antigen is positive, which is associated with high DNA levels. However, there is a precore mutant where the e antigen assay is falsely negative. These patients have elevated LFTs and an elevated HBV DNA. Treatment with either interferon, lamivudine, or adefovir is acceptable (**no combination therapy with interferon in hepatitis B!**). If the LFTs are normal, the e antigen is negative, and the HBV DNA is normal or minimally elevated, **do not treat hepatitis B!** Patients with an HbeAg that is negative, with a positive surface antigen, are considered carriers. These patients are infectious but no treatment is needed. Progression to liver cancer and cirrhosis in these patients is low.

Hepatitis B

	Surface Antibody	Core Antibody	Surface Antigen	E Antigen	LFTs	HBV DNA
Vaccine	+	–	–	–	–	–
Immune	+	+	–	–	–	–
Carrier	–	–	+	–	–	+/–
Mutant	–	–	+	–	+	+
Active	–	–	+	+	+	+

*Only active disease and pre-core mutants are treated. The active disease, pre-core mutants, and carriers are to be considered infectious.

Hepatitis C

Acute hepatitis C is the only form of acute hepatitis to receive treatment. Use interferon, ribavirin, and either telaprevir or boceprevir. Either telaprevir or boceprevir is added to treatment. The treatment is the same for chronic hepatitis C.

Case 2: Acute Hepatitis

You are asked by the orthopedic surgeon to see a 66-year-old man who underwent a right hip replacement and now has profoundly elevated LFTs. The patient was brought in after suffering a syncopal episode and a fall leading to a right hip fracture. Two days ago, surgery was performed. The patient feels well. There is no history of liver disease. Findings are:

Medications: Amlodipine, metformin

Abd: Normal bowel sounds; abdomen is soft and nontender

ALT: 877 (elevated)

Bilirubin: 1.3

AST: 1,211 (elevated)

Alkaline phosphatase: 243 (elevated)

Albumin: Normal

1. These LFTs are consistent with which of the following?

   A. Ischemic hepatitis
   B. Acute hepatitis B
   C. Acetaminophen overdose today
   D. Acute hepatitis A

   Answer:

2. What is the best therapy for ischemic hepatitis?

   A. Steroids
   B. Supportive
   C. Interferon
   D. Intravenous immunoglobulin

   Answer:

3. If a patient is found to have acute hepatitis B, what should you recommend?

   A. Supportive care
   B. Lamuvidine
   C. Interferon
   D. Steroids
   E. Interferon and ribavirin

   Answer:

4. If a patient has acute hepatitis C, what is the treatment?

   A. Supportive care
   B. Lamuvidine
   C. Interferon
   D. Steroids
   E. Interferon and ribavirin

   Answer:

Summary: Case 2

Treatment for acute hepatitis is largely supportive. The differential diagnosis includes shock (postoperative), toxin, hepatitis A, B, D on B, C, E. In patients with acute viral hepatitis, treatment is recommended only in patients with acute hepatitis C. In patients with acute hepatitis C, especially if there is an elevated bilirubin, interferon early (within the first month) significantly decreases the risk of chronic infection (80% to less than 5%). In patients with acute hepatitis A, B, D, and E, treatment is supportive. Acetaminophen overdose is treated with early institution of acetyl-cysteine to replenish the glutathione in the liver, which helps in detoxification.

1. An 18-year-old man has had lifelong constipation, requiring repeated enemas. His abdomen is distended and there is a tubular mass in the left lower quadrant. There is no stool in the rectum. Barium enema reveals a dilated colon above the rectum. The rectum is not dilated. The most likely diagnosis is which of the following?

   A. Irritable bowel syndrome
   B. Laxative abuse
   C. Chronic intestinal pseudo-obstruction
   D. Adult Hirschsprung disease
   E. Crohn disease

   Answer:

2. 60-year-old woman has had constipation for many years. She has a continuous feeling of needing to defecate and a sensation of incomplete evacuation. The stool is brown, hard, and negative for occult blood. Flexible sigmoidoscopy reveals dark mucosa. The most likely diagnosis is which of the following?

   A. Laxative abuse
   B. Crohn disease
   C. Chronic intestinal pseudo-obstruction
   D. Irritable bowel syndrome

   Answer:

3. A 28-year-old woman with Down syndrome has had chronic constipation since her early teens. She has had multiple admissions for abdominal pain. Radiographic studies when asymptomatic have shown air–fluid levels, but obstruction has never been demonstrated. The stool is brown, soft, and negative for occult blood. The most likely diagnosis is which of the following?

   A. Crohn disease
   B. Adult Hirschsprung disease
   C. Laxative abuse
   D. Chronic intestinal pseudo-obstruction

   Answer:

4. Which of the following regarding non-alcoholic steatohepatitis (NASH) is true?

   A. It is commonly seen in emaciated alcoholic patients.
   B. Diabetes mellitus is a common predisposing factor.
   C. The biopsy findings are different from those seen in alcoholic liver disease.
   D. An ERCP will confirm the diagnosis.
   E. Corticosteroids remain the mainstay of treatment.

   Answer:

5. The best approach to a 30-year-old patient who has cholelithiasis and complaints of abdominal bloating, gas pain, and normal LFTs is which of the following?

   A. Dissolution therapy with ursodeoxcholic acid
   B. ERCP with stone extraction
   C. Open cholecystectomy
   D. Laproscopic cholecystectomy
   E. No medical therapy at this time

   Answer:

6. 23-year-old presents with a change in behavior and abnormal LFTs. The AST is 122, ALT 154, alkaline phosphatase 199, and bilirubin normal. The psychiatrist wants to use clozapine. You should do which of the following?

   A. Repeat LFTs prior to agreeing to the use of clozapine
   B. Send off a hepatitis B surface antibody
   C. Send off a serum ceruloplasmin
   D. Obtain an ERCP
   E. Perform a contrast-enhanced CT scan of the patient's head

   Answer:

7. 45-year-old woman presents with pruritis and abnormal LFTs. She was well until last year, when her AST, ALT, and alkaline phosphatase were found to be 2 times normal. Now the alkaline phosphatase is 4 times normal; and bilirubin is slightly elevated. There is no abdominal pain, fever, chills, or weight loss. Abdominal ultrasound is negative. What is the best diagnostic test to confirm your suspicion?

   A. Antinuclear antibody
   B. Antimitochondrial antibody
   C. ERCP with possible endoscopic sphincterotomy
   D. Surgical exploration
   E. Hepatitis C antibody

   Answer:

8. What treatment(s) should be initiated?

   A. Ursodeoxycholic acid
   B. Ursodeoxycholic acid and cholestyramine
   C. Ursodeoxycholic acid and prednisone
   D. Cholecystectomy
   E. Radiology-guided percutaneous placement of biliary stent

   Answer:

9. 45-year-old woman in the ICU was admitted 2 days ago with sepsis and found to have abnormal LFTs and dilated bile ducts on ultrasound and CT. She was placed on metronidazole/cefepime and is continuing to do poorly. What is the best approach to this patient?

   A. Repeat the ultrasound
   B. Add vancomycin
   C. ERCP with possible endoscopic sphincterotomy
   D. Surgical exploration
   E. Radiology-guided percutaneous placement of biliary stent

   Answer:

11. 44-year-old man with chronic diarrhea and a vesicular rash on the extensor surfaces of the hands is found to have flatten villi on small bowel biopsy. Which of the following is true?

   A. He is at an increased risk of small bowel adenocarcinoma.
   B. A gluten-free diet will not be helpful.
   C. Dapsone has never been shown to help these patients.
   D. Even on a gluten-free diet, the anti-endomyseal antibodies will remain elevated.
   E. The xylose test will be positive. (e.g., low xylose in the urine)

   Answer:

12. 77-year-old woman has diarrhea for 6 months' duration. Upper endoscopy and colonoscopy, including biopsies, are negative. Stool analysis is negative. Small bowel series reveal several large jejunal diverticuli. What is the next best step in treatment?

    A. Repeat stool analysis
    B. Biopsy the ileum
    C. Mesalamine
    D. Ciprofloxacin and metronidazole
    E. Budesonide

    Answer:

13. 39-year-old male with jaundice confusion and malaise. + RUQ pain. Normal fever, HR 95, BP normal.

    Exam: Icterus, ascites, and hepatomegaly.

    AST 300

    ALT 15

    ETOH level 500

    Platelets 95000

    Paracentesis 200 WBCs with 50 PMN

    Most likely diagnosis

    Best management?

    → Discriminant Function = 4.6 * (Patient's PT – Control PT) + TBili

    When to start steroids?

    >32 points indicates poor prognosis and patient may benefit from glucocorticoid therapy.

14. 31-year-old woman with jaundice.

    ANA, negative

    ASMA, negative

    AMA, positive

    Liver biopsy – lymphocytic destruction of bile ducts

    Diagnosis:

    Treatment:

15. 31-year-old woman with jaundice.

    ANA, positive

    AMA, negative

    Liver biopsy – piecemeal necrosis of hepatocytes.

    Diagnosis:

    Treatment:

16. 31-year-old woman with jaundice.

    ANA, negative

    ASMA, negative

    AMA, negative

    Liver biopsy – mild inflammation with concentric fibrosis around bile ducts.

    Diagnosis:

    Treatment:

Neurology

3

Case 1

65-year-old woman comes to ED with sudden onset of right-arm weakness that began while she was watching television. Her daughter states her mother was alert but unable to talk clearly. Exam shows a right hemiplegia with brisk right-sided reflexes and up-stroking Babinski. Patient has slurred speech.

1. Diagnosis?

2. First step in management?

3. What is an appropriate diagnostic evaluation?

   A. Echo, Holter, carotid Doppler
   B. Echo, factor V mutation
   C. Holter, lupus anticoagulant, ESR
   D. Carotid Doppler, EEG
   E. ESR, CRP, Echo

   Answer:

4. What are the indications for the following interventions in acute stroke?

   Heparin:

   Aspirin:

   Clopidogrel:

   Ticlopidine:

   Warfarin:

TPA:

Carotid endarterectomy:

Dipyridamole:

Summary: Case 1

Stroke should be considered in any patient who presents with acute onset of a focal neurologic deficit.

The initial test of choice will always be a noncontrast CT scan of the head. This test is done to distinguish between hemorrhagic and ischemic stroke. Noncontrast CT scan is the most sensitive test for detecting blood in the brain. CT scans are often negative for ischemia within the first 48 hours after symptom onset. Diffusion-weighted MRI (magnetic resonance imaging) is the most accurate test for detecting cerebral ischemia.

Note

Restart aspirin 24 hours after tPA for stroke

The diagnostic workup of patients with acute ischemic stroke involves searching for embolic sources (echocardiogram, carotid duplex, and 24-hour Holter monitor). Also consider a workup for inherited hypercoagulability (thrombophilia).

There are numerous medications used to treat acute ischemic stroke. Giving heparin in acute ischemic stroke is incorrect because of adverse events associated with treatment. For every stroke prevented, one intracranial hemorrhage is caused. Therefore, treatment with heparin in acute ischemic stroke is limited. Antiplatelet therapy is most useful in secondary prevention of ischemic stroke. Aspirin is considered first-line treatment for secondary prevention of ischemic stroke. When patients have a known allergy to aspirin or continue to have recurrent cerebrovascular events on aspirin alone, dipyridamole may be added or switch to clopidogrel to enhance antiplatelet therapy. Ticlopidine is no longer used because the rates of thrombotic thrombocytopenic purpura and leukopenia are unacceptably high. Warfarin is used if there is chronic atrial fibrillation. Tissue plasminogen activator is given if the patient presents within 3 hours of symptom onset. Contraindications to the use of tissue plasminogen activator include stroke or serious head trauma within 3 months, hemorrhage (gastrointestinal or genitourinary) within 21 days, surgery within 14 days, history of intracranial hemorrhage, BP greater than 185/110 mm Hg, current use of anticoagulants, platelets less than 100,000, or coagulopathy (PT >15 s). Patients who receive tissue plasminogen activator in an appropriate manner have better neurologic function 3 months post-CVA than do patients who did not receive tissue plasminogen activator. Carotid endarterectomy is recommended when occlusion exceeds 70% of the arterial lumen; and the lesion is symptomatic.

5. 71-year-old woman with hypertension and right carotid bruit is having a stroke. Her BP 230/130. Intravenous nitroprusside is started; and the pressure drops to 135/96 mm Hg. She then develops right arm and leg weakness. What is the next step in management?

   A. Add aspirin
   B. Thrombolysis
   C. Emergency head CT scan
   D. Discontinue nitroprusside
   E. Carotid stenting and angioplasty

   Answer:

Case 2

Man comes with sudden vision loss that he describes as "a curtain falling in front of my eye." Denies any current focal weakness but does attest to an earlier episode of right-arm weakness that resolved spontaneously on its own. Exam is nonfocal. Symptoms resolve before his arrival in the emergency department.

1. Most likely diagnosis?

2. What medication would you start?
   A. Aspirin
   B. Ticlopidine
   C. Thrombolytics
   D. Dipyridamole

   Answer:

3. If already taking aspirin, what medication would you add?

4. When is surgery indicated in treatment of asymptomatic carotid bruit?

5. 58-year-old man with a history of diabetes and hypertension comes with sudden onset of urinary incontinence, personality changes, and weakness of half of his body. Weakness is worse in the lower extremity. Most likely area of the defect?
   A. Anterior cerebral artery
   B. Middle cerebral artery
   C. Posterior cerebral artery
   D. Posterior inferior cerebellar artery

   Answer:

6. 65 with loss of consciousness. Awakens dizzy with face numb on right, body weak on left. Most accurate test?
   A. MRI
   B. CT

   Answer:

7. Carotid 85% stenosis. Treatment:
   A. Carotid endarterectomy
   B. Carotid angioplasty
   C. Clopidogrel
   D. Aspirin and clopidogrel

   Answer:

Note

No tPA waking up with stroke timing unknown.

Note

Vertebrobasilar

Dizzy
Diplopia
Dysarthria

Summary: Case 2

In a patient who presents with sudden onset of a focal neurologic deficit that resolves spontaneously within minutes of onset, the most likely diagnosis is a transient ischemic attack (TIA). The blood supply of the brain is divided into 2 major systems of blood supply: the carotid or anterior circulation, and the vertebrobasilar (posterior) circulation. The major blood vessels comprising the anterior circulation include the anterior cerebral artery (ACA) and middle cerebral artery (MCA).

The best initial therapy for any TIA after verifying the absence of blood on a noncontrast CT scan of the head is aspirin. If the patient presents with a TIA while on aspirin, then the next step would be to switch to clopidogrel. The indications for endarterectomy for asymptomatic carotid atherosclerotic disease are not clearly defined. You should rarely consider surgery in these cases and only with a high-grade stenosis in a patient who is a good operative candidate.

Occlusion of the ACA presents with contralateral weakness and sensory loss in the leg more than the upper extremity. Urinary incontinence, confusion, and behavioral disturbances are common.

Occlusion of the MCA presents with contralateral hemiplegia, hemisensory loss, and homonymous hemianopia with eyes deviated toward the cortical lesion. Dominant hemisphere involvement results in aphasia.

The posterior circulation provides blood supply to the cerebellum, brain stem, occipital lobe of the cortex, and pons. The major blood vessels that comprise the posterior circulation are the posterior cerebral artery (PCA), basilar artery (BA), and vertebral arteries. Occlusion of the PCA presents with contralateral homonymous hemianopia, visual hallucinations, and agnosias. Occlusion of the penetrating branches of this vessel can result in CN III palsy with contralateral hemiplegia (Weber syndrome) or CN III palsy with contralateral ataxia or athetosis (Benedikt syndrome). Specific syndromes associated with occlusion of BA branches include the "locked-in syndrome" (paramedian branches) presenting as quadriparesis with intact vertical eye movements; and Wallenberg syndrome (posterior inferior cerebellar artery), which presents as ipsilateral facial sensory loss, contralateral body sensory loss, vertigo, ataxia, dysarthria, dysphagia, and Horner syndrome.

Occlusion of the major cerebellar arteries produces vertigo, vomiting, nystagmus, and ipsilateral limb ataxia. It is important to make this distinction because a carotid Doppler ultrasound is appropriate in the workup of a TIA only when the symptoms are consistent with anterior circulation involvement.

1. 29-year-old, healthy male resident called to present at Grand Rounds by his chairman. A few minutes after beginning his presentation, he **suddenly develops a cold sweat, sits down in a chair, and slumps to the left**. Five seconds later his arms and legs jerk several times. Thirty seconds later, he is **clearly conscious**, realizes what has happened, and begins to **apologize in embarrassment**. What is the most likely diagnosis?

   A. Neuro-cardiogenic syncope
   B. Seizure disorder
   C. Cardiac dysrhythmia
   D. Hypoglycemia

   Answer:

2. Which should be added routinely to all NON-hemorrhagic strokes?

   A. Statin
   B. Metformin
   C. Prasugrel
   D. ACE

   Answer:

3. Which is the major difference in posterior circulation stroke compared to middle and anterior?

   A. Use of aspirin or clopidogrel
   B. Use of heparin and ticlopidine
   C. Use of carotid Doppler and MRI
   D. Use of echo

   Answer:

Case 3

27-year-old woman with lancing, knifelike pain in left cheek. Pain began suddenly and is truly debilitating. Exam significant for bilateral lower-extremity hyperreflexia with increased muscle tone and stabbing, knifelike pain elicited by gentle percussion of cheek. Funduscopic exam shows right-sided optical nerve pallor. She had a transient episode of visual disturbance last year.

1. Diagnosis?

2. Treat the facial pain?

3. Best initial test to diagnose the underlying disease?

4. Most accurate test?

5. Acute treatment?

   A. Intravenous immunoglobulins
   B. Plasma exchange
   C. Steroids
   D. Interferon
   E. Glatiramer

   Answer:

6. What medications arrest progression of disease?

   A. Glatiramer and interferon
   B. Steroids
   C. Plasmapheresis
   D. Methotrexate
   E. Cyclophosphamide
   F. Immunoglobulins

   Answer:

7. What are the major complications of this disease? How should they be managed?

8. 34-year-old woman comes with blurry vision, especially when looking to the right. You note horizontal nystagmus. On conjugate gaze to right, you note that the left eye is unable to cross the midline. Diagnosis?

   A. Lacunar infarction
   B. Amyotrophic lateral sclerosis
   C. Myasthenia gravis
   D. Multiple sclerosis
   E. Guillain-Barré syndrome

   Answer:

9. 28-year-old woman with weakness of the lower extremities and visual disturbance. MRI is equivocal for multiple sclerosis. Which is most appropriate in determining the diagnosis?

   A. Visual evoked potentials
   B. CT scan of the head
   C. PET scan
   D. Cerebrospinal white cell count
   E. Cerebrospinal fluid, oligoclonal band

   Answer:

Summary: Case 3

Commonly, patients with multiple sclerosis (MS) will present complaining of weakness, numbness, tingling, or unsteadiness of a limb. Urinary urgency or retention, blurry vision, and double vision are all common initial manifestations of the disease. Symptoms may persist for several weeks or may resolve spontaneously over a few days.

There are several forms of the disease that may change the management of the disease and are therefore important to recognize. After their first exacerbation, most patients will have a disease-free period that lasts months to years. In relapsing, remitting disease progression is characterized by relapses of active disease with incomplete recovery during the periods of remission. In some patients the progression of disease becomes more aggressive, so that a consistent worsening of function occurs. This form of disease is called secondary progressive disease. In the least common form, the patient's symptoms are progressive from the onset of disease with the early onset of disability. This is called primary progressive disease.

It is important to understand when the diagnosis of multiple sclerosis should be suspected. Classically, the diagnosis is made clinically when a young patient (usually less than 55 years of age) presents with a history of multiple neurologic complaints that cannot be explained by the presence of one CNS lesion. In other words, you should suspect the diagnosis when a patient presents with multiple neurologic deficits separated by time and space (i.e., anatomy).

A number of triggers are known to exacerbate the disease. Infections or trauma may acutely worsen disease. Pregnancy, especially 2–3 months after birth, may also exacerbate a patient's symptoms.

1. A woman develops what she describes as a thick tongue and blurry vision after taking a hot shower. What is the most likely diagnosis?
2. Which is associated with progressive multifocal leukoencephalopathy (PML)?

   A. Glatiramer
   B. Mitoxantrone
   C. Natalizumab
   D. Beta interferon

   Answer:

MRI of the brain is the most accurate test to diagnose MS, reaching a sensitivity of 85 to 95% in symptomatic persons. Increased T2 density and decreased T1 intensity represent the increased water content of demyelinated plaques. Enhancement of lesions with gadolinium indicates active MS lesions that may enhance for up to 2 to 6 weeks after an exacerbation. MS is an unusual disease in that the best initial test for the diagnosis is also the most sensitive one, namely MRI of the brain and spine.

Evoked response potentials detect slow or abnormal conduction in response to visual, auditory, or somatosensory stimuli. The test is not specific for the diagnosis of MS and is rarely, if ever, used to make the diagnosis.

Cerebrospinal fluid (CSF) analysis usually reveals a mild pleocytosis (usually less than 50 cells/uL) and a total protein that is mildly elevated. A protein level exceeding 100 mg/dL is unusual and should be considered as evidence against the diagnosis of MS. An elevated IgG index (oligoclonal bands) is found in 70 to 90% of patients with MS. The finding is nonspecific and, as a result, CSF for oligoclonal banding is recommended only when the MRI is not confirmatory but clinical suspicion for MS remains high.

The treatment of multiple sclerosis can be divided into disease-modifying therapy, treatment of complications, and treatment for symptomatic relief during an acute exacerbation.

In relapsing-remitting disease there are three disease-modifying agents—IFN-β1a, IFN-β1b, and glatiramer acetate—that have been shown to reduce the number of clinical exacerbations and the number of MRI lesions. More importantly, these medications seem to delay the onset of significant disability.

In secondary progressive disease, IFN-β1b and mitoxantrone have been shown to reduce the number of exacerbations, reduce MRI activity, and delay the onset of disability. In patients who receive mitoxantrone, dose-related cardiotoxicity is a concern; this drug should be given only to patients with normal ejection fractions. In patients who have relapsing-remitting disease or secondary progressive disease and cannot tolerate treatment with IFN-β1b, IFN-β1a, or glatiramer acetate, you can consider treatment with methotrexate, cyclophosphamide, intravenous immunoglobulin, or azathioprine.

No approved disease-modifying therapy exists at this time for primary progressive disease.

The length and intensity of an acute exacerbation is shortened by the administration of glucocorticoids. Typically, an acute exacerbation is treated with 3 days of intense IV steroids, followed by a course of oral medication tapered over 4 weeks. In patients with severe disease who are unresponsive to steroid therapy, plasma exchange can be used as an alternative treatment.

For patients with spasticity, baclofen is the most effective medication. Tizanidine and diazepam are useful for nocturnal spasticity but are limited in their use for daytime symptoms because they cause intense somnolence. Pain secondary to trigeminal neuralgia and dysthesias responds well to carbamazepine, gabapentin, phenytoin, or tricyclic antidepressants. Bladder hyperactivity is treated with oxybutynin, whereas urinary retention is treated with bethanecol. Fatigue may be treated with amantadine or fluoxetine. Erectile dysfunction can be treated with sildenafil acetate.

Case 4

32-year-old woman comes to emergency department with difficulty walking that began 2 weeks ago. She has a sensation of "pins and needles" affecting the lower extremities. Symptoms worsening over last 2 weeks. For 2 days she has some difficulty breathing when walking down the block. 1 month ago she had an episode of diarrhea and low-grade fever that lasted 3 days and resolved on its own. Exam significant for bilateral lower extremity weakness with hyporeflexia, and decreased sensation in both hands.

1. Diagnosis?

2. Next step in management?
   A. Plasmapheresis
   B. Electromyography (EMG)
   C. CSF protein levels
   D. CSF cell count
   E. Forced vital capacity

   Answer:

3. Initial treatment?
   A. Intravenous immunoglobulin
   B. Steroids
   C. Cyclophosphamide
   D. Azathioprine

   Answer:

4. Most effective treatment?
   A. Intravenous immunoglobulin
   B. Intravenous immunoglobulin combined with plasmapheresis
   C. Intravenous immunoglobulin combined with steroids
   D. Plasmapheresis combined with steroids

   Answer:

5. Most accurate diagnostic test?

   A. Muscle biopsy
   B. Pulmonary function tests
   C. Nerve conduction velocity
   D. Acetylcholine esterase antibodies
   E. Serum protein electrophoresis

   Answer:

6. When are steroids indicated?

7. 73-year-old woman with weakness and paresthesia that began in distal hands and feet 3 days ago. History significant for myocardial infarction 3 years ago. You note absent patellar reflexes bilaterally. Next step in management?

   A. Lumbar puncture
   B. Electromyography/nerve conduction
   C. Intravenous immunoglobulins
   D. Plasmapheresis

   Answer:

8. 48-year-old woman with weakness of legs worsening over last 2 weeks. Exam reveals loss of deep tendon reflexes. Most likely organism to have caused this?

   A. *E. coli* 0157:H7
   B. Scombroid
   C. *Campylobacter*
   D. Salmonella
   E. *Shigella*

   Answer:

Summary: Case 4

Most patients with Guillain-Barré syndrome (GBS) will present with rapidly developing weakness that typically begins in the lower extremities and moves upward. On physical examination, the patient is noted to lack reflexes in the affected muscle groups. The progression of the symptoms will develop over hours to days. The legs are usually more affected than the arms and face. Fever, constitutional symptoms, or bladder dysfunction are rare associated symptoms and should raise the possibilities of alternate diagnoses.

In addition to the motor weakness, patients with GBS typically will complain of sensory disturbances that can take the form of pain or tingling dysthesias. Sensory changes are due to the loss of large sensory fibers producing loss of reflexes and proprioception. Autonomic instability (profuse sweating, postural hypotension, labile blood pressure, cardiac dysrhythmias) occurs in severe GBS, requiring treatment in an intensive care unit.

Approximately 75% of patients who present with GBS will have a history of an infection preceding the onset of symptoms by 1 to 3 weeks. The infection is typically of the respiratory or gastrointestinal systems (*Campylobacter jejuni*), though GBS may be preceded by infections with human herpes virus, cytomegalovirus, and Epstein-Barr virus. The only association between immunizations and GBS occurred in 1976 with the swine influenza vaccine. More recent formulations of influenza vaccine are associated with one additional case of GBS per million patients immunized. GBS occurs more frequently in patients with HIV, SLE, and lymphoma.

The diagnosis of GBS lies principally in recognizing the typical pattern of weakness with fever, constitutional symptoms, and the absence of reflexes. The characteristic finding is an elevated protein without an associated rise in the cell count. These changes in the CSF do not occur until 48 hours after the onset of symptoms. The most accurate test for the diagnosis is electromyography (EMG). The EMG is used to detect evidence of demyelination of the peripheral nerves.

Treatment should be initiated as quickly as possible because available therapy becomes ineffective approximately 2 weeks after the onset of symptoms.

Intravenous immunoglobulin and plasmapheresis are equally effective in treatment. There is no benefit to combination therapy. Glucocorticoids are not effective in the treatment of acute GBS. It is extremely important to monitor the vital capacity in patients with GBS and to initiate early respiratory support to prevent death from respiratory failure.

Case 5

39-year-old man comes to office complaining of seeing double. Patient describes seeing two of everything. Problem began several weeks ago and has been worsening over last few days. Also noticed several episodes of choking while eating over the last week. Symptoms are worse later in the day. Exam shows ptosis greater on right than left, and diffuse weakness that worsens after repetitive action. Pupillary reaction to light is normal. Sensory exam is normal.

1. Diagnosis?

   A. Botulism
   B. Guillain-Barré syndrome
   C. Polio
   D. Myasthenia gravis
   E. Parkinson disease

   Answer:

2. Initial diagnostic test?

   A. Edrophonium (Tensilon) testing
   B. Muscle biopsy
   C. Acetylcholine receptor antibodies
   D. Chest x-ray
   E. EMG

   Answer:

3. Most accurate test?

4. Imaging test of choice?

   A. Head CT
   B. Head MRI
   C. Chest CT
   D. Spine MRI
   E. Gallium scan

   Answer:

5. When will you treat with the following?

   Anticholinesterases:

   Prednisone:

   Thymectomy:

   Plasmapheresis:

   Intravenous immunoglobulin:

   The same patient is admitted to the hospital with an unrelated episode of *S. aureus* endocarditis. He is treated with vancomycin and gentamicin for his infection. You are called to the bedside to evaluate the patient after he is found unresponsive and in respiratory distress.

6. What caused the respiratory failure?

7. 54-year-old smoker with proximal muscle weakness, fatigue, and tiredness that improves with repetition of exercise. What is most likely found?

   A. Thymoma
   B. Small cell lung cancer
   C. Myasthenia gravis
   D. Colon cancer

   Answer:

Summary: Case 5

The major features on history to make the diagnosis of myasthenia gravis (MG) are muscle weakness and fatigability. Initially, patients will complain of diplopia, ptosis, and difficulty swallowing. Speech may have a "mushy" quality or a nasal quality with facial weakness manifesting as a "snarling" appearance when smiling. As the disease progresses, weakness may become generalized, involving proximal muscles in an asymmetric pattern. Deep tendon reflexes are intact.

Eaton-Lambert myasthenic syndrome is characterized by increasing muscle strength on repetitive contraction. This syndrome is seen in association with malignancy, especially small cell carcinoma of the lung.

Botulism may cause a myasthenic-like illness; but the pupils are usually dilated and repetitive nerve stimulation (electromyography, EMG) shows an incremental increase in muscular fiber contraction (opposite of myasthenia gravis).

The best initial test for the diagnosis of MG is the acetylcholine receptor antibody test. In generalized MG, 80% of patients will have a positive test. In the presence of fatigable muscle weakness, a positive antibody test is specific and virtually diagnostic of MG.

The edrophonium (Tensilon) test is sensitive but is not specific for the diagnosis. Additionally, patients may experience nausea, diarrhea, fasciculations, syncope (rare), or bradycardia during the test.

The most accurate test for the diagnosis of MG is single-fiber EMG. The characteristic finding is a decremental decrease in muscle fiber contraction on repetitive nerve stimulation.

Anticholinesterase (usually pyridostigmine) medications are useful for the symptomatic treatment of MG. If treatment with anticholinesterase medications is unsuccessful in providing symptomatic relief, you should consider immunosuppressive therapy.

There are numerous medications used for immunosuppressive therapy. These interventions differ primarily in the onset of therapeutic benefit. Glucocorticoids are effective in improving weakness, but will take 1 to 3 months before you observe a clinical benefit. Steroids are the initial immunosuppressive of choice. If patients fail steroid therapy, azathioprine is the most widely used medication used in combination with steroids. The benefits of azathioprine therapy may take more than 3 to 6 months to peak.

In patients who are postpubertal and age <55 with generalized myasthenia gravis, thymectomy is indicated before initiation of immunosuppressive therapy. Thymectomies are also performed when a thymoma is present to prevent the spread of malignant thymic disease.

Plasmapheresis and intravenous immunoglobulin are immunosuppressive therapies noted for their ability to rapidly improve weakness in MG. They are therefore reserved for patients in acute myasthenic crisis.

Case 6: Vertigo

73-year-old man in clinic complaining of dizziness. Patient describes his dizziness as a sensation of the "earth rolling under his feet" as he walks. Also describes "room is spinning around him." Started suddenly and with nausea and vomiting. Does attest to hearing a "roaring sound in his ears" and difficulty hearing your questions, forcing you to repeat yourself a number of times.

1. Diagnosis?

2. When will central vertigo be the most likely diagnosis?

The neurologic examination is significant for nystagmus, which is horizontal and is suppressed by fixation. Additionally, you note that the nystagmus is unidirectional and has a rotational component. Finger-to-nose is normal bilaterally.

3. Next step in the management?

4. When will the answer be MRI of the brain?

5. When will the most likely diagnosis be each of the following?

   Ménière disease:
   Benign positional vertigo:
   Labyrinthitis:
   Vertebrobasilar TIA:
   Perilymphatic fistula:

6. 76-year-old man comes to your office complaining of bilateral hearing loss. Weber test does not localize to either ear; but the Rinne test shows air conduction greater than bone conduction. Most likely diagnosis?

   A. Labyrinthitis
   B. Vestibular schwannoma
   C. Presbycusis
   D. Perilymphatic fistula
   E. Multiple sclerosis

   Answer:

Summary: Case 6

There are several points on history and physical examination that will distinguish central from peripheral vertigo. Patients with central vertigo tend to have chronic onset to their symptoms. The vertigo is **not** associated with hearing loss or tinnitus. On physical examination, the presence of neighborhood signs—i.e., a focal CNS examination—argues strongly for the presence of a central vertigo. The nystagmus in central vertigo is multidirectional, pure, and vertical, and **does not** suppress with fixation. Patients with peripheral vertigo will have a sudden onset of their symptoms. Their vertigo is associated with hearing loss and tinnitus. The CNS examination will be nonfocal and the nystagmus is usually horizontal, mixed, and unidirectional, and **suppresses** with fixation.

Once you have determined that the patient has peripheral vertigo, there is a wide differential diagnosis that should be considered.

Ménière disease is characterized by tinnitus, hearing loss, and episodic vertigo. Each episode lasts 1 to 8 hours. The symptoms wax and wane as the endolymphatic pressure rises and falls. The two most common causes of Ménière disease are syphilis and head trauma. Ménière disease is treated with a low-salt diet and diuretics. In patients who fail medical therapy, you can consider surgical decompression.

Benign paroxysmal positional vertigo is a cause of peripheral vertigo that is characteristically exacerbated by head movement or change in head position. Typically, episodes will occur in clusters that persist for several days. There will be a latency of several seconds after head movement and before the onset of vertigo. The vertigo usually lasts 10 to 60 seconds. Benign paroxysmal positional vertigo is treated with positional maneuvers that attempt to move the otolith out of the circular canals.

Labyrinthitis presents with sudden onset of severe vertigo that lasts for several days with hearing loss and tinnitus. The disease frequently follows an upper respiratory tract infection. Vertigo secondary to labyrinthitis is treated symptomatically with meclizine and diazepam.

Central vertigo is caused by any cerebellar or brain stem tumor, bleed, or ischemia. Drug toxicity and overdoses are important causes of central vertigo. Also consider multiple sclerosis in the young patient with unexplained central vertigo. Symptomatic treatment for peripheral vertigo includes meclizine or, in severe cases, diazepam.

Perilymphatic fistula is a form of peripheral vertigo related temporally to head trauma (blunt trauma to the ear, e.g., a hand slap to the ear) or extreme barotraumas during air flight, scuba diving, or vigorous Valsalva maneuver.

The Weber test is heard best in the normal ear when the hearing loss is sensorineural, and is heard best in the abnormal ear when the hearing loss is conductive.

With the Rinne test, air conduction is normally greater than bone conduction.

Case 7

43-year-old woman comes to ED with sudden onset of severe headache. Denies history of headaches. She was nauseous and vomited once while being transported to hospital.

1. Most likely diagnosis?

If a patient presents with headache and one of the following, seriously consider CT scan or MRI of the brain:

- "Thunderclap" headache
- "This is the worst headache of my life"
- Progressively worsening headache
- Onset at age >40 years
- Headache precipitated by coughing, sneezing, bending, or straining
- Fever, weight loss, malaise, jaw claudication
- Focal neurologic examination

2. Stat head CT scan without contrast finds no evidence of intracranial bleed. Next step in management?

   A. CT scan with contrast
   B. MRI
   C. Lumbar puncture
   D. Angiogram
   E. Neurology consultation

   Answer:

3. When is angiogram appropriate in subarachnoid bleed?

4. Lumbar puncture is performed. CSF finds no evidence of xanthochromia. What diagnosis is most likely?

5. Next step in management?

6. 28-year-old football player brought to hospital for a brief loss of consciousness from head trauma sustained during a game. No symptoms at present. Normal neurologic examination. CT scan of head done for the trauma shows 4-mm aneurysm in circle of Willis. What should you do about the aneurysm?

   A. Nothing
   B. Angiogram
   C. Surgical repair
   D. Catheter embolization
   E. Nimodipine

   Answer:

7. Person with sudden onset headache, stiff neck. CT shows subarachnoid hemorrhage. What is important step?

   A. Shunt placement
   B. Angiogram
   C. Surgical repair

   Answer:

8. Person with subarachnoid has angiogram locating site of aneurysm. Active bleeding has stopped. What to do?

   A. Surgical repair
   B. Beta blockers
   C. Catheter embolization with platinum wire

   Answer:

9. Which of the following is more likely to decrease risk of stroke?

   A. Nimodipine
   B. Diltiazem
   C. Aspirin
   D. Nothing proven to stop stroke

   Answer:

Summary: Case 7

In any patient who presents with a sudden onset of first-time headache, especially when the patient describes it as the "worst headache of my life," you must suspect a subarachnoid hemorrhage (SAH) as the most likely diagnosis. The best initial test to identify any intracranial bleeding is the noncontrast CT scan of the head. If after performing a CT scan of the head you still have a high clinical suspicion of a subarachnoid hemorrhage, the next step

is to perform a lumbar puncture (LP). The purpose of the LP is to identify the presence of xanthochromia, which is consistent with RBC (red blood cell) breakdown in the CSF. If after the LP is performed there is no xanthochromia, the next step is to perform an MRV (magnetic resonance veinography) to rule out an acute cerebral vein thrombosis as the cause of this patient's headache. Management of any subarachnoid hemorrhage centers around early aneurysm repair because any further bleeding carries a 60% mortality. Angiography is the diagnostic test of choice preoperatively. The most common cause of mortality and morbidity after repair is vasospasm. The best initial therapy for vasospasm associated with SAH is volume expansion resulting in "triple H" therapy (hemodilution, hypertension, and hypervolemia). Treatment of any cerebral vein thrombosis is IV heparin.

Asymptomatic AV (atrioventricular) malformations should be removed in the presence of a history of aneurysmal bleeding or if they are larger than 10 mm in diameter.

Case 8

53-year-old woman in ED with pain that began over the weekend. While lifting heavy boxes. The pain is lower back without radiation. The last time she urinated was over 24 hours ago. She has bilateral lower extremity weakness associated with bilateral hyperreflexia. She has undergone mastectomy and has just completed her fifth year of treatment with tamoxifen.

1. Next step in management?

   A. CT scan with contrast
   B. CT myelogram
   C. MRI
   D. Steroids
   E. Radiation
   F. X-ray of the spine

   Answer:

2. When is an immediate imaging study indicated in the evaluation of back pain?

   - *Fever*
   - *History of malignancy*
   - *Major neurologic deficit involving more than 1 nerve root*
   - *Pain that persists for more than 4 to 6 weeks*

Nerve Root	Motor	Reflex	Sensory
L4	Foot dorsiflexion	Knee jerk	Medial calf
L5	Big-toe dorsiflexion	None	Medial foot
S1	Foot eversion	Ankle jerk	Lateral foot

3. Initial test?

   A. CT scan with contrast
   B. CT myelogram
   C. MRI
   D. X-ray of the spine

   Answer:

4. Most accurate test?

   A. CT scan with contrast
   B. CT myelogram
   C. MRI
   D. X-ray of the spine

   Answer:

5. 65-year-old woman with wide-based gait and confusion. Patient's daughter denies the patient has any history of alcoholism. Diagnosis?

   A. Frontal lobe tumor
   B. Parkinson disease with dementia
   C. Vitamin B_{12} deficiency
   D. Old cerebellar infarct

   Answer:

6. Bilateral upper extremity weakness, fasciculations, and atrophy with bilateral loss of pain and temperature. Diagnosis?

   A. Brown-Sequard syndrome
   B. Amyotrophic lateral sclerosis
   C. Syringomyelia
   D. Guillain-Barré syndrome
   E. Syphilis

   Answer:

7. Loss of pain and temperature sensation on left side with loss of proprioception on right. Diagnosis?

   A. Brown-Sequard syndrome
   B. Amyotrophic lateral sclerosis
   C. Syringomyelia
   D. Guillain-Barré syndrome
   E. Syphilis

   Answer:

Summary: Case 8

Patients with spinal cord compression will commonly present with insidious onset of mild sensory disturbance, lower extremity weakness, and sphincter or sexual dysfunction. Pain is the earliest symptom in the majority of patients (96%). Pain may be intensified by actions that increase intrathoracic and thus CSF pressure. The diagnosis of acute spinal cord compression has to be suspected based on the history and neurologic examination. The importance of having a high index of suspicion for the diagnosis is essential to instituting appropriate therapy early in the course of the disease. Histories of cancer, fever, or bowel or bladder incontinence/retention are all points in the clinical history that strongly suggest the possibility of acute spinal cord compression. On neurologic examination, a dermatomal sensory level with bilateral lower extremity weakness, increased lower extremity muscle tone, and upper motor neuron signs below the level of compression are all consistent with the diagnosis of acute cord compression. Thoracic cord compression is the most common site of compression (70%), because the spinal cord is narrowest at that point. Symptoms may progress quickly.

Plain x-rays are abnormal in 84 to 94% of all cases. The diagnostic test of choice is MRI of the spine. When a spinal MRI is contraindicated, CT myelogram is the diagnostic test of choice.

High-dose dexamethasone should be started immediately once the diagnosis is suspected. After the specific etiology is delineated more clearly by MRI, specific therapy may be initiated. For radiosensitive tumors such as lymphoma or multiple myeloma, radiation therapy should be started as soon as possible. Surgical decompression is the treatment of choice for a herniated disk, epidural abscess, or hematoma. The prognosis depends mainly on the functional status of the patient at the time of presentation. Up to 80% of patients who are able to ambulate initially retain that ability after treatment. Only 5% of patients without antigravity leg strength are able to ambulate after treatment.

Syringomyelia is defined as cavitation of the spinal cord. It occurs as either communicating (with the CSF pathways) or noncommunicating. Communicating syringomyelia is usually associated with the Arnold-Chiari malformation, whereas the noncommunicating syringomyelia is typically secondary to trauma of the spinal cord. Typically, there is sensory dissociation with impaired pain and temperature and intact sensation to light touch. There may be lower motor neuron manifestations at the level of the lesion, with upper motor neuron signs below the lesion. Cavitation most commonly occurs at the level of the cervical cord. Treatment is surgical.

Case 9

37-year-old woman comes with "creepy, crawly" feeling with itching of her legs that gets worse at night. She feels an urge to move her legs, and the movement seems to alleviate her symptoms. Exam is negative.

1. Diagnosis?

   A. Multiple sclerosis
   B. Parkinson disease
   C. Restless leg syndrome
   D. Anxiety

   Answer:

2. Initial therapy?

   A. Fluoxetine
   B. Pramipexole or ropinirole
   C. Amitriptyline
   D. Citalopram
   E. Venlafaxine
   F. Haloperidol

   Answer:

3. What to replace?

   A. B12
   B. Pyridoxine (B6)
   C. Iron

   Answer:

4. Other medications you consider are:

   - *Levodopa/carbidopa*
   - *Gabapentin*
   - *Opioids*
   - *Benzodiazepines*

   Answer:

Summary: Case 9

Restless leg syndrome is characterized by the presence of unpleasant creeping sensations that arise from deep within the legs and arms. The symptoms occur especially when the patient is attempting to relax. The etiology is unknown. Restless leg syndrome is common during pregnancy and can accompany uremic or diabetic neuropathy, amyloidosis, or underlying malignancy. It can also be associated with iron deficiency anemia. Treatment is with a dopamine agonist, benzodiazepines, or opioid analgesics.

Case 10: Tremor

25-year-old man comes to clinic with "shaking of his hand" that seems to worsen when he moves. Also notices mild shaking of his head. He has become progressively more self-conscious of his problem since he started dating his girlfriend exclusively. Problem has gotten so bad that he drinks 3 beers every night to help control the tremor. Exam shows normal gait and finger-to-nose.

1. Diagnosis?

   A. Parkinson disease
   B. Alcohol dependence
   C. Anxiety
   D. Essential tremor

   Answer:

2. What would you **stop** in this patient?

   A. Caffeine and stimulants
   B. Bronchodilators
   C. Steroids
   D. All of the above

   Answer:

3. Best initial therapy?

   A. Propranolol
   B. Primidone
   C. Alprazolam
   D. Clozapine
   E. Mirtazapine
   F. Topiramate

   Answer:

4. When is thalamotomy indicated?

Summary: Case 10

In a patient who presents with tremor, the immediate question is to differentiate tremor of cerebellar origin from Parkinson disease and benign essential tremor. In the case presented here, the most likely diagnosis is essential tremor because of the paucity of abnormalities on examination and the worsening tremor with movement (unlike Parkinson disease). Caffeine, beta agonists, and steroids may worsen this condition, and treatment consists of propranolol or alprazolam. Alcohol in small amounts also brings some relief to essential tremor.

Case 11: Altered Mental Status

1. Man brought to emergency department after being found unresponsive in street. He has no identification per ambulance personnel. Best initial management?

   A. Urine toxicology screen
   B. Flumazenil
   C. Naloxone, thiamine, dextrose
   D. Dextrose
   E. Bicarbonate

   Answer:

   After about 10 minutes of furious activity, the patient's airway is protected by emergent intubation, and he is hemodynamically stable.

2. When is **opioid** overdose the diagnosis?

3. When is **uncal** herniation the diagnosis?

4. When is **atropine** overdose the diagnosis?

5. When is **barbiturate overdose** the diagnosis?

6. 54-year-old woman is brought to ED with "blurry vision" that began 1 week ago. When you attempt an interview, she states that she would like some lemonade because it is "so very hot." When asked where she is, she responds "Why, at the county fair." Exam: wide-based gait, nystagmus, lateral rectus palsy of right eye. Next step in the management?

   A. Administer thiamine and then glucose
   B. Administer glucose and then thiamine
   C. CT scan of head
   D. Serum toxicology for ethanol and barbiturates

   Answer:

Summary: Case 11

With any patient who presents in an unconscious state, the next step is to secure the patient's airway and ensure adequate breathing and circulation. The initial medications given to any patient who presents with coma of unknown etiology include naloxone, thiamine, and glucose.

When you are presented with a patient in a coma, the next step is to try to determine the etiology of the loss of consciousness. Any coma can have various infectious, metabolic, or structural causes. The presence of nuchal rigidity and fever argues strongly for the presence of CNS infection as a cause of the coma. Focal neurologic examination in response to painful stimuli argues for structural cause of the coma. When conjugate gaze deviation is present, it suggests either an ipsilateral cortical lesion or a contralateral pontine lesion. The loss of pupil reactivity implies midbrain involvement, and loss of ocular movement suggests pontine involvement. Opioid overdose should be suspected when coma is accompanied by pinpoint pupils. Uncal herniation is the most likely diagnosis when ipsilateral pupillary dilatation is present with loss of consensual pupillary response. Atropine overdose should be suspected in patients in a coma who have dilated and fixed pupils. Barbiturate overdose is associated with bullous skin lesions. Brain death is considered possible when all brain-stem reflexes have been absent for >6 hours. The presence of seizure activity or decerebrate or decortical posturing is not consistent with brain death. Brain death cannot be established when a patient has received sedatives or neuromuscular blockers. The apnea test is consistent with brain death when there are no spontaneous breaths for a period >6 seconds in the presence of a PCO_2 >60 mm Hg.

Case 12

HIV-positive man with diabetes comes to clinic with "pins and needles" in hands and feet. Problem began several months ago and has been progressively worsening. More recently, he has noticed weakness in his hands and some difficulty walking. He has hypothyroidism for 5 years, treated with levothyroxine. Neuro exam is significant for loss of position and vibration sense in all 4 extremities, and gait disturbance. Reflexes are symmetrically hyporesponsive in all extremities.

1. Diagnosis?

   A. Vitamin B_{12} deficiency
   B. Diabetes
   C. Pyridoxine deficiency
   D. Didanosine use
   E. Hypothyroidism
   F. Thyrotoxicosis

   Answer:

   Blood smear and CBC are normal. B_{12} level in lower range of normal.

2. Next step in diagnosis?

   A. Hemoglobin A1c
   B. Vitamin B_6 level
   C. T4/TSH level
   D. Stop all antiretroviral medications
   E. Nerve conduction studies
   F. Methylmalonic acid levels
   G. Schilling test
   H. Anti-intrinsic factor antibodies

   Answer:

Summary: Case 12

Subacute combined degeneration occurs with vitamin B_{12} deficiency. Patients will complain of distal paresthesias and weakness of the extremities, followed by spastic paresis and ataxia. On examination, there is a combined deficit of vibration and proprioception with pyramidal signs (plantar extension and hyperreflexia). Diagnosis is made by low serum vitamin B_{12}, and treatment is with vitamin B_{12} replacement.

Case 13

48-year-old woman comes with difficulty walking that started gradually and progressively worsened over last few months. She has some difficulty swallowing that started 1 month ago. Exam: right foot drop with hyperreflexia and increased muscle tone, although the head droops. You also note atrophy of thenar and calf muscles bilaterally. Wasting of tongue and resting fasciculations.

1. Diagnosis?

   A. Lead poisoning
   B. Parkinson disease
   C. Amyotrophic lateral sclerosis (ALS)
   D. Myeloma
   E. Vitamin B_{12} deficiency
   F. Hypocalcemia

   Answer:

2. Treatment?

   A. Plasmapheresis
   B. IVIg
   C. Steroids
   D. Spinal cord growth factor
   E. Riluzole

   Answer:

3. After several months, patient returns to clinic with exertional shortness of breath and worsening somnolence during the day. What would you recommend?

   A. Tracheostomy
   B. Endotracheal intubation
   C. Lung transplant
   D. Continuous positive airway pressure (CPAP)
   E. No therapy is effective.

   Answer:

Summary: Case 13

Amyotrophic lateral sclerosis should be the most likely diagnosis in any patient who presents with a combination of upper and lower motor neuron findings on neurologic examination. The treatment for ALS consists of riluzole, which acts to reduce the presynaptic release of glutamate.

Case 14: Parkinson Disease

65-year-old man brought by wife, who states her husband has been taking a very long time getting dressed. He has fallen a number of times. Handwriting has become smaller. Exam is significant for small-stepped, shuffling gait, resting tremor of right hand, and cogwheel rigidity of right arm and wrist.

1. When is amantadine indicated?

2. When are anticholinergics (benztropine, trihexyphenidyl) indicated?

3. When is carbidopa/levodopa indicated?

4. When are COMT inhibitors (tolcapone, entacapone) indicated?

5. When are dopaminergic agonists (bromocriptine, pramipexole, ropinirole) indicated?

6. When is deep brain stimulation indicated?

7. When is surgery indicated?

8. 55-year-old man with Parkinson disease and severe functional impairment was recently started on carbidopa/levodopa for significant bradykinesia. His wife brings him to your office, stating that he is "seeing bugs crawling on the floor" and claiming to be the first man who has landed on Mars. Next step in management?

   A. Initiate therapy with ropinirole
   B. Discontinue the carbidopa/levodopa
   C. Initiate therapy with quetiapine
   D. Suggest a low-protein diet

   Answer:

Note

MAO-inhibitor:
Selegiline
Rasagiline
Place in therapy, not clear

9. • Frequent falls/postural instability • HYPEREXTENSION of neck/body • Cognitive impairment/dementia • Vertical gaze impairment so it is hard to look down and walk down stairs

   Diagnosis?

   Treatment?

Summary: Case 14

The cardinal manifestations of Parkinson disease are bradykinesia (manifested by slow movements, mask facies, reduction of automatic movements), cogwheel rigidity, postural instability, and resting tremor.

Several other diseases can imitate Parkinsonism. Severe depression can cause a paucity of spontaneous movement that can mimic Parkinsonism. Essential tremor can be mistaken for the tremor of Parkinson disease, but essential tremor can be distinguished by a lack of other neurologic symptoms, a family history of tremor, and amelioration with alcohol. Normal pressure hydrocephalus can present with ataxia and gait disturbances that can be mistaken for Parkinson disease. The presence of dementia and urinary incontinence with dilated ventricles on CT scan of the head help identify this disorder. Huntington disease can present with akinesia and chorea. The positive family history usually suggests the correct diagnosis.

The diagnosis of Parkinson disease is a clinical one. It is important to identify any secondary causes of a patient's Parkinsonism that are potentially reversible. There is no diagnostic test of choice that can identify patients with Parkinson disease.

There are many medications available for the treatment of Parkinson disease. The underlying pathophysiology that causes Parkinson disease is the imbalance of dopaminergic (too little) and cholinergic (too much) tone on the basal ganglia. Thus, medical treatment revolves around increasing dopaminergic tone or decreasing cholinergic tone on the basal ganglia.

Not surprisingly, the medications available for the medical treatment of Parkinson disease either directly stimulate dopamine receptors (carbidopa/levodopa, dopamine agonists), indirectly increase the amount of dopamine available (COMT inhibitors, selegiline, amantadine), or block acetylcholine stimulation of the basal ganglia (benztropine, trihexyphenidyl).

The first step when considering what medication to start in a patient with Parkinson disease is to evaluate the patient's functional status. Patients with intact functional status are managed differently from patients with compromised functional status.

Patients with intact functional status (less bradykinesia) are not generally given carbidopa/levodopa as initial therapy. If they are younger than 60 years, such patients are started on anticholinergic medication. If the patient is older than 60 years, the treatment of choice is amantadine. The reason why anticholinergics are relatively contraindicated in elderly patients is that their side effects (dry mouth, urinary retention, constipation, confusion/hallucinations) occur more frequently and severely in the elderly patient.

For patients with compromised functional status (more significant bradykinesia), the best initial therapy is going to be carbidopa/levodopa. Carbidopa inhibits extracerebral dopa decarboxylase, allowing more of the levodopa to reach the CNS where it is needed. Levodopa is the precursor to dopamine. Carbidopa protects the levodopa from breakdown in the periphery, ensuring its secure delivery to the CNS. There are several late complications to carbidopa/levodopa therapy. Dyskinesia (abnormal movements), akathisia (restlessness), and "on-off" phenomena are all disconcerting to the patient. All of these late side effects are termed "response fluctuations" and can be managed by using a sustained release form of carbidopa/levodopa, adding a dopamine agonist, adding selegiline, adding a COMT inhibitor, or restricting the main protein meal to the night.

Surgery should be considered only for patients who cannot tolerate medical therapy or who are not responding adequately to medical therapy. The procedures usually done include pallidotomy or thalamotomy.

Parkinsonian Syndromes

When the history is . . .	The most likely diagnosis is . . .
Parkinson + orthostatic hypotension	Shy Drager syndrome
Parkinson + ataxia	Olivopontocerebellar atrophy
Parkinson + vertical gaze palsy, "wide-eyed stare"	Supranuclear palsy
Acute-onset Parkinson	Vascular disease
Urinary incontinence + dementia + "magnetic gait"	Normal pressure hydrocephalus

Case 15: Seizures

34-year-old woman brought after roommate finds her unconscious on floor. Roommate describes seeing jerking and twitching repeatedly, frothing at mouth, and defecating on herself. Patient currently unresponsive. She suddenly begins to jerk violently in a generalized fashion.

1. Initial treatment?

2. If seizures continued, what medication would you give?

3. If seizures still continued, what would you give?

4. If seizures still continued, what would you give?

5. When is it reasonable to stop epileptic medications in a patient with epilepsy?

6. 27-year-old woman brought after suddenly losing consciousness while playing basketball. Her mother tells you that before the woman passed out, her left foot began twitching, at which time she began to froth at the mouth. At that point, all of her limbs began shaking violently. The woman is lethargic, but you cannot appreciate any neurologic deficit. What is the next step in the management?

   A. Begin therapy with phenytoin
   B. Observation; no therapy indicated at this time
   C. Begin therapy with lamotrigine
   D. Begin therapy with pregabalin
   E. Begin therapy with gabapentin

   Answer:

7. Patient has a **complex partial seizure** with motionless stare, chewing, lip smacking, and confusion. Where is the lesion?

   A. Frontal lobe
   B. Parietal lobe
   C. Temporal lobe
   D. Occipital lobe

   Answer:

8. Man from **Mexico** comes for **seizures**. CT scan of brain shows multiple **cystic lesions** with calcification. Next test?

   A. Serology for cysticercosis
   B. Serology for toxoplasmosis
   C Stool for ova and parasite examination
   D. Blood culture
   E. HIV testing

   Answer:

Summary: Case 15

Seizures are caused by "VITAMINS":

Vascular (stroke, bleed, arteriovenous malformation)

Infection (meningitis, abscess, encephalitis)

Trauma (especially penetrating)

Autoimmune (CNS vasculitis)

Metabolic (hyponatremia, hypocalcemia, hypomagnesemia, hypoglycemia, hypoxia, drug overdose/withdrawal)

Idiopathic

Neoplasm

P**S**ychiatric

A seizure is an essentially paroxysmal, involuntary event (associated with abnormal movement or change of consciousness or both). Characteristically, seizures are sudden in onset, with or without an aura. Patients often complain of disorientation, sleepiness, and muscle aching for minutes to hours after the event. Patients may also experience incontinence, tongue-biting, and headache as a result of the seizure. It may be difficult at times to differentiate a seizure from syncope, and it is important to obtain a complete history from any individual who witnessed the event. Generally, patients with syncope will not complain of significant post-ictal symptoms. They will recover consciousness within several minutes of the event and, on physical examination, will not have evidence of incontinence or tongue-biting.

It is important to classify seizures according to their clinical features because this will determine what medications will be used for treatment. Seizures can be classified as partial versus generalized, and complex versus simple.

Partial seizures occur within discrete portions of the brain. The patient will often complain of involuntary jerking of a finger or hand. When consciousness is maintained for the duration of the seizure, it is termed a simple partial seizure. When there is a change in consciousness during the seizure, it is termed a complex partial seizure. When a partial seizure progresses to a generalized seizure, it is called a partial seizure with secondary generalization. Typically, the seizure will begin focally and become generalized as the seizure activity involves both cerebral hemispheres.

Generalized seizures arise from both cerebral hemispheres spontaneously without any detectable focal onset. Generalized tonic-clonic (grand mal) seizures are characterized by tonic contraction of muscles throughout the body, followed by intermittent relaxation of various muscle groups (clonic phase). Absence seizures (petit mal) are characterized by sudden, brief loss of consciousness without loss of postural tone. Characteristically, the electroencephalogram (EEG) will show a generalized, symmetric 3-Hz spike-and-wave discharge pattern. Atonic seizures are characterized by sudden loss of postural tone lasting 1 or 2 seconds. Myoclonic seizures are characterized by sudden brief muscle contraction.

Status epilepticus is defined as recurrent or continuous seizures.

EEG is the test of choice for the diagnosis of epilepsy. The diagnosis of idiopathic seizures is made only after secondary precipitating factors have been ruled out. Always check serum electrolytes, glucose, toxicology, and an arterial blood gas to rule out hypoxia as a cause of a patient's seizure. A CT scan or MRI of the head is usually indicated to rule out a structural lesion as the cause of seizure. It is important to think of any seizure as a symptom—much like shortness of breath or chest pain—that has an extensive differential diagnosis. The evaluation of any seizing patient is to rule out reversible causes of seizure.

The treatment of seizures can be divided into the acute management of the acutely seizing patient (status epilepticus) and the management of the epileptic patient.

The first step in the treatment of any acutely seizing patient is to secure the airway, breathing, and circulation. Once adequate airway, breathing is ensured and the patient is hemodynamically stable, the next step is to simultaneously evaluate and treat any precipitating causes of seizure. If a reversible cause is identified, it should be treated aggressively.

If the patient continues to seize, the following strategy is appropriate: The initial drug of choice is lorazepam or diazepam, both of which are benzodiazepines. These medications work by potentiating GABA receptor function. If the patient continues to seize, the next medication to add is either phenytoin or fosphenytoin. These medications work by inhibiting sodium-dependent action potentials. CNS side effects of phenytoin include diplopia, dizziness, and ataxia. Systemic side effects include gum hyperplasia, lymphadenopathy, hirsutism, and rash. If the patient continues to seize, the next medication to add is phenobarbital. Side effects include sedation, ataxia, and rash. If, despite all of the above therapy, the patient continues to seize, then you can add either midazolam or propofol.

In patients with first-time seizures, anticonvulsant therapy should be started only if the patient has an abnormal neurologic examination, has presented with status epilepticus, has a strong family history of seizure, or has an abnormal EEG. Otherwise, first-time seizures are generally not treated.

For primary generalized tonic-clonic seizures, valproic acid is considered first-line treatment. (If valproic acid is not among the answer choices, you may select lamotrigine.) Valproic acid works by increasing the availability of GABA. Side effects include ataxia, tremor, liver toxicity, low platelets, gastrointestinal irritation, and hyponatremia. Lamotrigine works by decreasing glutamate release. Side effects include diplopia, ataxia, rash, and Stevens-Johnson syndrome. Absence seizures are treated with ethosuximide as first-line therapy. (If ethosuximide is not among the answer choices, valproic acid is an acceptable option.) For myoclonic and atonic seizures, valproic acid is the treatment of choice.

Partial seizures, whether they are complex or simple and whether or not they progress to secondary generalized seizures, are all treated the same. Carbamazepine and phenytoin are considered first-line therapy. Valproic acid and lamotrigine are considered acceptable alternatives.

Case 16: Dementia Syndromes

74-year-old man is brought by daughter for father's memory. He has been forgetting the places of simple things. Exam normal. Mini-Mental Status Exam is significant memory impairment.

1. Diagnosis?

When the history is . . .	The most likely diagnosis is . . .
Personality changes before memory impairment	
Stepwise progression of dementia with temporal association to vascular event	
Dementia associated with anhedonia, insomnia, sadness, feelings of worthlessness and anxiety	
Gradual onset of impairment of more than one cognitive domain, with memory going first	Alzheimer disease
Dementia with focal neurologic examination	Subdural hematoma, tumor
Cognitive impairment limited to memory	Mild cognitive impairment
Dementia associated with daytime somnolence, loud snoring, apneic episodes	Sleep apnea

2. Treatment for Alzheimers?

3. 76-year-old man, who is a retired mathematician, comes to office for routine exam: He asks what mental function he is most likely to lose first as he ages. What will be your answer?

   A. Attention and calculation
   B. Orientation
   C. Registration
   D. Memory

   Answer:

4. 82-year-old man from nursing home is admitted for increasing **confusion and the inability to control his urine**. He has slowly progressive memory loss. He is disoriented to time and place and walks with a **wide-based gait**. CT shows **dilated ventricles with very little atrophy**. Diagnosis?

   A. Alzheimer disease
   B. Normal pressure hydrocephalus
   C. Huntington's chorea
   D. Multi-infarct dementia

   Answer:

5. Which has been shown to improve memory in women with late-stage Alzheimer disease?

   A. Estrogen
   B. Estrogen/progesterone combination
   C. Memantine
   D. Vitamin E
   E. Aspirin

   Answer:

6. **85-year-old** woman admitted to nursing home for long-term inability to ambulate after a hip fracture. She recovers from herpes zoster. Over next several weeks, she is more **confused**. She asks about a grandson that died. Her medications are hydrochlorothiazide, ibuprofen, **lorazepam**, and amlodipine. What is next?

   A. Transfer to hospital for evaluation
   B. Switch ibuprofen to acetaminophen
   C. MRI of the brain
   D. Consult neurology
   E. Stop the lorazepam

   Answer:

7. Rapidly progressive dementia with myoclonus.

   Diagnosis?

   Test?

   Treatment?

8. Dementia with VIVID hallucinations. Greatly detailed. Fluctuating. Parkinsons

   Diagnosis?

   Treatment?

9. Dementia with choreiform movement with emotional lability.

   Diagnostic test?

   Treatment?

Summary: Case 16

There are over 100 identifiable causes of dementia in the elderly. Among the many reversible causes of dementia you should consider hypothyroidism, vitamin B_{12} deficiency, hepatic or uremic encephalopathy, CNS vasculitis, syphilis, brain abscess, brain tumor (primary or metastatic), medications (especially anticholinergics), obstructive sleep apnea, central sleep apnea, trauma, subdural hematoma, normal pressure hydrocephalus, and depression. Irreversible causes of dementia include progressive multifocal leukoencephalopathy; Alzheimer disease; dementia with Lewy bodies; frontotemporal degeneration, including Pick disease; and vascular dementia, including multi-infarct dementia, Binswanger disease, and Creutzfeldt-Jakob disease (CJD).

The most common cause of dementia is Alzheimer disease. Typically, patients will present with problems in memory and visuospatial abilities that generally occur early in the course of the disease. Social graces can be retained despite significant loss of cognitive decline. Hallucinations and personality changes typically occur late in the course of the disease.

Mild cognitive impairment refers to memory loss without dysfunction of other cognitive domains. These patients have a higher risk of developing Alzheimer disease later in life but do not have Alzheimer disease.

Patients with frontotemporal dementias, such as Pick disease will typically present with personality changes early in the course of their disease with relative sparing of their visuospatial function.

Dementia with Lewy bodies (DLB) can be confused with delirium and is characterized by fluctuating cognitive impairment. Dementia secondary to Parkinson disease should be accompanied with clinical findings consistent with that disease.

Dementia secondary to CJD is characterized by a shorter (weeks to months), more aggressive course than Alzheimer disease. Patients with CJD will present with dementia and myoclonus.

Vascular dementia is divided into multi-infarct dementia, which typically has a stepwise progression associated with discrete cerebrovascular events; and Binswanger disease, involving the subcortical white matter, which presents with a slowly progressive course.

Normal pressure hydrocephalus will present with prominent gait abnormalities early in the course of the disease that usually precede the onset of cognitive impairment. There will also be associated incontinence.

All patients with cognitive impairment should be assessed with a Mini-Mental Status Examination to identify the areas of cognitive impairment.

Initially, the workup should focus on ruling out reversible causes of the dementia. If a reversible cause is identified it should be treated, with the hope that cognitive function can be recovered. Laboratory studies should include a complete blood count, electrolytes, calcium, creatinine, liver function studies, glucose, TSH, vitamin B_{12}, RPR, and HIV. Brain imaging should be reserved for patients who have focal neurologic examination, seizures, gait abnormalities, and an acute or subacute onset of their symptoms.

Treatment of dementia revolves around ensuring that the family and the patient have the proper medical and emotional support to cope with the disease. Caregivers are at increased risk for depression and anxiety. Their concerns and frustrations should be addressed at frequent intervals.

Pharmacotherapy with donepezil has been shown to improve cognitive function in mild to moderate dementia. Other anticholinesterase inhibitors (rivastigmine, galantamine) appear to be have similar efficacy. If the caregiver reports no improvement within 3 to 6 months, pharmacotherapy should be discontinued.

Case 17: Headaches

23-year-old woman with bilateral headaches occurring since her menstrual periods began at age 15. Describes bilateral, throbbing headaches that peak between 6 and 12 hours after they start. Sometimes before headache starts she sees "flashing lights." Neuro exam nonfocal.

1. Diagnosis?

2. Treatment?

After 2 weeks of daily headaches, patient returns to clinic. Despite taking the prescribed medication, her headaches are worsening.

3. When is prophylaxis?

4. What to use?

5. Most common precipitant of migraine?
   A. Foods
   B. Emotions
   C. Sex
   D. Exercise

   Answer:

6. Which of the following is a contraindication to using triptans?
   A. Pregnancy and coronary disease
   B. Hyponatremia
   C. Seizure disorder
   D. Depression and schizophrenia

Answer:

If a patient presents with headache and one of the following, seriously consider CT scan or MRI of the brain:

- "Thunderclap" headache
- "This is the worst headache of my life!"
- Progressively worsening headache
- Onset at age >40 years
- Precipitation of headache with cough, sneeze, strain, or bending
- Fever, weight loss, malaise, scalp tenderness, jaw claudication
- Focal neurologic examination

Summary: Case 17

Primary headache syndromes include migraine and cluster and tension-type headaches. Secondary causes of headache include intracranial hemorrhage, brain tumor, meningitis, temporal arteritis, and glaucoma.

A history of recurrent symptoms makes the diagnosis of a primary headache disorder more likely. A history of a first-time headache, especially when severe and rapidly peaking, speaks strongly for serious underling pathology. Additionally, any patient who presents with the following should be considered to have a secondary headache syndrome: complaints of "the worst headache of my life;" worsening symptoms over days to weeks; an abnormal neurologic examination; fever; vomiting preceding the headache; headache induced by coughing, bending, or lifting; or onset after 55 years of age. Headache with fever and nuchal rigidity suggests meningitis as the underlying cause. Conversely, a headache that is described as "the worst headache of my life," is thunderclap in onset, and is accompanied by nuchal rigidity without fever suggests an intracranial hemorrhage as the underlying cause.

Patients with brain tumors will present complaining of headache that is described as a deep, dull, aching pain that disturbs sleep. The history of vomiting that precedes the onset of headache by a number of weeks or a history of headache induced by coughing, lifting, or bending is typical of posterior fossa brain tumors.

Patients with temporal arteritis complain of a unilateral pounding headache associated with visual changes, described as a dull and boring with superimposed lancinating pain. Patients will also complain of polymyalgia rheumatica, jaw claudication, fever, weight loss, and scalp tenderness (difficulty combing hair or lying on a pillow). Temporal arteritis is a disorder of the elderly generally presenting in patients older than 50 years. Patients with glaucoma will usually give a history of eye pain preceding the onset of their headache.

1. Man with right-sided sharp pain in head, red eye, runny nose. Had 4 episodes in last 2 days. Gets 8-10 of these every year at this time.

   Best abortive therapy?

   Prophylactic therapy?

   A. Triptans
   B. Verapamil
   C. SSRI
   D. Valproic acid

   Answer:

Note

Visual disturbance most in migraines.

2. 47-year-old woman gets severe headaches 2–3 times every few months. They are a few days apart. She is not pregnant and has no heart disease. Best therapy?

   A. Propranolol daily
   B. Verapamil daily
   C. Sumatriptan as needed
   D. 100% oxygen
   E. Prednisone

   Answer:

3. Patient with recurrent migraine headaches **almost daily**. They respond well to injection of sumatriptan. Your plan?

   A. Oral sumatriptan daily
   B. Cyproheptadine daily
   C. Head CT scan
   D. Propranolol daily

   Answer:

4. Who is more likely to have Horner's syndrome?

   A. Cluster headache
   B. Tension headache
   C. Migraine
   D. Pseudotumor cerebri

   Answer:

5. Which of the following is most like to have focal neurological defects?

   A. Migraine
   B. Cluster

   Answer:

6. 54-year-old man with moderate severe headaches. Going on for years. Associated with nausea. BP 150/85. Fundus normal. No focal deficits. No neck stiffness. History coronary disease.

   What next?

   A. MRI head
   B. Lumbar puncture
   C. Naprosyn and prochlorperazine
   D. Sumatriptan

   Answer:

Migraine headaches are defined as a benign and recurrent syndrome of headache, nausea/vomiting, and other varying neurologic dysfunction. Patients will describe the headache as throbbing, unilateral, and aggravated by minor movement. Other associated features include photophobia, phonophobia, and the time to maximal pain (4 to 72 hours). Migraine is a likely diagnosis when a typical trigger can be identified. Typical triggers include alcohol; certain foods, such as chocolate, cheeses, and monosodium glutamate; hunger; or irregular sleep patterns. Migraine without aura is a migraine without a preceding focal neurologic deficit. Migraine with aura (classic migraine) is a migraine headache that is accompanied by a preceding aura, which consists of motor, sensory, and/or visual symptoms. Focal neurologic symptoms usually occur during the headache rather than as a prodrome. The pathognomonic aura for classic migraine is the scintillating scotoma. Migraine equivalent is defined as focal neurologic symptoms without the classic complaints of headache, nausea, and vomiting. Complicated migraines are migraines with severe neurologic deficits that persist after the resolution of pain. Basilar migraines are migraine headaches associated with symptoms consistent with brain-stem involvement (vertigo, diplopia, ataxia, or dysarthria).

Cluster headaches begin without warning and are typically described as excruciating, periorbital, and peaking in intensity within 5 minutes of onset. They are rarely described as pulsatile in nature. The attacks will last from 45–90 minutes and occur 1–3 times a day for a 4- to 8-week period. Symptoms associated with cluster headache include rhinorrhea, reddening of the eye, nasal stuffiness, and nausea. Emotion and food rarely will trigger a cluster headache.

Tension-type headaches are described as tight, bandlike headaches that occur bilaterally. Patients may also describe their headache as "viselike" and perhaps associated with tightness of the posterior neck muscles. Patients will describe their pain as one that builds slowly and may persist for several days with or without fluctuations. Movement will not generally exacerbate the headache.

The patient who presents with severe, sudden onset of a first-time headache accompanied by strong evidence for an underlying cause on history or physical examination should have a CT scan of the head to rule out any secondary causes.

Effective management of migraine headaches should always begin with an attempt to identify probable triggers for the individual patient and to modify the person's lifestyle by avoiding the things that trigger the symptoms. Most patients will require pharmacotherapy in addition to any nonpharmacologic intervention that is advised.

The pharmacologic treatment for migraine headaches can be divided into management of an acute episode and prophylaxis. Initially, in mild migraine that is defined as headache in the absence of nausea or vomiting, nonsteroidal anti-inflammatory medications may be used. Acutely, abortive therapy consists of sumatriptan, which acts as a serotonin receptor agonist. The "-triptans" are contraindicated in patients with known cardiovascular disease. These medications can be given orally, intranasally, or even subcutaneously, depending on the severity of the headache. Alternatively, ergotamine can be given for acute abortive therapy. Dopamine antagonists, such as metoclopramide, can be given acutely as an oral formulation to aid in the absorption of other abortive medications. When given parenterally, dopamine antagonists can provide relief acutely for migraine headaches.

Prophylactic treatment for migraine therapy should be started when patients have acute migraine headaches more than 3 times per month. Propranolol, timolol, valproic acid, and methysergide are all considered first therapy for migraine prophylaxis. These medications take 2 to 6 weeks to have an effect and can be discontinued gradually over 6 months once clinical stabilization has occurred. Methysergide is associated with valvular and retroperitoneal fibrosis.

Note

Migraine

- Beta blocker

Cluster

- Verapamil

Opioid analgesics are not routinely recommended for the treatment of migraine because of the possibility of developing addiction. Opioids are used only in patients with severe, infrequent migraines that are unresponsive to other therapy.

Treatment for tension headache consists of relaxation. Patients should be encouraged to find activities that are relaxing for them. Initial pharmacotherapy consists of acetaminophen and NSAIDs.

Cluster headaches are prophylactically treated with verapamil, prednisone, or lithium. Acutely, the most effective treatment is triptans or 100% oxygen. Sumatriptan is equal to 100% oxygen. Cluster headaches are best prevented with verapamil.

Case 18

35-year-old woman with headache that started slowly approximately 6 months ago. Located bilaterally. Worse upon awakening. Associated with blurry vision and transient visual obscurations. Also complains of "ringing in her ears" that corresponds to her heartbeat. The patient is obese. Funduscopic exam significant for papilledema.

1. Diagnosis?

2. Which is most often found?
   A. Diplopia
   B. Neck stiffness
   C. Paralysis

   Answer:

3. Next step in management?

4. What test confirms your diagnosis?

5. Initial treatment?

6. When would you consider surgery?

7. Most common long-term manifestation?

   A. Visual field loss
   B. Stroke
   C. Hydrocephalus

   Answer:

Summary: Case 18

In an obese woman of childbearing age who presents with headache and papilledema, the most likely diagnosis is pseudotumor cerebri. The next step in the management of this patient is to obtain an MRI of the brain to rule out a space-occupying lesion as a cause of her papilledema. Magnetic resonance venography can be useful to rule out cerebral venous thrombosis. Other causes of pseudotumor cerebri include hypoparathyroidism, Addison disease, hypervitaminosis A, oral contraceptives, tetracycline use, and rapid corticosteroid withdrawal. The best initial treatment is weight loss and treatment of any identified underlying cause. The next step in the management of these patients includes therapy with acetazolamide and steroids. Surgery should be considered for patients with vision loss or refractory headaches.

Case 19: Altered Mental Status

You are called to bedside by the nurse regarding a patient who is agitated. While giving his medication the elderly man became acutely agitated and combative, attempting to strike her. As you enter room patient shouts, "Get away from me!"

1. Name of this syndrome? How is it different from dementia?

2. Next step in management?

3. What med to give?

When this is in the history and physical examination . . .	The most likely diagnosis is . . .
IDU, alcohol abuse, substance abuse	Withdrawal or intoxication
Fever, elevated WBCs, nuchal rigidity	Acute infection Consider UTI, pneumonia, meninigitis, encephalitis, cellulitis
Paradoxical movement of abdomen on inspiration, respiratory distress	Hypoxemia, hypercapnia
History of carcinoma with focal neurologic examination	Metastatic carcinoma to the brain
Jaundice, ascites, and edema	Hepatic encephalopathy
Bilateral asterixis	Metabolic encephalopathy, i.e., hepatic, hypercapnia, drug ingestion
Coagulopathy with focal neurologic examination	Intracranial bleed
Myoclonic jerking and tremor in an awake patient	Uremia or antipsychotic medication
Anticholinergic medication	Reaction to the drug
Urinary or fecal incontinence, or tongue lacerations	Seizure
Postoperative	Hyponatremia

4. Woman comes to clinic without complaint. On exam, when light is shined in left eye there is no pupillary constriction. When light is shined in right eye, both pupils constrict normally. Funduscopic exam is normal. Diagnosis?

   A. Retinal detachment
   B. Essential hypertension
   C. Optic neuritis
   D. Glaucoma

   Answer:

5. Man comes to clinic complaining of face stiffness. Face feels "it is being pulled to one side." Symptoms began suddenly. Denies pain but "hearing soft noises loudly." Exam: right-sided facial palsy with restricted eye closure. What would you recommend?

   A. Observation
   B. Aspirin
   C. Surgical decompression
   D. Prednisone and eye lubrication

   Answer:

6. Woman with gradual vision loss over last 5 years. Funduscopic exam, you note moderate neovascularization and round, yellowish spots haphazardly distributed at the posterior pole of the retina. Next step in management of this patient?

   A. Radiotherapy
   B. Laser photocoagulation
   C. Observation
   D. Pilocarpine eye drops

   Answer:

Summary: Case 19

In any patient who presents with acute delirium, the next step is to identify an underlying cause of the patient's symptoms. Indications for sedation include engagement in harmful activity or subjective distress from hallucinations associated with the delirium. Haloperidol is the agent of choice for the pharmacologic management of the acutely delirious individual.

Case 20: Psychiatric Disorders

45-year-old woman comes complaining of palpitations. She has begun to feel her heart racing once a day for last 3 weeks. She has visited your clinic in the past for evaluation of chest pain, headache, back pain, and bloating. All previous workups have been negative. Exam today is normal.

1. Diagnosis?

2. Best management?

3. 25-year-old woman comes to emergency department after an episode of severe headache when she attempted to board an airplane earlier that day. Symptoms were accompanied by right-sided chest pain that resolved within 5 minutes of onset. She felt smothered and also had some shortness of breath. This is her first such episode. Exam normal. EKG shows no abnormalities. Best initial therapy?

   A. Education and relaxation techniques
   B. Cognitive behavioral therapy
   C. Diazepam
   D. Fluoxetine

   Answer:

4. 18-year-old girl comes to office at behest of her mother because of dramatic weight loss over the last 3 months since she broke up with her boyfriend. During interview she is constantly fixing her makeup. When asked about her weight, she immediately appears horrified and asks, "Do I look fat?" Vehemently denies binge eating. Has not menstruated for last 5 months. She appears emaciated. You note dry, scaly skin and parotid gland enlargement. Diagnosis?

   A. Bulimia nervosa
   B. Hyperthyroidism
   C. Lymphoma
   D. Anorexia nervosa
   E. Celiac sprue

   Answer:

5. 57-year-old man complaining of feeling worthless since he lost his job 4 weeks ago. He feels sad and empty and does not find pleasure in his grandchildren. He has also noticed extreme fatigue and low energy on a daily basis. Wife states that her husband has been agitated and irritable over the last 2 weeks. Exam normal. EKG: old LBBB (left bundle branch block). Initial therapy?

   A. Desipramine
   B. Amitriptyline
   C. Citalopram
   D. Selegiline

   Answer:

6. Woman complaining of recurrent anxiety about cleanliness of her home. States that her thoughts have begun to interfere with her daily living, because she feels it necessary to clean every doorknob before she can touch it. Exam normal. Best initial therapy?

   A. Behavior modification
   B. Cognitive therapy
   C. Fluoxetine
   D. Clomipramine

   Answer:

7. Known alcoholic is acting very bizarrely because of the inability to find alcohol. Which medications should you **AVOID** in this situation?

   A. Glucose and thiamine
   B. Lorazepam
   C. Naloxone
   D. Carbamazepine
   E. Haloperidol

   Answer:

8. Patient on clozapine for psychosis. Blood count reveals leucopenia. What would you do?

   A. Discontinue clozapine and use another antipsychotic medication
   B. Bone-marrow biopsy
   C. HIV testing
   D. Repeat the CBC in 10 days
   E. Colony-stimulating factor

   Answer:

9. 74-year-old man has chronic constipation, prostatic hypertrophy, and glaucoma. He presents with depression requiring an antidepressant. What is the drug of choice?

   A. Desiprimine
   B. Nortriptyline
   C. Amitriptyline
   D. Fluoxetine

   Answer:

10. An antidepressant is started. How long should you wait to see the maximum effect?

    A. 2 months
    B. 9 months
    C. 1–2 years
    D. Indefinitely

    Answer:

11. A patient is depressed following the death of her husband. There is plenty of support from the family. They bring her to you. Which is most appropriate management?

    A. Supportive therapy and return in 2 weeks
    B. Paroxetine
    C. Diazepam
    D. Electroconvulsive therapy

    Answer:

12. Man comes with multiple physical complaints referable to different organs. Patient is impulsive, dramatic, and demanding. You do not believe symptoms are intentionally produced or feigned. Diagnosis?

    A. Somatoform disorder
    B. Conversion disorder
    C. Hypochondriasis
    D. Factitious illness

    Answer:

13. Young female complains to you that your partner is treating her improperly. She says that he avoids her questions and really does not care, and that she likes your style better. She has **missed many appointments** and has had **three different primary doctors**. After the visit, she calls you many times to ask different medical questions. Diagnosis?

    A. Paranoid personality disorder
    B. Borderline personality disorder
    C. Panic attacks
    D. Conversion disorder

    Answer:

14. Which is associated with highest lifetime risk of suicide?

    A. Bipolar disorder
    B. Major depression
    C. Borderline personality
    D. Anxiety disorder

    Answer:

Summary: Case 20

In a patient who complains of ≥4 or more unexplained symptoms, the most likely diagnosis is abridged somatization. Somatization disorder requires a patient to have at least 8 unexplained medical symptoms.

Patients with somatization should have 1 primary care provider and should have frequent, brief, scheduled visits. In the absence of associated depression or panic disorder, medications are unlikely to be of any benefit.

Haloperidol should be avoided in those with alcohol abuse, because it lowers the threshold to have a seizure. Clonazepine is associated with neutropenia and if the medication is given and neutropenia develops, the clonazepine should be stopped immediately. Tricyclic antidepressants should be avoided in elderly patients particularly if there is constipation, urinary retention, or glaucoma. Antidepressant medications will reach a maximum therapeutic benefit in about two months. Brief reactive depression, such as from a death in the family, should not be treated with medication.

Somatoform disorder is multiple physical complaints referable to different organs. The patient is often dramatic, impulsive, and demanding. In somatoform disorder, the patient is not purposely feigning the symptoms. In a conversion disorder, there is a specific motor or sensory disorder, such as aphonia, paralysis, or pseudo seizures, but the symptoms are not intentionally produced. Hypochondriasis is when a person believes that he or she has a serious medical illness, despite reassurance and appropriate medical evaluation. In factitious illness, physical symptoms are produced voluntarily and the sick role is itself a source of gratification.

Case 21: Peripheral Neuropathy

54-year-old man comes for evaluation of blurry vision. Pupils are not the same size, with left greater than right. Left eye cannot look up, down, or in; and left eyelid is drooping.

1. Diagnosis?

   A. Horner syndrome
   B. Eaton-Lambert syndrome
   C. Myasthenia Gravis
   D. Third cranial nerve palsy

   Answer:

2. 63-year-old woman, who has a history of diabetes, presents with inability to move her right eye up, down, or in. There is ptosis of the same eye. Pupils react normally. Most common cause?

   A. Intracranial neoplasm
   B. Cavernous sinus thrombosis
   C. Diabetes mellitus
   D. Lung cancer at the apex of the lung

   Answer:

3. After an injury to elbow, patient develops hyperextension of the metacarpophalangeal joints with flexion of the interphalangeal joints. Hand looks like a claw. Most likely diagnosis?

   A. Ulnar nerve palsy
   B. Radial nerve palsy
   C. Peroneal nerve palsy
   D. Tarsal tunnel syndrome
   E. Morton's neuroma
   F. Meralgia paresthetica (lateral cutaneous nerve)

   Answer:

4. Man falls asleep drunk in bar with arm over back of chair. When he wakes up, he is not able to extend his wrist ('wrist drop'). Diagnosis?

   A. Ulnar nerve palsy
   B. Radial nerve palsy
   C. Peroneal nerve palsy
   D. Tarsal tunnel syndrome
   E. Morton neuroma
   F. Meralgia paresthetica (lateral cutaneous nerve)

   Answer:

5. Obese pregnant woman with pain and numbness of the outer aspect of one thigh that seems to worsen with sitting. Diagnosis?

   A. Ulnar nerve palsy
   B. Radial nerve palsy
   C. Peroneal nerve palsy
   D. Tarsal tunnel syndrome
   E. Morton neuroma
   F. Meralgia paresthetica (lateral cutaneous nerve)

   Answer:

6. Pain and numbness in the ankle and sole of the foot with parasthesias that worsens with walking. Diagnosis?

   A. Ulnar nerve palsy
   B. Radial nerve palsy
   C. Peroneal nerve palsy
   D. Tarsal tunnel syndrome
   E. Morton neuroma
   F. Meralgia paresthetica (lateral cutaneous nerve)

   Answer:

7. A woman comes in with weakness of the foot with loss of **dorsiflexion and eversion**. She wears **high boots** and often sits with her legs crossed. Diagnosis?

   A. Ulnar nerve palsy
   B. Radial nerve palsy
   C. Peroneal nerve palsy
   D. Tarsal tunnel syndrome
   E. Morton neuroma
   F. Meralgia paresthetica (lateral cutaneous nerve)

   Answer:

8. 45-year-old woman with sharp intermittent pain radiating into the toes. **She feels better when she takes off her shoes**. There is tenderness when pressure is applied between the heads of her second and third metatarsals. Most likely diagnosis?

   A. Ulnar nerve palsy
   B. Radial nerve palsy
   C. Peroneal nerve palsy
   D. Tarsal tunnel syndrome
   E. Morton neuroma
   F. Meralgia paresthetica (lateral cutaneous nerve)

   Answer:

9. Man with a history of healed trauma to the foot comes with **severe pain when a sheet touches his foot**. The foot is pale. Diagnosis?

   A. Acute gout
   B. Tarsal tunnel syndrome
   C. Reflex sympathetic dystrophy
   D. Fractured ankle

   Answer:

10. Avid biker, with wasting of hypothenar eminence and interosseous muscles. No sensory loss. What is involved?

    A. Radial nerve
    B. Median nerve
    C. Brachial nerve
    D. Ulnar nerve

    Answer:

11. Sensory loss of lateral aspect of thigh. Which spinal segment is involved?

    A. L4
    B. L5
    C. S1
    D. L2

    Answer:

Note

Nocturnal awakening with hand pain is carpal tunnel.

12. Patient with facial droop and blisters on the external auditory canal. Etiology?

    A. Herpes simplex
    B. Varicella zoster
    C. Epstein-Barr virus
    D. Cytomegalovirus

    Answer:

13. Most common cause of mononeuritis multiplex?

    A. Multiple sclerosis
    B. Sarcoidosis
    C. Diabetes mellitus
    D. Malignancy
    E. HIV

    Answer:

14. 35-year-old athlete has pain in right heel. He has tenderness on palpation of anterior calcaneus. Pain is extremely severe when arising in morning with first few steps. Improves with walking and stretching. Diagnosis?

    A. Plantar fasciitis
    B. Tarsal tunnel syndrome
    C. Osteoarthritis
    D. Peroneal nerve palsy

    Answer:

Summary: Case 21

Third cranial nerve palsy results in the inability to lift the eyelid, or to look up, down, or in. When diabetes causes third nerve palsy, the ability to constrict the pupil is retained. Injury at the elbow resulting in a 'claw' hand results from ulnar nerve palsy. 'Saturday night palsy' is damage to the radial nerve that results in wrist drop. This is often transient in nature. Injury to the lateral cutaneous nerve of the thigh or 'meralgia paresthetica' is more common in obese patients, pregnancy, and with sitting cross-legged. It is an injury of the L2 nerve root. Tarsal tunnel syndrome is like carpal tunnel syndrome occurring in the foot. Prolonged exercise makes it worse. Plantar fasciitis gets BETTER with stretching and exertion and is maximally painful with the first few steps, then improves. Tarsal tunnel causes both pain and numbness of the sole and ankle. Plantar fasciitis is extremely painful and tender at the calcaneus. There is no numbness with plantar fasciitis. Peroneal nerve palsy occurs more often in those who wear high boots and is associated with foot drop. Morton's neuroma causes pain that is markedly improved when shoes are removed. It is near the 2nd and 3rd metatarsal heads. Reflex sympathetic dystrophy is clearly associated with healed trauma to the foot and results in severe pain with relatively minor contact, such as a sheet touching the foot. Injury to the ulnar nerve can also occur from repetitive minor trauma to the hand while riding a bicycle. There is wasting of the hypothenar eminence as well. Ramsay-Hunt syndrome is a Varicella-zoster reactivation with blisters in the external auditory canal as well as facial droop. Diabetes is the most common cause of mononeuritis multiplex by far.

Nephrology 4

ACUTE RENAL FAILURE

Case 1

70-year-old man admitted with diverticulitis confirmed by abdominal CT scan. Was placed on ampicillin, gentamicin, and metronidazole. History of benign prostatic hypertrophy and cirrhosis. Over last 2 days, condition has worsened, including vomiting. BP 90/60 mm Hg, pulse 105. Repeat abdominal CT scan shows a possible peridiverticular abscess. BUN now 34; and creatinine 2.4.

1. Most likely cause of renal failure?
   A. Prerenal azotemia
   B. Acute tubular necrosis
   C. Allergic interstitial nephritis
   D. Postrenal obstruction
   E. No clear diagnosis at this time

   Answer:

2. What to do next to confirm the diagnosis?

Prerenal Azotemia	**Acute Tubular Necrosis**
U/A	
BUN: Creatinine **20:1**	BUN: Creatinine **10:1**
Urine sodium	Urine sodium
FeNa	FeNa
Urine osmolality	Urine osmolality

3. How would hepatorenal syndrome fit this diagnostic scheme? Therapy?

Note

3 Reasons for Renal Failure

- Pre-renal
- Intrinsic Disease
- Post-renal

4. What test specifically confirms gentamicin as cause of renal failure? What about contrast?

5. Treatment proven effective for drug-induced acute tubular necrosis?

Summary: Case 1

Prerenal azotemia can result from any cause of decreased perfusion of the kidney. The presence of renal insufficiency is not dependent on the total body fluid status. All that matters is how much perfusion the kidney is getting. The kidney experiences renal artery stenosis the same way that it would life-threatening hypotension. The juxtaglomerular complex does not know that the systemic blood pressure is elevated. Even though a patient may have severe edema from congestive failure or the low oncotic pressure of hypoalbuminemia or cirrhosis, the kidney experiences this in the same way it would severe dehydration. Hepatorenal syndrome gives the same numbers as prerenal azotemia, i.e., an elevated BUN:creatinine ratio and a low urine sodium, because there is an intense renal vasoconstriction resulting in decreased renal perfusion. When the BUN:creatinine ratio cannot help you distinguish the source of the renal failure, you can also use the urine osmolality. In prerenal azotemia, the urine osmolality is >500. In acute tubular necrosis (ATN), renal concentrating ability is defective, the kidney can neither concentrate nor dilute the urine, and the urine osmolality is <350. The urine sodium can easily substitute for the fractional excretion of sodium (FeNa). If the urine sodium is low, the FeNa will be <1%. Hypomagnesemia is suggestive of gentamicin-induced renal failure. There is no specific therapy to reverse ATN. Hydration, diuretics, and low-dose dopamine have never been shown to alter the overall outcome.

Note

Causes of Pre-renal Azotemia

Volume Depletion

- Vomiting
- Diarrhea
- Bleeds
- Burns

Case 2

Man with tuberculosis was placed on isoniazid, rifampin, ethambutol, and pyrazinamide. Initially became afebrile. He developed a new fever (38.8°C/102°F) and rash. Having visual disturbance as well. History significant for gout and seizure disorder. On phenytoin for many years, taking allopurinol off and on for long time. BUN and creatinine rise to 28 and 2.4.

1. Type diagnosis of renal insufficiency?

2. Cause?

3. Initial test?

4. Most specific test?

5. Initial therapy?

6. Why does he have visual disturbance?

   The renal insufficiency has caused an accumulation of ethambutol that has caused the optic neuritis resulting in his visual disturbance.

7. At what BUN and creatinine to start dialysis?

8. What in history/physical/labs tell you to use dialysis?

   Refractory hyperkalemia, metabolic acidosis, pericarditis, fluid overload, encephalopathy

Note

ATN: UA

Muddy granular casts, no RBCs

Note

ACE does not cause interstitial nephritis.

Summary: Case 2

Allergic or acute interstitial nephritis (AIN) can be caused by virtually any medication that results in an allergic reaction in the kidney. The drugs are the same drugs that patients are allergic to in general, such as penicillins, sulfa drugs, phenytoin, allopurinol, and rifampin. Fluoroquinolone antibiotics are also a prominent source of interstitial nephritis. Diuretics such as thiazides and furosemide are sulfa derivatives as well. AIN can also be caused acutely as a reaction to virtually any bacterial, viral, or Rickettsial infection. The main way to clinically distinguish AIN from other causes of acute renal failure is the presence of fever, rash, joint pains, and eosinophils in the blood and urine. Urinalysis will show white cells but cannot specifically identify them as eosinophils. You need to specifically test for them with either a Wright stain or Hansel stain of the urine. The majority of cases will respond to simply ceasing the offending medication. This is why it is important to determine a specific diagnosis; otherwise, you cannot be sure which medication to stop. In very severe cases of AIN that seem to be progressing into end-stage renal disease, despite ceasing the offending medication, the therapy is steroids. Dialysis use is not based on a specific BUN or creatinine level; it is based on the development of life-threatening symptoms that cannot be corrected by other means, such as hyperkalemia, severe metabolic acidosis, pericarditis, fluid overload, or neurologic abnormalities such as encephalopathy.

Case 3

30-year-old man has just finished 25-mile bicycle ride after a triathlon. He has a seizure, while on ground gets run over by car. History of hypercholesterolemia. Takes pravastatin, simvastatin, atorvastatin, lovastatin, and extra helpings of cerivastatin. He is now in ED. You are first person to see him after he has been lying in bed in hallway for 4 hours.

1. Most urgent step? (How will he die first?)

2. First test to establish specific diagnosis?

   A. EKG
   B. Urinalysis
   C. CK
   D. Urine myoglobin
   E. Renal ultrasound

   Answer:

3. Initial therapy?

Summary: Case 3

Rhabdomyolysis can be caused by any form of severe muscular injury, such as that from a seizure, strenuous exercise, cocaine, or even prolonged pressure. Just lying on a hard floor for several hours from syncope can result in muscular necrosis. Heat stroke, neuroleptic malignant syndrome, and malignant hyperthermia can all cause severe muscle necrosis. On the other hand, hypothermia causes it as well. A low level of potassium or phosphorus and the use of statin medications and alcohol can also lead to muscle necrosis. Endocrine myopathies, such as those associated with hyperthyroidism and hypercortisolism do not elevate the muscle enzyme levels. The urinalysis is the best initial way to determine if a patient has severe rhabdomyolysis. The urine will be dipstick-positive for blood, but on microscopic examination, you will not find any red cells. The CPK (creatine phosphokinase) will be markedly elevated into the thousands, but this takes more time. The most urgent step in life-threatening rhabdomyolysis, however, is either to check a potassium level or to check the EKG (electrocardiogram). Patients can die very acutely from abnormalities of the cardiac conduction system. Rhabdomyolysis is treated acutely with hydration and bicarbonate. The bicarbonate will correct a severe acidosis as well as prevent the precipitation of myoglobin at the kidney tubules. Hydration will decrease the contact time of the myoglobin with the kidney tubule.

Note

Rhabdomyolysis lowers calcium.

Case 4

Man with history of hypertension admitted for chest pain is treated for unstable angina. Pain has resolved. Coronary angiography is being planned. Patient has long-standing mild renal insufficiency with creatinine 1.7–2.0.

1. What to do prior to angiography to decrease risk of worsening renal failure?

After the angiography and angioplasty, he develops worsening renal failure anyway. There is bluish discoloration of toes and livedo reticularis but no skin necrosis. Pulses intact. There are white cells in urine found to be eosinophils. Tests show eosinophilia, leukocytosis, hypocomplementemia, and elevated ESR (erythrocyte sedimentation rate).

2. Diagnosis?

3. Specific test?

4. Therapy?

5. Which acute renal failure (kidney injury) is the fastest?

   A. Contrast
   B. Allergic
   C. Gentamicin

   Answer:

Summary: Case 4

Note

Fleet's Phosphosoda Enema causes acute renal failure.

It is very common for patients who need angiographic procedures to have moderate degrees of renal insufficiency. When radiocontrast causes renal failure, it usually starts to do so within 12 hours after the administration of the contrast. It is associated with a low FeNa (<1%) and resembles prerenal azotemia. The case in question concerns what can be done to prevent contrast-induced renal insufficiency. Evidence is accumulating that hydration with 1–2 liters of intravenous normal saline can prevent renal insufficiency. In addition, bicarbonate and N-acetylcysteine may also help prevent renal insufficiency from nephrotoxic contrast agents. If cholesterol emboli develop anyway, there is no specific therapy to reverse the renal insufficiency that develops. Clues to the presence of cholesterol emboli are the development of eosinophilia, leukocytosis, low complement levels, and an elevation of the sedimentation rate. The cholesterol emboli also lead to bluish discoloration of the toes. The most specific test, although rarely performed, is a biopsy of either the skin lesions or the kidney. Steroids and anticoagulation are the most common wrong answers.

Casts	Significance
Hyaline	Dehydration; these casts develop as an accumulation of the normal amount of tubular protein; they do not necessarily mean disease
Red cell	Glomerulonephritis
Broad, waxy	Chronic renal failure
Granular	Also called "dirty" or "muddy"; they are associated with acute tubular necrosis and represent accumulated epithelial cells
White cell	Pyelonephritis, interstitial nephritis

Case 5

34-year-old woman with sickle cell disease has increased pain. She is taking a markedly increased number of Percodan® tablets (aspirin/oxycodone). She has sudden onset of flank pain, fever, chills, and hematuria. Also passing strange necrotic material in urine. Urinalysis shows red cells and white cells but no casts. BUN 32, creatinine 3.5.

Note

Radionuclide scan can tell if kidney is viable.

1. Diagnosis?

2. Most accurate test?
   A. Urinalysis
   B. CT scan
   C. Intravenous pyelogram
   D. BUN, creatinine
   E. Kidney biopsy

   Answer:

3. Therapy?

Summary: Case 5

Analgesics are destructive to the kidney in several ways. They are directly toxic to the kidney tubule and can result in acute tubular necrosis. In addition, they can give allergic interstitial nephritis. They can result in papillary necrosis, particularly in those who have sickle-cell disease or are diabetic. Finally, the inhibition of prostaglandins at the afferent arteriole results in decreased renal perfusion. Clues to the occurrence of acute papillary necrosis are the sudden onset of flank pain, fever, chills, and hematuria. The most specific finding is passing pieces of necrotic material in the urine. The most specific test for this disorder is CT scan. The intravenous pyelogram (IVP) is no longer done. CT scan shows just as much information or more than IVP with no contrast exposure. There is no specific therapy to reverse the necrosis.

Which one does **NOT** cause papillary necrosis?

A. Analgesics
B. Sickle trait
C. Pyelonephritis
D. Diabetes
E. Aminoglycosides

Answer:

END STAGE RENAL DISEASE (ESRD)

Note

Avoid Aluminum and Magnesium Containing antacids in ESRD.

All patients should be on:

- Erythropoietin
- Vitamin D
- Calcium
- Oral phosphate binders
  - Calcium carbonate
  - Lanthanum
  - Sevelamer

1. The most common cause of death is:

   A. Infection
   B. Acidosis
   C. Coronary disease

   Answer:

2. Patient on dialysis has fever. What to do?

   A. Nothing. It is expected
   B. Draw blood cultures, treat if positive
   C. Draw cultures and load with Vancomycin and gentamicin

   Answer:

GLOMERULAR DISEASE

Case 1

50-year-old man comes because of fatigue, shortness of breath, and edema. Uses no medications and denies hypertension or diabetes. Afebrile bilateral lower extremity edema. BUN and creatinine mildly elevated at 34 and 2.8. Red blood cells in urine as well as red blood cell casts.

If THIS is in the history and physical . . .	**. . . Then THIS is the most likely diagnosis**	**THIS is the best initial test and most specific test(s)**	**THIS is the best initial therapy**
Pulmonary AND renal symptoms, dyspnea	Goodpasture syndrome	Anti-basement membrane antibodies Biopsy	Plasmapheresis with steroids or cyclophosphamide
	Wegener	C-ANCA Biopsy	
	Polyarteritis nodosa		
Recent viral infection (most common), recurrent episodes of hematuria	Berger disease (IgA nephropathy)	Normal complement level Biopsy; skin and kidney show IgA	**If proteinuria, use ACE inhibitors; fish oil minimally effective**
Gastrointestinal symptoms, joint pain, renal problems, skin lesions			
Hypertension, periorbital edema, 1 week after throat infection, 2 weeks after skin infection			
	Cryoglobulinemia		
Anything from normal to nephrotic syndrome	SLE (systemic lupus erythematosus)	Low complement 24-hour urine Biopsy	

1. Which disorders in the table cause rapidly progressive glomerulonephritis?

2. Which disorders cause nephrotic syndrome?

3. Woman with edema of legs and face. Takes atenolol, procainamide, and naproxen. BP 146/86 mm Hg, BUN 86 mg/dL, creatinine 6.0, serum albumin 2.5, and ANA is positive at 1:60 with a speckled pattern. Urine shows 4+ protein and oval fat bodies. 24-hour protein shows 5.6 grams of protein. The complement levels and anti-double stranded DNA are normal. Diagnosis?

   A. Procainamide-induced lupus nephritis
   B. Naproxen-induced nephrotic syndrome
   C. Amyloidosis
   D. Membranous nephropathy

   Answer:

4. Patient with recurrent hematuria and:

   - Displaced Lens of Eye
   - Sensorineural hearing loss
   - Family history

   Diagnosis?

Summary: Case 1

Glomerulonephritis of all types have several things in common. They all present with hematuria and red cell casts. They also have mild proteinuria, <2 grams per 24 hours (urine protein:creatinine ratio <2). Beyond this, the diagnosis is based on what unique features there are to each disease, such as pulmonary involvement in Goodpasture syndrome or both upper *and* lower respiratory involvement in Wegener granulomatosis. Wegener is systemic vasculitis that affects the joints, eyes, GI tract, skin, and brain just like polyarteritis nodosa (PAN) does. The main difference is that PAN does not involve the lungs. Henoch-Schönlein purpura is relatively unique in that it is the only one that gives GI, joint, and renal involvement with purpuric skin lesions, particularly on the buttocks and lower extremities. Berger disease is diagnosed by excluding the other causes of glomerulonephritis with blood tests and then performing a renal biopsy. The only frequently found clue to the diagnosis of Berger on a board test is the history of a recent viral infection followed by hematuria. Although the IgA level can be elevated in Berger, this is found in only 50% of patients and therefore is relatively insensitive. The absence of anti–basement membrane antibodies helps exclude Goodpasture. C-ANCA should be found in Wegener. Post-streptococcal glomerulonephritis should follow a pharyngeal or skin strep infection by 1–3 weeks. In addition, there are very good blood tests, such as anti-streptolysin O, low C3 levels, and anti-DNAse, to help diagnose post-streptococcal disease. Cryoglobulinemia is suggested by the presence of chronic hepatitis B or C infection and the presence of cryoglobulins on blood testing. The most accurate test for all forms of glomerulonephritis is a kidney biopsy. The biopsy should be performed in all forms of this disorder except for post-streptococcal disease and Henoch-Schönlein purpura. These diseases resolve spontaneously >95% of the time, and a renal biopsy is not necessary.

Goodpasture is treated with plasmapheresis and steroids. PAN, Wegener, lupus nephritis, and cryoglobulinemia are all treated with a combination of steroids and cyclophosphamide. One exception to this is cryoglobulinemia secondary to chronic hepatitis in which the best initial therapy is to treat the infection with interferon or lamivudine (for hepatitis B) or to combine the interferon with ribavirin (for chronic hepatitis C). All forms of glomerulonephritis can lead to nephrotic syndrome if there is sufficient damage to the kidney.

Drug-induced lupus, such as that from procainamide, usually does NOT affect the kidneys or central nervous system. Drug-induced lupus does not result in a positive double-stranded DNA antibody or lower the complement levels.

Low Serum Complement	Normal Serum Complement
• Post streptococcal • SLE • Cryoglobulinemia • Idiopathic membranoproliferative	• IgA Nephropathy (Berger disease) • Goodpasture syndrome • Wegener granulomatosis • Polyarteritis nodosa • Henoch-Schönlein purpura • TTP/HUS

1. Nephrotic syndrome, large tongue, dysphagia, and dysarthria. Diagnosis?

   A. Myxedema
   B. Angioedema
   C. Acromegaly
   D. Amyloidosis

   Answer:

2. Associated with positive rheumatoid factor most?

   A. Post-streptococcal
   B. Cryoglobulinemia
   C. IgA nephropathy
   D. SLE
   E. Polyarteritis nodosa

   Answer:

Case 2

1. 20-year-old college football player is sent to you because of fever developing in the second week of his 2-week football training camp in Florida. Normal exam. Urinalysis shows 1+ proteinuria. Most appropriate management?

   A. No further evaluation is needed.
   B. Repeat the sample again in 2–3 weeks
   C. Urinary protein-to-creatinine ratio on a spot or random urine
   D. Split the urine measurement with a 16-hour daytime sample and a nighttime sample
   E. 24-hour urine collection
   F. Renal biopsy

   Answer:

2. 27-year-old man for pre-employment physical exam. Healthy. Uses no medications. Urinalysis shows 1+ proteinuria. Follow-up measurements 2 and 3 weeks later show no protein. Most appropriate management?

   A. No further evaluation is needed.
   B. Repeat the sample again in 2–3 weeks
   C. Urinary protein-to-creatinine ratio on a spot or random urine
   D. Split the urine measurement with a 16-hour daytime sample and a nighttime sample
   E. 24-hour urine collection
   F. Renal biopsy

   Answer:

3. 27-year-old man has mild proteinuria on several urinalyses over several months. Works as a waiter. Asymptomatic. No past medical history. Most appropriate management?

   A. No further evaluation is needed.
   B. Repeat the sample again in 2–3 weeks
   C. Urinary protein-to-creatinine ratio on a spot or random urine
   D. Split the urine measurement with a 16-hour daytime sample and a nighttime sample
   E. 24-hour urine collection
   F. Renal biopsy

   Answer:

Summary: Case 2

Transient proteinuria is found in 1–10% of the general population. If it resolves on subsequent urine samples, then no further evaluation is necessary. A transient functional proteinuria can also occur with transient stressors, such as vigorous exercise, fever, sleep apnea, and with congestive failure. This proteinuria resolves when the stress resolves. Orthostatic proteinuria is found in generally healthy patients under the age of 30. The diagnosis is confirmed by finding the proteinuria only during the daytime while a nighttime sample is normal. If the first morning urine is normal, then it is most likely orthostatic in nature. If the proteinuria persists, then further evaluation is necessary. A spot urine for the protein:creatinine ratio is a useful approximation of the amount of protein found in a 24-hour urine collection. If the ratio is 1, then you find 1 gram over 24 hours, etc. If there truly is an elevated protein level that persists, then a renal biopsy should be performed.

1. Woman with 2 weeks of cough, hemoptysis, dyspnea, and dark-colored urine. Chest x-ray shows infiltrates. Urinalysis shows 50–100 red cells and many red cell casts. Complement and ANA are normal. Renal biopsy will show:

   A. Granulomatous necrotizing vasculitis
   B. Linear deposits of IgG by immunofluorescence
   C. Granular sub-endothelial deposits of IgG
   D. IgA deposits in the mesangium

   Answer:

2. Muscle cramps and weakness. BP 110/70. BUN and creatinine normal. Potassium 2.6 mEq/L (normal 3.5–5.4); bicarbonate 32 mEq/L; urine sodium 50 mEq/L; urine potassium 60 meq/L. Renin and aldosterone levels are elevated. Diagnosis?

   A. Renin-producing kidney tumor
   B. Primary hyperaldosteronism
   C. Ectopic ACTH production
   D. Bartter syndrome

   Answer:

Goodpasture syndrome consists of renal and pulmonary involvement. Biopsy will show linear deposits of IgG. Bartter syndrome will give an elevated level of both renin and aldosterone in response to increased urinary loss of sodium and chloride. Bartter syndrome is a form of secondary hyperaldosteronism, therefore the blood pressure will be normal or slightly low.

Note

NSAIDs cause proteinuria.

Note

Urgent dialysis
- Hyperkalemia
- Encephalopathy
- Fluid Overload

Case 3

63-year-old woman has lower extremity edema. History of lymphoma. Takes no medications. Generalized edema that is much worse in the lower extremities. Normal BUN and creatinine, albumin 2.6 (normal 3.5–5.5), cholesterol of 285 (elevated). Urinalysis shows 4+ proteinuria.

1. Diagnosis?

2. What caused her problem?

3. What test next?

4. Most accurate test?

   A. Urinalysis
   B. Kidney biopsy
   C. 24-hour urine
   D. Protein : creatinine ratio
   E. Nuclear renal flow scan

   Answer:

5. Initial therapy?

Summary: Case 3

Nephrotic syndrome refers to a syndrome of hyperproteinuria leading to hypoproteinemia leading to edema. Hyperlipidemia is caused by the urinary loss of the lipoprotein signals on lipids that would normally signal the body to remove them from circulation as well as to inhibit production. Although not part of the diagnostic criteria, a hypercoagulable state occurs secondary to the urinary loss of antithrombin III. Any of the causes of glomerulonephritis can potentially lead to nephrotic syndrome, if the severity is sufficient to lead to massive proteinuria. In other words, nephrotic syndrome refers to a severity of disease rather than a specific etiology. In addition to the causes of glomerulonephritis, a number of systemic diseases not primarily referable to the kidney also result in nephrotic syndrome. These are diabetes, HIV, hepatitis, heroin use, amyloidosis, and cancer, such as lymphoma. Nephrotic syndrome can also be caused by a number of drugs, such as ACE inhibitors, gold, and penicillamine use. Finally, there are several primary kidney diseases, such as minimal change disease in children, focal-segmental disease, mesangial, and membranous disease, that can occur without a specific relationship to a specific systemic disease. They are all diagnosed initially with a urinalysis, 24-hour urine, and, most accurately, a kidney biopsy. They are all treated with steroids, sometimes in combination with cyclophosphamide, if the steroids are not sufficient.

1. BP 150/90. History of injection drug use. Urinalysis has hematuria as well as 4+ proteinuria. 24-hour urine 4 grams protein. Etiology?

   A. Focal segmental glomerulosclerosis
   B. Minimal change disease
   C. Hypertensive nephropathy
   D. Membranous glomerulonephropathy

   Answer:

2. 24-year-old **Asian** man evaluated for progressive hematuria over several weeks. Hematuria began few days after upper respiratory tract infection. BUN and creatinine normal. Urinalysis shows 2+ proteinuria and some blood. **Serum complement is normal**.

   A. Post-streptococcal glomerulonephritis
   B. Berger disease (IgA nephropathy)
   C. Goodpasture syndrome
   D. Wegener granulomatosis

   Answer:

3. Man undergoes a renal biopsy for glomerulonephritis with linear deposits. Most likely diagnosis?

   A. Wegener granulomatosis
   B. Goodpasture syndrome
   C. Post-streptococcal glomerulonephritis
   D. SLE

   Answer:

4. Why does nephrotic syndrome lead to bone lose and iron deficiency anemia?

   A. Malabsorption
   B. Liver dysfunction
   C. Urine loss of carrier protein

   Answer:

5. Fish oil may be good for:

   A. Focal segmental
   B. Minimal change
   C. IgA

   Answer:

Case 4

32-year-old man comes for evaluation of generalized edema that is worse in lower extremities. UA: 4+ protein; urine protein:creatinine ratio is 5 to 1; serum albumin level decreased. He was diagnosed with HIV several years ago, and he used indinavir in past. Currently, takes no medications. CD4 count 28.

1. Most effective therapy?

   A. Steroids
   B. Cyclophosphamide
   C. Azathioprine
   D. Trimethoprim/sulfamethoxazole
   E. Antiretroviral therapy
   F. ACE inhibitors

   Answer:

Summary: Case 4

Although indinavir can cause kidney stones and renal insufficiency, it is generally a cause of kidney stones in only 4% of the patients who use it. Indinavir is not generally associated with glomerulonephritis. HIV itself causes nephrotic syndrome. HIV-induced glomerulonephritis is treated with antiretrovirals. As the HIV is treated and the CD4 count rises above 100, the glomerulonephritis will resolve.

1. 72-year-old man evaluated for fatigue, anemia, bone pain, lytic lesions, and frequent infections. Creatinine 2.4 urinalysis shows 1+ protein. 24-hour urine, however, shows 5 grams of protein. What is the most likely explanation for this finding?

   A. False-positive 24-hour urine; do nothing
   B. Repeat the 24-hour urine
   C. Perform a kidney biopsy
   D. Light chains react weakly with the dipstick; do a urine immunoelectrophoresis
   E. Post-infectious glomerulonephritis; perform an ASLO titer

   Answer:

2. 64-year-old chronically uremic patient with chest pain and fever. Exam reveals pericardial friction rub and clear lungs. What's next?

   A. Intravenous fluids
   B. Intravenous furosemide
   C. Pericardiocentesis
   D. Immediate hemodialysis

   Answer:

3. Patient on hemodialysis for end-stage renal disease on calcium acetate every morning to treat high phosphate without improvement. Next step?

   A. Calcium acetate with meals
   B. Parathyroidectomy
   C. Switch to calcium carbonate every morning

   Answer:

4. Mechanism of action of ACE inhibitors in slowing rate of progression of diabetic nephropathy?

   A. Decrease in afferent arteriolar pressure
   B. Increase in glomerular filtration pressure
   C. Decrease in efferent arteriolar pressure

   Answer:

5. Patient started on ACE inhibitor. Creatinine rises from 1.2 to 1.5

   A. Stop
   B. Continue

   Answer:

6. 22-year-old man with sudden **severe** testicular pain. Minimal redness and the affected testis is **elevated and lying in a transverse direction**. Diagnosis?

   A. Orchitis
   B. Epididymitis
   C. Hydrocele
   D. Testicular torsion

   Answer:

Acute uremic pericarditis is an indication for urgent dialysis. If once daily phosphate binders are insufficient, they should be used multiple times a day with meals. Calcium carbonate has no greater efficacy than calcium acetate. ACE inhibitors dilate the efferent arteriole and decrease intraglomerular hypertension. Although there is a temporary decrease in GFR, the overall effect is to decrease the rate of progression of diabetic renal disease. Testicular torsion causes sudden severe pain with elevation of the testis. The normal position of the testis is now changed to the transverse direction.

Chronic Renal Failure

Dialysis is used if there is a form of life-threatening abnormality that cannot be corrected another way:

- Pericarditis
- Severe acidosis
- Fluid overload
- Encephalopathy
- Hyperkalemia

Bone abnormalities can be treated with calcium and vitamin D replacement. Calcium carbonate and phosphate binders are given with meals to decrease phosphate absorption. The most common cause of death in end-stage renal disease is from infection and from cardiovascular disease from accelerated atherosclerotic disease. Renal transplantation is always better than long-term dialysis because of an increased survival.

SODIUM DISORDERS

Case 1

27-year-old man with bipolar disorder for evaluation of polyuria. He is on lithium. He has been urinating 10–20 times per day. He just bought 4 CD players, 6 toaster ovens, and 5 TVs. His psychiatrist says he drinks 15 liters per day and he urinates 15 liters per day. Sodium level 140.

1. Diagnosis?

2. Which will have low urine osmolality: psychogenic polydipsia or nephrogenic diabetes insipidus from the lithium?

3. Which will have low urine sodium: psychogenic polydipsia or nephrogenic diabetes insipidus from the lithium?

4. What would give the first clue as to diagnosis?

   A. Polyuria
   B. Polydipsia
   C. Low urine sodium
   D. Low urine osmolality
   E. Nocturia

   Answer:

5. Best initial diagnostic test?

6. Most sensitive test to diagnose nephrogenic diabetes insipidus?

7. Treatment for nephrogenic diabetes insipidus?

Summary: Case 1

Both psychogenic polydipsia and diabetes insipidus can cause polyuria, and by itself a high volume of urine is not enough to distinguish the two. If the serum sodium were low, then the diagnosis would be psychogenic polydipsia. If the sodium were high, then it would be nephrogenic diabetes insipidus (NDI). The point of this case is that when there is an exactly normal sodium, you need to rely on different diagnostic criteria to establish an etiology. In diabetes insipidus, the thirst mechanism is intact; and as long as oral intake is adequate, the sodium level will not rise. Both NDI and polydipsia will result in a low urine osmolality and low urine sodium. These tests cannot reliably be used to establish the diagnosis. The most common wrong answer to what is the most reliable diagnostic test is a water deprivation test. If the patient on history says he only urinates once or twice at night, then the diagnosis is psychogenic polydipsia. When the patient stops drinking, he will stop urinating. In NDI or central DI (CDI), the patient will continue to produce a high volume of urine even at night, because the level of urination is not dependent on water intake, which is exactly the nature of the problem. Water deprivation is still the best initial test. Looking for a decreased urine output as a response to the administration of vasopressin (DDAVP) is the way to distinguish between a central and nephrogenic cause of the DI. The most sensitive test, however, is to look for an elevated level of vasopressin (ADH) in NDI and a low ADH level in central DI. The treatment of CDI is to give vasopressin. The management of NDI is to correct the underlying cause by stopping lithium or demeclocycline or to correct causes, such as hypokalemia or hypercalcemia. If these drugs are not the cause and there are no correctable electrolyte abnormalities, then the treatment is to use a thiazide diuretic or an NSAID, such as indomethacin. The inhibition of prostaglandins increases renal concentrating ability. Sickle-cell disease, amyloidosis, and Sjögren syndrome are examples of diseases in which you cannot correct the underlying cause.

Note

Every 100 glucose above normal is 1.6 drop in Na.

1. 39-year-old woman is brought to ED for confusion of one day's duration. She begins seizing. Sodium 112 (normal 135–145), potassium 4.1, BUN 8 mg/dL, plasma osmolality 230 mOsm/l (normal 280–300), urine sodium10 mEq/L, and urine osmolality 50 mOsm/l. Urine output is 2 liters in 3 hours. Diagnosis?

   A. Addison disease
   B. SIADH
   C. Psychogenic polydipsia
   D. Salt-losing nephropathy
   E. Diabetes insipidus

   Answer:

Case 2

Woman admitted to ICU because of very severe neurologic abnormalities and profoundly low sodium at 114. She has not had a seizure yet. History of type 2 diabetes and congestive heart failure. Maintained on ACE inhibitor and diuretic. Pulse 125/min, BP 98/68 mm Hg, severe confusion, and disorientation. Sodium 114, serum bicarbonate 24, chloride 112, BUN 80, potassium 5.0, glucose 1,750, calcium 10.2, and magnesium normal. Chest x-ray normal.

1. Diagnosis?

   Non-ketotic hyperosmolar syndrome

2. Best initial therapy?

   Several liters of normal saline and insulin

3. What is her serum osmolality?

   Serum osmolality:
   2 × (Na) + BUN/2.8 + glucose/18
   228 + 80/2.8 + 1,750/18
   228 + 32 + 97 = 357 (normal 280–295)

Summary: Case 2

This patient is hyperosmolar but has a normal serum bicarbonate and therefore is not ketotic or acidotic. Although the sodium level is profoundly low at 114, it is a pseudohyponatremia from the extreme hyperglycemia. For every 100 increase in glucose above normal, there is a 1.6-point drop in the sodium level. This person's glucose is 1,600 above normal; therefore, the corrected sodium level is actually 140 once it is corrected for the hyperglycemia. She is hyperosmolar. The equation is:

$(2 \times \text{sodium}) + (\text{BUN}/2.8) + (\text{glucose}/18) = 357$

The management is to correct the massive volume depletion with normal saline and to give a little insulin.

Case 3

82-year-old woman with colon cancer with increasingly severe confusion over 2 days. She has metastases to brain and lung. She is profoundly confused and disoriented. No seizures and is not comatose. On exam, there is no orthostasis. No edema. Sodium 114, potassium 4.5, glucose 80, uric acid low at 2.2, and a BUN of 12.

1. Diagnosis?

2. What else in brain can cause this problem?

3. What else in lung can cause this problem?

4. Best initial test?

5. Best initial therapy?

6. Best long-term management?

   A. Furosemide
   B. Carbamazepine
   C. Tolvaptan
   D. 3% sodium chloride with furosemide
   E. Salty potato chips

   Answer:

7. Patient with sodium 112 and confusion is given hypertonic saline, diuretics and conivaptan. Sodium rises to 128 over 3 hours. Patient develops cranial nerve defects and quadriparesis. Diagnosis?

Summary: Case 3

Hyponatremia with a normal volume status is usually from SIADH, if the serum sodium level is truly low and not a pseudohyponatremia from hyperglycemia or hyperlipidemia. Other causes of euvolemic hyponatremia are psychogenic polydipsia and hypothyroidism, which do not seem in any way to be present from the details presented in the case. Any brain or pulmonary pathology can lead to SIADH. The normal response to hyponatremia would be to have low urine sodium and low urine osmolality. It is a sign of disease to have a urine sodium >20 or a urine osmolality >100 in the presence of hyponatremia. Mild cases of SIADH with very mild symptoms or no symptoms are managed with fluid restriction. More severe symptoms, such as confusion, disorientation, and seizures, are managed with hypertonic saline and sometimes with additional saline combined with a diuretic. Diuretics lead to a net-free water loss. In the long-term, when you cannot correct the underlying cause of the SIADH, the treatment is tolvaptan. Demeclocycline is a tetracycline antibiotic that induces a nephrogenic diabetes insipidus and therefore increases urinary-free water loss. Tolvaptan is an ADH, V2-receptor antagonist that has replaced demeclocycline as the best long-term therapy for SIADH.

Case 4

42-year-old man with sickle-cell disease is admitted to ICU for head trauma. He continues to be disoriented because of a persistently high sodium of 160. He is producing 10–15 liters per day of urine. Glucose is normal. He weighs 100 kg. No response in urine volume or osmolality to intranasal or subcutaneous administration of vasopressin.

1. Diagnosis?

2. What is the estimated volume deficit?

   [(Na/140)−1] × (weight × 0.6) or (Patient Na − 140/140) × (weight × 0.6)
   160/140 = 1.14 or (160 − 140/140) × 60 = 8.57 liters
   1.14 − 1.00 = 0.14
   0.14 × 60 = 8.57

3. What electrolytes would you measure?

4. These electrolytes are normal, and you cannot find a correctable underlying cause. What is the therapy?

Summary: Case 4

Nephrogenic diabetes insipidus is caused by sickle-cell disease as well as hypokalemia, hypercalcemia, and amyloidosis. The fluid deficit is calculated by:

(patient sodium − 140/140) × (weight in Kg × 0.6)

This formula is useful because the physician will often underestimate the fluid deficit and give far too little saline replacement. If you cannot correct the underlying cause, then the treatment is with thiazide diuretics or NSAIDs (nonsteroidal anti-inflammatory drugs).

NSAID EFFECTS

1. Which of the following describes the effects of NSAIDs on the kidney?

   A. Prostaglandin inhibition dilates the efferent arteriole
   B. Increases renin release
   C. Increases aldosterone production
   D. Constriction of afferent arteriole

   Answer:

2. NSAIDs induce all of the following EXCEPT:

   A. Increased hypertension
   B. Acute tubular necrosis
   C. Interstitial nephritis
   D. Nephrotic syndrome
   E. Hypokalemia

   Answer:

POTASSIUM DISORDERS

Case 1

High-school wrestler brought to ED by family because of muscular pain, weakness as well as polyuria and polydipsia. He tried a week's worth of cathartics but didn't lose much weight. He induced vomiting over the last several days and used inhaled beta agonist 14 times a day for exercise-induced asthma. His potassium is now 2.4.

1. What caused hypokalemia?

   Diarrhea at first. Then vomiting. The inhaled beta agonists then drove his potassium into the cells.

2. What will urine potassium be?

   Very low: <20 mEq/L

3. Most urgent test and what will it show? (How will he die now?)

4. Maximum rate of oral administration of potassium?

5. Maximum rate of intravenous administration of potassium?

6. What intravenous fluids to **avoid** in hypokalemia?

   A. Normal saline
   B. D5W
   C. Half normal saline
   D. Ringer's lactate

   Answer:

7. How much potassium will he need to raise his level to a normal value of 4.5 from 2.4?

8. After several hours of vigorous replacement, the potassium level rises by only 0.2. What will you test for?

Summary: Case 1

Most causes of the loss of gastrointestinal fluids result in hypokalemia. Diarrhea and vomiting both cause hypokalemia with a low urine potassium. The manifestations of hypokalemia are muscular weakness, cardiac rhythm disturbances, and sometimes a nephrogenic diabetes insipidus. The earliest electrocardiographic finding is u waves. U waves are an extra positive deflection after the t wave that indicates Purkinje fiber repolarization. There is generally no limit to the maximum rate of the oral replacement of potassium because the bowel wall will regulate potassium absorption so that there will be no rebound hyperkalemia. You should not use dextrose-containing fluids in patients with hypokalemia, because there may be an increase in insulin secretion stimulated by the additional sugar. This insulin release can intracellularly drive potassium and further lower the potassium level. Do not give potassium faster than 20 mEq per hour intravenously, because it may lead to an arrhythmia. Because the majority of potassium is intracellular, you must give 4–5 mEq per kilogram of body weight in order to raise the serum potassium by one point. Most of what you administer will enter the cells. Hypokalemia that is refractory to potassium replacement is sometimes from hypomagnesaemia. There are magnesium-dependent channels in the kidney that will give an increased urinary wastage of potassium, if the magnesium level is low.

Case 2

Man recently diagnosed with stage 3A Hodgkin disease has just received his first dose of ABVD (adriamycin, bleomycin, vinblastine, dacarbazine) chemotherapy. He has developed muscular weakness and pain. Potassium level has risen to 6.7.

1. Diagnosis?

2. Most urgent step?

   A. EKG
   B. Urinalysis
   C. Phosphorous level
   D. Calcium level
   E. Magnesium
   F. Uric acid level

   Answer:

3. Best initial step if this is abnormal?

Summary: Case 2

Other causes of hyperkalemia besides cellular destruction, such as rhabdomyolysis, are drugs, such as ACE inhibitors, beta blockers, heparin, trimethoprim, and NSAIDs. The most common factitious causes of hyperkalemia are thrombocytosis, the placement of a tourniquet for a long time, and hemolysis in a blood sample left standing for too long or drawn through too narrow a needle, resulting in hemolysis. When there are EKG abnormalities from hyperkalemia, the best initial step is to administer calcium chloride or gluconate in order to protect the heart from an arrhythmia.

PHOSPHATE DISORDERS

1. Which causes **LOW** phosphate levels?

   A. Hypoparathyroidism
   B. Vitamin D overdose
   C. DKA
   D. Starvation
   E. Fanconi Syndrome

   Answer:

2. Which causes **HIGH** phosphate levels?

   A. Hyperparathyroidism
   B. Celiac disease
   C. Chronic pancreatitis
   D. Alcoholism
   E. Renal failure

   Answer:

Hypomagnesemia

- Starvation
- Diuretics/Renal Loss
- Amphotericin

METABOLIC ACIDOSIS

Case 1

Three men are brought to ED completely drunk. They have been at a wild party in the garage of a photocopy repairman. All three show signs of inebriation. The chemistries show a serum bicarbonate of 14 (normal 24), sodium of 137, chloride of 98, and glucose of 240.

1. How will you best determine to test for an ethanol level, a methanol level, or an ethylene glycol level?

Note

Compensation Respiratory Acidosis

$\downarrow pCO_2$ 10 = $\uparrow HCO_3^-$

1 Acute

3.5 Chronic

2. Which will have metabolic acidosis?

3. Which will give an elevated anion gap of 25?

4. Best initial test for ethylene glycol intoxication? Methanol?

Note

Respiratory Alkalosis

$\downarrow pCO_2$ 10 = $\uparrow HCO_3^-$

2 Acute

5 Chronic

5. Best initial therapy for methanol intoxication? Ethylene glycol? Ethanol?

6. What makes you think of an overdose of isopropyl alcohol?

Summary: Case 1

Metabolic acidosis is divided into those that increase the anion gap and those with a normal anion gap. The anion gap is calculated by sodium – (bicarbonate + chloride). Normally, the anion gap should be <12. The two main causes of a metabolic acidosis with a normal anion gap are renal tubular acidosis and diarrhea. An elevated anion gap with metabolic acidosis is caused by "LA MUDPIE". "L" is for lactic acid, which occurs with any type of anaerobic metabolism, such as hypotension or sepsis. "A" is for aspirin. Look for hyperventilation and a respiratory alkalosis. "M" is methanol. "U" is for uremia. The creatinine should be significantly elevated to a level >3 to result in acidosis. "D" is for diabetic ketoacidosis. No matter what the glucose is, you should have an elevated acetone level in the blood. Acetone in the urine is not particularly significant and can occur with even minor degrees of starvation, such as skipping 1 or 2 meals. "P" is for paraldehyde, which is an old pediatric anti-seizure medication. "I" is for isoniazid, the antituberculosis medication. "E" is for ethylene glycol, which is particularly common with intentional overdoses of antifreeze and the development of hypocalcemia, and renal insufficiency from stone formation and acute tubular necrosis. A low anion gap is seen in those with myeloma.

RENAL TUBULAR ACIDOSIS (RTA)

Proximal RTA (II)	Distal RTA (I)	Type IV RTA

Case 1

Man with history of Fanconi syndrome and amyloidosis from myeloma presents with osteomalacia. Potassium 3.2, serum bicarbonate 18. Chloride elevated at 110; sodium normal at 138. Urine pH 5.2.

1. Diagnosis?
   A. Proximal RTA (Type II)
   B. Distal RTA (Type I)
   C. Type IV RTA

   Answer:

2. What is the confirmatory test?

3. Best therapy?

Note

Early renal failure does **not** increase anion gap.

Case 2

A woman is on amphotericin for fungal endocarditis. Her creatinine is 1.8. The Potassium is low at 3.0; chloride is 115; sodium is 136; and serum bicarbonate is 12. She has developed some nonobstructive kidney stones. Her urine pH is 6.7.

1. Diagnosis?
   A. Proximal RTA (Type II)
   B. Distal RTA (Type I)
   C. Type IV RTA

   Answer:

2. Confirmatory test?

3. Therapy?

Case 3

Diabetic man with well controlled glucose has normal anion gap metabolic acidosis. Serum bicarbonate 20; potassium is elevated at 5.8.

1. Diagnosis?
   A. Proximal RTA (Type II)
   B. Distal RTA (Type I)
   C. Type IV RTA

   Answer:

2. Diagnostic test?

3. Therapy?

Summary: Cases 1–3

All forms of RTA result in a metabolic acidosis with a normal anion gap. Type IV RTA is usually associated with diabetes. There is a hyporeninemic hypoaldosteronism. Because there is a decrease in aldosterone effect, there is an elevation in potassium and the retention of hydrogen ions. Type IV RTA is the only one that gives hyperkalemia. The treatment is with aldosterone replacement in the form of fludrocortisone. Type I distal RTA results from the decreased ability of the kidney to excrete hydrogen ions or acid into the kidney tubule and hence remove it from the body. This results in a basic urine with a pH above 5.5. In this basic urine, the patient will form stones and nephrocalcinosis. The test is to administer acid in the form of ammonium chloride. A normal person will excrete the extra hydrogen ions into the urine. Patients with type I RTA cannot excrete hydrogen ions into the urine, and therefore the urine stays basic (pH >5.5) despite a worsening acidosis. Because the proximal tubule is intact in type I RTA, the treatment is with oral bicarbonate. Bicarbonate is absorbed primarily in the proximal tubule and therefore will be successfully absorbed in a distal tubular problem. In a type II, or proximal RTA, the kidney cannot absorb bicarbonate in the proximal tubule. The urine pH is alkalotic at the beginning. When the body has become depleted of bicarbonate, then the urine pH becomes acidic (pH <5.5). In an acidic urine, only cysteine stones will form. Most calcium-containing stones will not form, and therefore type II RTA is not associated with kidney stones. Because the proximal tubule is not working, it is difficult to treat with bicarbonate. The best therapy is to administer a diuretic. The volume depletion causes a volume contraction alkalosis.

Compensation for Respiratory Disorders

Respiratory Acidosis: For every 10 increase in pCO_2, bicarbonate will rise 1 point acutely, 3.5 points chronically

Respiratory Alkalosis: For every 10 decrease in pCO_2, bicarbonate will decrease 2 points acutely, 5 points chronically

1. Which is found in multiple myeloma?

   A. Distal RTA
   B. Low anion gap
   C. High parathyroid hormone level
   D. Low urine calcium

   Answer:

2. Patient with Na 132, K 3.2, Cl 110, HCO_3^- 18

   Only one of these is **NOT likely** to have these numbers:

   A. Diarrhea
   B. Ureterosigmoidoscopy
   C. RTA
   D. Early Renal Failure
   E. Chronic Renal Failure

   Answer:

METABOLIC ALKALOSIS

Case 1

Depressed obese woman comes because of increasing fatigue and diarrhea. She has nothing to do all day except work in her candy store and eat licorice. She has worsening hypertension despite use of thiazide diuretic. BP is 144/92. Potassium 3.0. Bicarbonate 32. Urine chloride of 42 (elevated). Urinary potassium low at 24.

1. Most likely cause of?

2. How do you know she does **not** have Conn syndrome?

3. How do you know this is **not** Bartter syndrome?

4. Single most important lab value to determine etiology of metabolic **alkalosis**?

   Urine Chloride.

5. Most common EKG finding in this case?

6. Treatment?

Summary: Case 1

Metabolic alkalosis is characterized by an elevated serum bicarbonate level. The main key to the diagnosis is the urinary chloride level. A low urine chloride level (<10) is found with upper gastrointestinal fluid loss, diuretics, villous adenomas, and posthypercapnia. A high urine chloride (>20) is found with mineralocorticoid excess, such as in Conn syndrome or primary hyperaldosteronism, Cushing syndrome, Bartter syndrome, and licorice ingestion. Hypokalemia also contributes to alkalosis, because hydrogen ions move into the cells in order to have them release potassium ions. Bartter syndrome is from the inability of the loop of Henle to reabsorb sodium and chloride. This results in a secondary hyperaldosteronism. Volume depletion of any kind also makes you relatively alkalotic. The kidney reabsorbs the same amount of bicarbonate into a smaller bodily volume, raising the bicarbonate concentration. In addition, there is a secondary form of hyperaldosteronism to try to correct the volume depletion. Aldosterone makes you excrete the cations potassium and hydrogen in exchange for reabsorbing sodium.

TUBULAR DEFECTS

Case 2

Match the following:

A. Bartter's Syndrome

B. Gitelman's Syndrome

C. Liddle's Syndrome

D. All of the above

E. None of the above

1. Ascending loop of Henle, decreased transport
2. Distal tubule, decreased transport
3. Distal tubule, ENaC increased transport
4. Hypertension
5. High urine chloride
6. Hypokalemia

Saline-Responsive (most common)	**Saline-Unresponsive**
Normal blood pressure	
Low urine chloride (<10 mEq)	High urine chloride (>20 mEq)
Etiology: • Diuretics • Vomiting • Diarrhea • Nasogastric suction • Exogenous alkali • Posthypercapnia • Volume contraction	**Etiology:** • Increased mineralocorticoids • Conn syndrome • Bartter syndrome • Licorice • Liddle's syndrome • Gitelman's syndrome
Infuse sodium chloride, KCl	Block the aldosterone; spironolactone

ACID-BASE COMPLEX PROBLEMS

Respiratory acidosis (increased pCO_2)
For every 10 ***increase*** in **pCO_2** º Acutely: HCO_3^- rises 1 point º Chronicly: HCO_3^- rises 3.5 points
Respiratory alkalosis (decreased pCO_2)
For every 10 ***decrease*** in **pCO_2** º Acutely: HCO_3^- drops 2 points º Chronicly: HCO_3^- drops 5 points

1. Na 142, K3.3, Cl 95, HCO_3^- 38
   BP 150/100
   Renin level: low
   Urine Chloride: >20
   Patient most likely has:

   A. Diuretic induced metabolic Alkalosis
   B. Licorice ingestion
   C. Bartter syndrome
   D. Gitelman's syndrome

   Answer:

2. Exacerbation COPD and CHF
   pCO_2 70, pH 7.34, Intubated and ventilated PCO_2 now 50
   Furosemide, steroids, albuterol, tiotropium
   Extubated and discharged on same
   One week later
   pH 7.46, pCO_2 60, PO2 55, Bicarbonate 40

   A. COPD
   B. Diuretics

   Answer:

3. Patient ingests unknown substance
pH 7.18 pCO_2 23, pO2 98, HCO_3^- 8
Serum
Na 136 Cl 100 HCO_3^- 10
This patient has:

   A. Gapped Metabolic Acidosis
   B. Non-Gapped metabolic acidosis
   C. Gapped and non-gapped acidosis

   Answer:

4. Na 135, CL 80, HCO_3^- 24, BUN/Creat 110/11
pH 7.4, pCO_2 37, HCO_3^- 22
This patient most likely has;

   A. Normal Acid Base
   B. Metabolic acidosis with Metabolic alkalosis
   C. Metabolic alkalosis with Respiratory alkalosis

   Answer:

NEPHROLITHIASIS

Case 1

47-year-old man comes to ED within an hour of the sudden onset of severe, overwhelming flank pain radiating to groin and scrotal area. He has hematuria with reddish tinge to urine but denies dysuria. He is HIV-positive maintained on lamivudine, zidovudine, indinavir, and trimethoprim/sulfa. Temperature normal. Tenderness. The urine pH is 6.5.

1. Best initial step?

   A. Urinalysis
   B. Analgesics
   C. Straining the urine
   D. X-ray
   E. Ultrasound
   F. CT scan

   Answer:

2. Most accurate diagnostic test?

The following day all of his symptoms have resolved. This is his first episode of pain. A followup ultrasound shows a 1.5-cm stone in the renal pelvis.

3. Cause of his kidney stone?

4. Most appropriate management at this time?

Case 2

47-year-old man comes for recurrent kidney stones. No past medical history.

1. Most likely cause?

2. Parathyroid hormone level, calcium level, uric acid, creatinine, urine volume, and urine culture are all normal. Best therapy?

3. What would be different if an abdominal x-ray failed to show the stones and the urine pH were low?

   A. Uric acid
   B. Struvite
   C. Calcium oxalate

   Answer:

Summary: Cases 1–2

Nephrolithiasis is far more likely in men. All stones are radio-opaque except for uric acid and cystine stones. The most common cause of calcium oxalate stones is idiopathic hypercalciuria. Although they form in an alkaline environment, an extremely high pH >7.5 should raise the possibility of a struvite stone. Struvite crystals are rectangular prisms resembling a coffin lid. This is an important distinction, since it is essential to eradicate infection with struvite stones; and the chronic use of methenamine mandelate may be necessary for this purpose. Hyperuricosuric patients with uric acid stones must have their urine alkalinized with potassium citrate and be treated with allopurinol. Cystine stones should be suspected in those presenting at a young age, such as those in their 20s. Cystine stone formers are treated with alkalinizing the urine with potassium citrate and sometimes acetazolamide. Type I renal tubular acidosis also presents with stone formation because of the high urine pH. Inflammatory bowel disease and others with a malabsorption of fat present with oxalate stones. The malabsorbed fat chelates with calcium in the gut, leading to increased oxalate absorption and increased stone formation.

Patients with Crohn disease have fat malabsorption particularly after resection of large amounts of the small bowel. Fat malabsorption leads to calcium malabsorption as well. The leaves oxalate free to be absorbed in increased amounts from the gastrointestinal tract, which is associated with the development of kidney stones.

1. Woman with history of **Crohn disease** and surgical resection of terminal ileum presents with severe left flank pain radiating to groin for 4 hours. Urinalysis shows 2+ blood; Flat plate shows a small ureteric stone. Most likely cause of renal stone?

   A. Increased excretion of calcium in urine
   B. Increased oxalate absorption from gastrointestinal tract
   C. Increased calcium absorption form gastrointestinal tract
   D. Medication adverse effect
   E. Dehydration

   Answer:

2. Patient has stone 6 mm in renal pelvis. No passage after several weeks. What should be done next?

   A. Lithotripsy
   B. Percutaneous removal
   C. Tamsulosin and Nifedipine

   Answer:

POLYCYSTIC KIDNEY DISEASE

Case 1

32-year-old woman comes for evaluation of flank pain, hematuria, and recurrent urinary tract infections and kidney stones. No other past medical history. Ultrasound of kidney reveals polycystic kidneys.

1. Most common associated anatomic problem?

2. What other anatomic problems are likely to be found?

   Mitral valve prolapse, diverticular disease, and circle of Willis aneurysms

3. Most common cause of death in patient like this?

4. Will you offer her a cerebral angiogram?

Summary: Case 1

Polycystic kidneys most often present with chronic hematuria and recurrent stone formation. The most common cause of serious injury and death is from end-stage renal disease. Recurrent stone formation and infection results in chronic scarring of the kidneys, which leads to renal failure. Polycystic kidney disease is also associated with cysts of multiple organs of the body, with the most common site being the liver. In addition, these patients have mitral valve prolapse, colonic diverticula, and aneurysms of the circle of Willis; however, subarrachnoid hemorrhage is not the most common cause of death. You do not have to perform routine angiography in these patients, unless there is a history of subarrachnoid hemorrhage or there is a prominent family history of hemorrhage.

URINARY INCONTINENCE

Case 1

Note

Sono relatives BEFORE HLA type to donate to polycystic family

70-year-old woman comes because of intense urinary urgency. Over last several months, she has developed urinary frequency, and sudden overwhelming urge to urinate that she is unable to control. Unless she is near a bathroom, she has urinary leakage that is extremely embarrassing. Renal and pelvic ultrasound and urinalysis are normal.

1. Diagnosis?

2. Most accurate diagnostic test?

   Urodynamic studies to measure bladder pressures. Fill the bladder up with water and measure the pressures.

3. Over next few weeks, you try behavioral therapy and instruct patient to void every 1–2 hours while awake and then increase intervals between urinations by 30 minutes. This fails as does biofeedback. What would you try next? Most common adverse effect?

4. 82-year-old, nursing-home patient with indwelling urinary catheter has cloudy urine. There are **no white cells**, but culture grows >10,000 colony forming units of pseudomonas. There is **no fever** and no recent change in the condition of the patient. Next step?

   A. Repeat urinary culture
   B. Observation
   C. Trimethoprim/sulfamethoxozole for 3 days
   D. Trimethoprim/sulfamethoxozole for 7 days

   Answer:

5. Bethanechol is used for:

   A. Neurogenic bladder
   B. Stress incontinence
   C. Urge incontinence

   Answer:

Action	Diagnosis
Do residual volume, if >100 mls	**Bladder outlet obstruction**
Do residual volume, if <100 mls, instill 250 mls	If urge to void, it is **urge incontinence**
If there is no urge to urinate with instilling 250 mls, then instill a total of 600 mls	If there is no urge to urinate with 600 mls instilled, then there is **impaired bladder contraction**

Case 2

Elderly woman comes because of urinary leakage. Every time she laughs or coughs, she wets herself. Ultrasound of urinary tract is normal. You instruct her to stand up and cough. As you bend down to look, you find you have a wet face.

1. Best initial therapy?

2. What to do therapeutically if this is not effective?

Summary: Cases 1–2

Urinary incontinence is divided into two forms. In one form, there is urge incontinence from an overactive detrusor muscle. These patients have urinary frequency with extreme urgency. The patients develop an overwhelming urge to urinate. This also can be associated with pain and discomfort. The test is to measure the pressure in the bladder by filling up the bladder with water, inserting a manometer into the bladder with a catheter, and measuring the pressure. The treatment is initially behavior modification: asking the patient to void every 1–2 hours while awake, followed by increasing the time between urinations by 30 minutes. If this does not work, anticholinergic medications, such as oxybutynin, imipramine, or tolterodine, are used. The most common side effect of these medications is a dry mouth from the anticholinergic activity of these medications. The other type of incontinence is stress incontinence in which there is weakness of the muscle of the pelvic floor. When the patients cough or laugh, intra-abdominal pressure increases. This leads to leakage of urine out of the bladder. The best initial therapy for this form of incontinence is with pelvic floor muscular exercises, such as Kegel exercises or estrogen cream. If this is not effective, then surgery to tighten the urethra is indicated.

HYPERTENSION

Case 1

47-year-old man comes for advice about smoking cessation. No current complaints and no past medical history. He is not black, white, Asian, or Hispanic. Blood pressure 155/92. The following week his blood pressure is 152/94. It is the same the following week.

1. Next step in management?

   Lifestyle modifications, such as exercise, sodium restriction, smoking cessation, dietary alteration, relaxation methods, and weight loss

2. Which of these will be most effective?

3. Which has weakest data to suggest efficacy?

4. After 4 months of attempts, he comes back and says he would rather just be fat and lazy, keep smoking, and take some pills. Best initial medical therapy?

   Diuretics such as thiazide

5. What will you do in the 30% of patients who are not adequately controlled with this regimen?

   Add a beta blocker, calcium blocker, ACE inhibitor, or ARB (angiotensin receptor blocker)

Special Circumstances

When you see THIS in the history…	…Use THIS as the best initial therapy
Diabetes	ACE
Myocardial infarction	Beta blocker, ACE
CHF	ACE, beta blocker
Isolated systolic hypertension	Thiazides
Migraine headaches	
BPH	Alpha blockers
Asthma	Avoid beta blockers
Depression	Avoid beta blockers
Peripheral arterial disease	
Osteoporosis	
Pregnancy	

6. In primary management of hypertension, when you should answer each of the following.

   Hydralazine:

   Clonidine:

   Minoxidil:

   Alpha-methyldopa:

7. What antihypertensive medication is associated with the worst depression?

Note

Ephedra (Ma Huang) is an herb causing high BP.

Summary: Case 1

In the initial management of hypertension, the first step is to confirm that the patient is truly hypertensive by repeating the measurement several times over a few weeks. Once the hypertension is confirmed, then you should try to modify the patient's lifestyle, if the hypertension is mild. The most effective lifestyle modification is to lose weight. There is a 1-to-1 linear reproducible relationship between weight and blood pressure. For every kilogram lost, the blood pressure drops by 1 mm of mercury. The best initial medical therapy for hypertension is with diuretics in patients without compelling indications. Diuretics are still the best initial therapy for isolated systolic hypertension as well. This is true only in patients who do not have any other significant past medical history.

If there is a history of diabetes, systolic congestive heart failure, or microalbuminuria, then the best therapy is with an ACE inhibitor. Microalbuminuria is any protein level >30 mg per day. Microalbuminuria is detected by the radioimmunoassay or ELISA.

Those with a history of a myocardial infarction or migraine headaches should be started first on a beta blocker and not a diuretic, because there is a greater mortality benefit. Beta blockers should be avoided in asthma, depression, and peripheral arterial disease. Thiazide diuretics can increase calcium reabsorption, which is useful in patients with osteoporosis. Hydralazine and alpha-methyldopa can be safely used in pregnancy. However, any therapy except ACE inhibitors, ARB, and diuretics can be used safely in pregnancy. Clonidine, hydralazine, and alpha-methyldopa should not be used routinely as either first- or second-line therapy in the routine management of hypertension. They do not have greater efficacy than the other medications and have more adverse effects. The goal with diabetes or chronic kidney disease is <130/80 mm Hg.

Case 2

1. Man has hypertension, history of myocardial infarction, and **hyperlipidemia**. First drug to control his BP?

Case 3

1. Woman has hypertension, history of myocardial infarction, and **diabetes**. First drug to control BP?

2. What is the BP goal of therapy?

Case 4

1. Man has history of mild myocardial infarction, hypertension, and **asthma**.

2. First drug to control his BP?

Summary: Cases 1–4

You should expect to find questions on the Boards that require you to analyze multiple variables in the management of hypertension. Many cases will have both an indication for and against specific medications. You should answer based on what factor indicates the greater mortality benefit. Although hyperlipidemia and diabetes are relative contraindications to the use of beta blockers, it is more important in patients with a history of a myocardial infarction to use medications, such as beta blockers, that lower mortality. When the patient is diabetic, increase therapy until the blood pressure is <130/80.

Case 5

1. 54-year-old man comes to emergency department with several hours of headache, blurry vision, mild confusion, and dyspnea. BP is 210/130.

2. Best therapy?

   Labetalol, nitroprusside, nicardipine

Case 6

1. 24-year-old woman comes because of headaches. You find blood pressure 160/105.

2. Who will you evaluate for secondary (potentially correctable) causes of hypertension?

   The young (<30), the old (>60). Those with very hard to control hypertension. Those who have something specific in the history and physical suggestive of a cause of secondary hypertension.

Special Circumstances—Secondary Hypertension

When you see THIS in the history or physical…	Then THIS is the most likely diagnosis	Treatment
Abdominal bruits	Renal artery stenosis	
Muscular weakness, hypokalemia		
Striae, buffalo hump, truncal obesity, easy bruising		
Lower extremity wasting and upper > lower BP		
Episodic, flushing, wheezing, sweating		
Hirsute female		

Summary: Case 6

Less than 5% of patients with hypertension will have secondary causes of hypertension. You do not have to evaluate all the patients for secondary hypertension. If in a question you need to know that the patient has one of these diseases, there will be something in the history or physical. The first clue indicating that the patient has secondary hypertension is if they present a patient who is especially young (<30) or old (>60). Statistically, the most common cause of secondary hypertension is renal artery stenosis. If you see hypertension combined with muscular weakness and hypokalemia, then you should suspect primary hyperaldosteronism or Conn syndrome. If the patient has higher blood pressure in the upper extremities than in the lower extremities, then you should investigate for coarctation of the aorta. Pheochromocytoma is suggested by the presence of episodic hypertension associated with wheezing, flushing, and diarrhea.

1. 44-year-old man with headaches, BP 188/100 mm Hg, **potassium 2.8,** elevated bicarbonate level. The renin level is low; and the aldosterone level is elevated after salt loading. Diagnosis is:

   A. Renovascular hypertension
   B. Primary hyperaldosteronism
   C. Bartter syndrome
   D. Low renin essential hypertension

   Answer:

Case 7

24-year-old woman comes with headaches. BP is 160/105. You find a bruit on one side. Renal ultrasound shows both kidneys are small and one kidney is slightly smaller than the other.

1. Next diagnostic step?

2. Most accurate diagnostic test?

3. Best initial therapy?

Summary: Case 7

The most common cause of secondary hypertension is renal artery stenosis. A clue to the diagnosis is the presence of hypertension occurring outside the normal age range. Bruits are found in <30% of patients, but they have a fairly high degree of specificity. An ultrasound can show small kidneys, but this is relatively nonspecific. The most accurate diagnostic test overall is the renal angiogram. Before you do the angiogram, however, there are several different forms of noninvasive testing that can be performed. The duplex ultrasound is the most technically variable and may have up to 90% sensitivity, if the test is accurately performed. A captopril nuclear renogram is less accurate, if there is a significant amount of renal insufficiency. The magnetic resonance angiogram (MRA) is extremely sensitive and specific. You should generally not be asked to choose between them in the same question, because all three have about the same accuracy. If the question occurs, however, you should choose the MRA. The initial therapy for renal artery stenosis is with balloon angioplasty and the placement of a stent. ACE inhibitors should only be used if angioplasty is unsuccessful and the patient is not a surgical candidate. ACE inhibitors will control the blood pressure but will not prevent the progression to renal failure.

Case 8

A man is about to undergo surgery for removal of a pheochromocytoma.

1. What medication do you give him prior to surgery?

2. What class does it belong to?

Note

Small cuffs **over**estimate BP.

Note

Large cuffs **under**estimate BP.

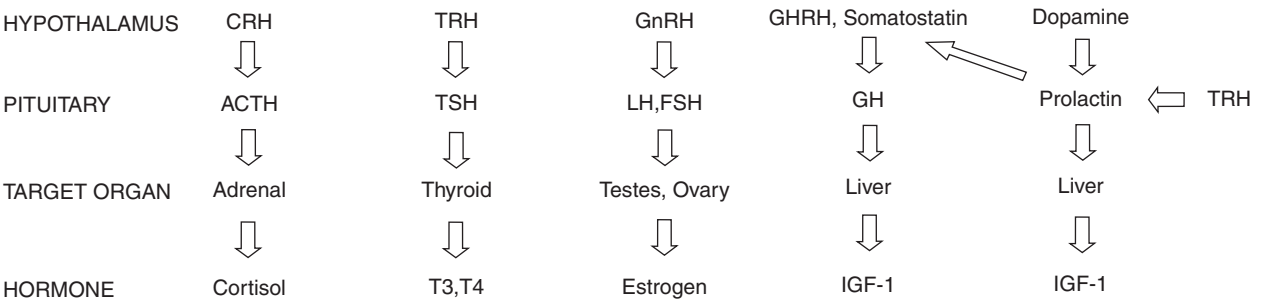
Summary: Case 8

The standard of care for controlling blood pressure prior to the removal of a pheochromocytoma is phenoxybenzamine. This is an alpha adrenergic receptor blocker.

Endocrinology

5

Hypothalamus Pituitary Axis



Questions

1. With target organ failure, what will happen to the levels of the corresponding pituitary hormone? Why?

2. If pituitary hormone levels are normal in the presence of target organ failure, what is the diagnosis?

Case 1

32-year-old complaining of weakness and fatigue. Decreased tolerance to low temperature and losing her pubic and underarm hair. No period for at least 5 months. + Latent untreated TB. Examination for dry, pale, finely textured skin. Chemistries hyponatremia with normal potassium.

1. Next step in management?

   A. TSH
   B. β-HCG
   C. Stat MRI of the brain and pituitary
   D. Cosyntropin stimulation test
   E. Neurosurgery consult for pituitary biopsy

   Answer:

2. Diagnosis?

   A. Hypothyroidism
   B. Adrenal insufficiency
   C. Growth hormone deficiency
   D. Cushing syndrome
   E. Pan-hypopituitarism

   Answer:

3. Pituitary MRI is performed, showing a 2.2 cm mass in the anterior pituitary. TSH 0.33, free T4 0.56, A.M. cortisol 2.1, ACTH 3, IGF-1.54 (<10th percentile for age), prolactin 53. Most likely etiology?

   A. Hashimoto's thyroiditis
   B. Acromegaly
   C. Non-functioning pituitary adenoma
   D. Cushing disease
   E. Craniopharyngioma

   Answer:

4. 26-year old is 3 months post-partum, giving birth to a healthy boy without complication via C-section. Her period has not returned as of yet. Unable to breast feed the baby due to lack of milk. Diagnosis?

   A. Lymphocytic hypophysitis
   B. Sheehan syndrome
   C. Non-functioning pituitary adenoma
   D. Prolactinoma
   E. Sarcoidosis

   Answer:

5. 44-year-old African American man presents with headache, worsening. Shortness of breath on exertion. He has positive orthostatics, positive bibasilar crackles, and bitemporal visual field deficits. Chest x-ray shows significant mediastinal lymphadenopathy, and head CT shows enlargement of the sellar area. An HIV test is negative. Diagnosis?

   A. Toxoplasmosis
   B. Metastatic lung cancer
   C. Glioblastoma multiforme
   D. Sacroidosis
   E. Histoplasmosis

   Answer:

6a. What is pituitary apoplexy?

6b. How would you treat pituitary apoplexy?

7. 24-year-old man complaining of significant polyuria and polydipsia. Drinks ice water, and is constantly urinating. Sodium of 151, and a 24-hour urine collection has a volume of 3.2 L. Pituitary MRI reveals "thickening of the pituitary stalk." Negative chest x-ray, remaining serum chemistries are normal. Diagnosis?

   A. Histiocytosis X
   B. Sarcoidosis
   C. Diabetes
   D. Pituitary adenoma
   E. Lymphocytic hypophysitis

   Answer:

Summary: Case 1

Panhypopituitarism is the most likely diagnosis because the patient exhibits deficiency of all glandular hormones controlled by the trophic hormones of the anterior pituitary. Thyroid hormone deficiency is manifested as cold intolerance, weight gain, or fatigue. The loss of pubic hair and the absence of menstruation are manifestations of gonadotropin deficiency. The presence of hyponatremia with a normal potassium strongly indicates cortisol deficiency with intact aldosterone secretion. Patients with growth hormone deficiency often complain of feelings of social isolation. Any time a female patient of reproductive age presents with complaints of menstrual irregularities, **always send a pregnancy test**!

Sheehan syndrome is postpartum pituitary necrosis secondary to blood loss experienced during delivery. It most commonly presents in women who deliver via C-section. The pituitary naturally hypertrophies during pregnancy to sustain the hormonal demands of the mother and fetus. The acute blood loss that occurs during labor—or even more so in C-section (the second bloodiest surgery in medicine)—coupled with the increased demand, leads to pituitary necrosis. Patients typically complain of cold intolerance, weakness, lack of menstruation, and difficulty lactating after giving birth.

The laboratory investigations you would order to evaluate pituitary functioning include TSH, FT4, A.M. cortisol, ACTH, cosyntropin stimulation test, IGF-1 levels, and prolactin.

Because the patient is hemodynamically stable, MRI (magnetic resonance imaging) would be the next step in the management of this patient. MRI of the brain with gadolinium is used to determine the etiology of this patient's panhypopituitarism. In our case, the etiology is a non-functioning pituitary macro-adenoma, which is the most common cause.

Panhypopituitarism can be caused by Sheehan syndrome, TB, ischemia, sickle-cell disease, aneurysms, autoimmune disease, radiation, trauma, encephalitis, Langerhans cell histiocytosis, sarcoidosis, hemochromatosis, and pituitary adenomas.

Patients with pituitary apoplexy will complain of headache, nuchal rigidity, and photophobia with symptoms of hypoadrenalism. When the CSF (cerebrospinal fluid) is analyzed, there will be little evidence of bacterial meningitis. Pituitary apoplexy occurs when there is bleeding or infarction of a preexisting pituitary macroadenoma. Treatment involves emergent surgical decompression and replacement of deficient hormones (especially steroids).

Treatment for panhypopituitarism involves replacement of all the hormones that are deficient. These include thyroid hormone, steroids, sex hormones, and growth hormone. Generally, you will replace steroids before initiating therapy with thyroid hormone, as thyroid hormone may increase the metabolism of endogenous steroids, causing acute adrenal insufficiency.

Case 2

44-year man with headaches, sweating, and generalized weakness. Symptoms have been gradually worsening over last 3 months, glove and ring sizes have increased over the last several years. Desire to have sex with his wife has decreased over the last year. History is for hypertension diagnosed 2 months ago, for which he takes a low-dose diuretic. Physical examination is noteworthy for a soft, doughy, and sweaty handshake. You also note coarse facial features and protrusion of his lower jaw.

1. Diagnosis?

2. Initial test?
   A. Growth hormone
   B. IGF-1
   C. TSH
   D. Prolactin
   E. IGF binding protein

   Answer:

3. Test would confirm?

4. Laboratory testing?

5. MRI or CT (computed tomography) scan of the head be indicated?

6. Major complications of disease?

7. Best initial treatment?

8. Two weeks later the patient presents with acute cholecystitis. What medication what most likely added?

   A. Pegvisomant
   B. Lanreotide
   C. Bromocriptine
   D. Cabergoline
   E. Methimazole

   Answer:

9. When is cabergoline or bromocriptine indicated?

10. When is radiation therapy indicated?

Summary: Case 2

Patients who present with enlarging ring or hat sizes, protrusion of the jaw, coarsening of the facial features, and deepening of the voice are most likely to have acromegaly. Amenorrhea, headaches, and visual field deficits (bitemporal hemianopsia) are also consistent with the diagnosis.

The best initial test for the diagnosis of acromegaly is to measure levels of IGF-1 (somatomedin C). The most accurate test to diagnose acromegaly is the oral glucose suppression test. In normal individuals, a glucose load should suppress growth hormone levels to <1 μg/L within 2 hours after a 75-gm load of glucose. In acromegaly, growth hormone levels are not suppressed.

You would order laboratory investigations to evaluate the functioning of the thyroid and adrenal glands and ovaries/testes. The panel would include TSH, FT4, cosyntropin stimulation test, IGF-1 levels, and prolactin.

Once you have established the presence of elevated growth hormone, you will pursue the presence of a pituitary macroadenoma (>1 cm) by obtaining a CT scan/MRI of the pituitary gland. In over 60% of cases, the tumor is a macroadenoma with significant cavernous sinus invasion at the time of diagnosis.

Major complications of acromegaly are diabetes, hypertension, with LVH and CHF, colonic polyps, sleep apnea, carpal tunnel, osteoarthritis, and pseudogout.

The best initial therapy for acromegaly is surgical removal of the macroadenoma.

Surgical intervention is the current treatment of choice for acromegaly. The somatostatin analogues octreotide and lanreotide have multiple indications based on the updated acromegaly guidelines. These include adjunctive therapy post-operatively to further decrease residual tumor, and initial therapy to shrink the tumor allowing it to be more amenable to pituitary resection.

10–20% of acromegalics co-secrete prolactin along with growth hormone. This is the population group that has a chance of benefit with the addition of dopamine agonists. They are most effective when used together with somatostatin analogues.

After surgical and medical interventions fail, stereotactic radiosurgery is indicated.

Case 3

27-year-old man complains of infertility and inability to smell his dinner. He is also color-blind and deaf. LH/FSH and testosterone are reduced.

1. Diagnosis?

2. Treatment?

Summary: Case 3

Kallmann syndrome is an X-linked dominant disorder characterized by deficiency of GnRH. LSH, FSH, and testosterone are also reduced. Hypothalamic hypogonadism in women is manifested by amenorrhea or oligomenorrhea and is caused by weight loss, emotional or physical stress, or athletic training. Anorexia nervosa and obesity can also cause hypothalamic hypogonadism. These patients will have normal prolactin levels and reduced LH and FSH with their amenorrhea.

The most common mutation involved in Kallmann syndrome in men is a mutation of the KAL-1 gene, which is responsible for allowing the proper migration of embryonic gonadotrope cells to their place in the sella turcica. This same migration defect is responsible for the sensory deficits associated with Kallmann. The treatment for Kallmann depends on the goals of the patient; if the goal is just virilization and return of androgen function, then just testosterone is indicated. If the goal includes fertility, then gonadotropes (LH/FSH) need to be replaced.

Case 4

32-year-old woman complaining of fluid discharge from her breast. That her symptoms started 3 months ago. Denies headache but attests to a 6-month history of infrequent and irregular menses. unable to become pregnant despite attempts over the last year. Physical examination NL.

1. Diagnosis?

2. Best test?

3. Next step?

   A. Start bromocriptine
   B. Refer to neurosurgery
   C. Refer for radiation therapy
   D. Order MRI
   E. Observe

   Answer:

4. Major causes of secondary hyperprolactinemia?

Causes of Hyperprolactinemia

Physiologic Causes	*Pharmacologic Causes*	*Pathologic Causes*

5. When would you initiate therapy?

6. Treatment of choice for a prolactinoma?

   A. Surgery
   B. Cabergoline
   C. Radiation therapy
   D. Observation

   Answer:

7. When is surgery indicated?

8. 27-year-old woman recently diagnosed hyperprolactinema. After a negative pregnancy test is sent for MRI a 2.7 cm pituitary mass. Prolactin level is 67. No visual field deficits. Next step?

   A. Repeat prolactin with hemodilution
   B. Repeat MRI
   C. TSH
   D. Cabergoline
   E. Immediate radiation therapy

   Answer:

Summary: Case 4

Amenorrhea and galactorrhea in a young woman who is unable to conceive strongly suggests the diagnosis of a prolactin-secreting adenoma. Hyperprolactinemia in men presents with decreased libido, erectile dysfunction, and infertility.

The best initial test to determine the presence of hyperprolactinemia is to measure the prolactin levels in the blood. When prolactin levels exceed 200 ng/mL, the likelihood of having a prolactin-secreting pituitary adenoma is high. When prolactin levels are under 100 ng/mL, other causes for the hyperprolactinemia should be sought by history, physical examination, and laboratory evaluation.

After establishing the presence of hyperprolactinemia, the next diagnostic step is to get a CT scan/MRI of the pituitary.

Therapy is initiated when a macroprolactinoma (>1 cm) is present in the visual field deficits, hypogonadism, infertility, significant galactorrhea, headaches, acne, or hirsutism and significant loss of bone density. Bromocriptine can be used as initial therapy for hyperprolactinemia, but because patients may have less tolerance of the adverse effects associated with this medication (GI upset, hypotension), it should be chosen only when cabergoline is not

given as an answer choice. Cabergoline is the dopamine agonist of choice for the initial treatment of a prolactinoma. Approximately 90% of treated patients will respond to this therapy.

Surgery is the initial therapy of choice with pituitary apoplexy, or the patient cannot tolerate or fails medical therapy with a dopamine agonist. Even in patients with optic chiasm compression, dopamine agonists are the initial treatment of choice, as the majority will have resolution of visual field deficits within 48 hours of initial therapy.

In patients with microprolactinomas, estrogen replacement therapy and oral contraceptives may be taken without danger of enlarging the pituitary.

Patients with galactorrhea and normal prolactin levels should be evaluated for hypothyroidism with TSH and free T_4 levels. Low thyroid hormones result in increase in TRH which increases prolactin secretion. Symptoms abate with thyroid replacement therapy.

Case 5

56-year-old man admitted for cardiac bypass surgery. You note an elevated alkaline phosphatase. The other liver enzymes are normal; and direct and indirect bilirubin are normal. Serum calcium and phosphate are normal. Physical examination is normal.

1. Next step in the management of this patient?

2. Diagnosis?

3. Best initial test?

4. Most accurate test?
   A. Bone scan
   B. Skeletal survey
   C. CT scan
   D. MRI
   E. PET scan

   Answer:

5. What is the treatment?

6. When is calcitonin the treatment?

7. 62-year-old man. 12-year history of Paget disease presents with a "deep and achy" pain in his right hip over the past 6 months. X-ray of right hip and pelvis shows new sclerotic changes in proximal femur. The patient has not required bisphosphonates and doing well with acetaminophen. Next best course of action?

   A. Start alendronate
   B. Start zoledronic acid
   C. Perform a bone biopsy of the femur
   D. Add ibuprofen to the patient's pain regimen
   E. Start calcitonin

   Answer:

Summary: Case 5

The next step in the evaluation of this patient's isolated rise in alkaline phosphatase is to determine the source of the enzyme in the serum. To determine whether the alkaline phosphatase is coming from the bone or the liver, you would check a GGT or a bone-specific alkaline phosphatase. When the GGT is within normal limits, the most likely cause of an isolated elevation of alkaline phosphatase with normal serum calcium and phosphorus is Paget disease of the bone.

The best initial test for the diagnosis of Paget disease is a radiologic bone survey. The most accurate test for the diagnosis of Paget disease is a nuclear bone scan. The treatment of choice for Paget disease is *always* a bisphosphonate. Asymptomatic Paget disease of the bone is usually left untreated. Therapy is initiated when patients complain of bone pain or if there is significant cranial involvement leading to deafness. In the past, calcitonin was the therapy of choice for the treatment of Paget disease. The advent of bisphosphonates has made calcitonin obsolete in the treatment of this disease. The primary role of calcitonin today is for the acute management of bone pain.

In addition, patients with Paget disease have a 100-fold increased risk for osteosarcoma compared to age-matched patients without Paget; thus, if a patient with long-standing Paget presents with new types of pain or radiological findings, a bone biopsy is mandatory to rule out osteosarcoma of the involved bone.

Case 6

65-year-old woman with back pain. Pain started suddenly 2 days prior been progressively worsening. No fever or cancer. PE: for point tenderness over the lower spine. Lumbar spinal x-ray is positive for a compression fracture of L5. Marked osteopenia of all the vertebra. Calcium, phosphorus, and alkaline phosphatase all falling within normal.

1. Diagnosis?

2. Most accurate test for osteoporosis?

3. What is the next best step in the management of this patient?

   A. MRI of spine
   B. Estrogen levels
   C. Vitamin D and TSH
   D. Prolactin

   Answer:

4. Secondary causes of osteoporosis?

5. Best initial therapy for osteoporosis?

6. When is hormone replacement therapy (HRT) used?

7. Treatment of choice for osteoporosis?

8. When is raloxifene used?

9. 78-year-old woman complaining of severe back pain. Lumbar spinal x-ray reveals severe osteopenia of L4 and L5. Best therapy?

   A. Calcitonin
   B. Raloxifene
   C. Hormone replacement therapy
   D. Risedronate

   Answer:

10. 62-year-old woman comes for results of a recent bone densitometry scan, which showed a T score of 1 SD below normal. Denies history of bone fractures. Physical examination 139 lb and is otherwise normal. Next step?

   A. Begin alendronate
   B. Begin hormone replacement therapy
   C. Begin raloxifene
   D. Begin calcium and vitamin D

   Answer:

11. 47-year-old woman complains of hot flashes and requesting hormone replacement therapy. Advise past medical history of uterine fibroids.?

   A. No evidence to suggest that HRT will affect her fibroids
   B. HRT will decrease fibroid size.
   C. HRT will increase fibroid size.

   Answer:

12. 55-year-old man is found to have vertebral compression fracture. Normal calcium phosphate levels. Testosterone levels decreased. Most appropriate management?

   A. Alendronate
   B. Calcitonin
   C. Testosterone
   D. Vitamin D and calcium supplementation

   Answer:

13. Postmenopausal woman is found to have T score of -1.5. She exercises regularly, has a BMI 21, and is currently a smoker. History of recurrent prednisone use due to COPD. Most appropriate next step in management?

    A. Alendronate
    B. Increase intensity of exercise
    C. Raloxifene
    D. Parathyroid hormone
    E. Vitamin D and calcium supplementation

    Answer:

14. Postmenopausal woman with osteoporosis and history of DVT on alendronate therapy for 18 months. She presents with a hip fracture. Next step in management of this patient?

    A. Continue alendronate and start estrogen plus progesterone
    B. Continue alendronate and start calcitonin
    C. Continue alendronate and add raloxifene
    D. Discontinue alendronate and start raloxifene
    E. Discontinue alendronate and start parathyroid hormone

    Answer:

15. Premenopausal woman with breast cancer develops chemotherapy-induced ameonorrhea. Which agent is appropriate to prevent bone loss?

    A. Alendronate
    B. Calcitonin
    C. Parathyroid hormone
    D. Raloxifene
    E. Tamoxifen

    Answer:

What amount of vitamin D has been shown to aid in decreasing fractures?

800 IU/day

Most common cause of secondary hyperparathyroidism is Vitamin D. What is the number 1 cause?

Bariatric surgery

60-year-old male with bone pains and osteopenia. X-ray shows Looser's Zone. Diagnosis?

Osteomalacia due to Vit D deficiency

What is the biggest risk factor for osteoporosis?

Sedentary lifestyle

Elderly female with hip fracture and Dexa of -1.5. Which factor is most important in whether to start a bisphosphonate or not? FRAX score is discussed in the book; I put it in?

A. T score

B. Hip fracture

Answer is hip fracture

What can artificially increase the T-score?

OA, trauma, metastasis

Summary: Case 6

In a 65-year-old woman, who presents with osteopenia, the most likely diagnosis is osteoporosis. It is important to distinguish between osteoporosis and osteomalacia both by history and by laboratory evaluation. Osteoporosis is characterized by decreased bone matrix and decreased bone mineralization. Osteomalacia is characterized by intact matrix but decreased mineralization. The most common form of metabolic bone disease is osteoporosis. The laboratory findings in osteomalacia are characterized by decreased calcium, phosphorus, and vitamin D. The alkaline phosphatase is typically elevated. In osteoporosis, the alkaline phosphatase, calcium, and phosphorus are usually normal.

Once osteoporosis is established as the most likely diagnosis of this patient's metabolic bone disease, the next step is to evaluate the patient for an underlying cause of her osteoporosis. When a secondary cause of the osteoporosis is identified, you treat the underlying disease to treat the osteoporosis. The most accurate test for the diagnosis of osteoporosis is bone densitometry. The test is interpreted in the following manner: The T score is the score used to determine your management of the case. If a patient has a T score of >2.5 standard deviations below the mean, that patient has osteoporosis. If the T score lies between 1–2.5 standard deviations below the mean, then the patient has osteopenia. Any patient with osteoporosis should receive aggressive therapy for the disease. If the T score lies between 0–2 standard deviations below the mean, then the patient has osteopenia. Osteopenia in the presence of 2 risk factors *or* a history of pathologic fracture should be managed like full-fledged osteoporosis. Risk factors for osteoporosis include a history of smoking, low body weight, Caucasian race, and a family history of the disease. The best initial therapy for osteoporosis is always calcium and vitamin D.

Patients with risk factors for the development of osteoporosis should be started at an early age with supplemental calcium and vitamin D. Patients should receive 1,500 mg daily if they are not receiving hormone replacement therapy (HRT). If they are receiving HRT and are younger than 50 years of age, then 1,000 mg of calcium per day is sufficient.

HRT should be used for the treatment of osteoporosis when the patient has a history of hot flashes. HRT should never be used if a patient is pregnant or has unexplained vaginal bleeding, a history of breast or endometrial cancer, a history of liver disease, or recent vascular thrombosis. For men with osteoporosis and hypogonadism, the treatment of choice is testosterone.

The treatment of choice for osteoporosis is bisphosphonates. These medications reduce bone resorption by inhibiting osteoclastic activity. The bisphosphonates effectively increase bone density and decrease the risk of pathologic fracture. The major side effect of these medications is esophagitis.

Raloxifene is a selective estrogen receptor modulator. Like HRT, raloxifene increases bone density and reduces LDL. Unlike HRT, raloxifene does not confer an increased risk of endometrial cancer, it reduces the risk of breast cancer, and it has no effect on reducing levels of triglycerides. Like estrogens, raloxifene is contraindicated in pregnancy and should not be used in patients with a history of deep vein thrombosis. Patients with hot flashes will experience a worsening of symptoms when taking raloxifene.

Case 7

37-year-old woman complains of tingling of the lips progressively worsening. Also complaining of tingling of her hands, muscle cramping, and vague abdominal pain. Physical examination is significant for uncontrollable grimacing when her cheek is lightly tapped. Serum chemistries calcium of 6.2 mg/dL.

1. Next best step in management?
   A. Send PTH
   B. Send 25-vitamin D
   C. Parathyroid scan
   D. Order calcium carbonate
   E. Order calcium gluconate

   Answer:

2. Next step in the diagnostic workup of this patient's hypocalcemia? Why?

3. What would you expect to find on EKG?

4. What is the treatment of hypoparathyroidism?

5. What diuretic should be avoided in patients with hypocalcemia?

Hypoparathyroidism

Diagnosis	Calcium	Phosphate	PTH	Alkaline Phosphatase	Phenotype
Primary hypoparathyroidism					
Pseudo-hypoparathyroidism					Mental retardation, short stature, round face, ectopic bone formation, short fourth metacarpals, obesity
Pseudo-pseudohypoparathyroidism					Mental retardation, short stature, round face, ectopic bone formation, short fourth metacarpals, obesity

6. 19-year-old woman presents for recurrent numbness and tingling in her fingers, legs, and face. She has a cleft palate, mild cognitive deficiency, and a short fourth metatarsal of her hands. Calcium 7.1, PTH 128, and phosphate 2.1. Next test?

   A. TSH
   B. Magnesium
   C. 1,25 vitamin D
   D. Prolactin

   Answer:

Case 8

34-year-old woman comes for a regular checkup. Denies any complaints. Ca^{2+} elevated at 11.7 mg/dL. Physical examination is normal.

1. Most common causes of hypercalcemia?

2. Symptoms of hypercalcemia?

Hypercalcemia

Diagnosis	Serum Calcium	Serum Phosphate	Serum PTH (IRMA Assay)
Primary hyperparathyroidism			
Malignancy (multiple myeloma, breast, lung, and prostate carcinoma)			
Granulomatous disease (sarcoid, TB)			
Familial hypocalciuric hypercalcemia			

3. Best initial treatment?

   A. Alendronate
   B. Normal saline
   C. Furosemide
   D. Pamidronate
   E. Sensipar

   Answer:

4. Pamidronate or zoledronic acid used?

5. Ketoconazole or steroids used?

6. When is surgery the answer? What is the most common complication of surgery?

NOTE

Age < 50

Renal Stones

Serum Ca+2 > 1mg above normal

Symptomatic (T score > 2.5, hip fracture, stones etc)

7. 72-year-old man is confused and unresponsive. PMH is significant for metastatic lung cancer. Serum calcium is measured at 16.2 mg/dL. Which will lower serum calcium the fastest?

   A. Plicamycin
   B. Pamidronate
   C. Calcitonin
   D. Prednisone

   Answer:

8. 28-year-old woman has incidentally discovered hypercalcemia. Her calcium was 11.3 and PTH 67. She denies any history of fracture. A 24-hour urine calcium is 23. Next appropriate step?

   A. Immediate parathyroid surgery
   B. Calcitriol
   C. Parathyroid scan and neck CT
   D. Check her sister's calcium
   E. Renal sonogram

   Answer:

   Patient with thyroid mass, elevated Ca, elevated calcitonin and calcifications noted in the mass. Diagnosed with medullary carcinoma. How to screen family members?

   26-year-old female with 9 kidney stones in the last 17 months. Ca is 12.1 mg/dl, PO4 2.1, and PTH is 335 pg/ml (10–65). Most appropriate management is:

Summary: Case 8

The most common causes of hypercalcemia are primary hyperparathyroidism and hypercalcemia of malignancy. Any granulomatous disease (TB, sarcoid) can induce hypercalcemia by increased production of vitamin D by the macrophages in the granuloma. Additionally, thyrotoxicosis and adrenal insufficiency can also induce hypercalcemia. Frequently, patients with hypercalcemia are asymptomatic. Symptomatic hypercalcemia is manifested by renal stones, hypertension, polyuria, fatigue, mental status changes, bone pain, osteoporosis, and pathologic fractures. The initial treatment of any patient with symptomatic hypercalcemia is to aggressively hydrate the patient with large amounts of normal saline. In patients with renal insufficiency where the physician's ability to hydrate may be limited, additional therapy with calcitonin may be required to acutely lower the serum calcium. Treatment with furosemide to induce renal secretion of calcium is effective only when the patient has adequate hydration and sodium onboard, i.e., normal saline. Pamidronate and zoledronic acid are the anti-resorptive therapies of choice in patients with hypercalcemia due to malignancy. The problem with both drugs is that they take 1 to 2 days to have an effect. The fastest way to decrease calcium levels is with the use of calcitonin. The problem with calcitonin is that it has a short half-life requiring multiple daily doses; in addition, many patients develop resistance to calcitonin via immunologic mechanisms, which decreases its efficacy. Patients who have hypercalcemia secondary to granulomatous disease should be treated with steroids or ketoconazole. In primary hyperparathyroidism, surgery is indicated if any of the following are present:

- Symptomatic hypercalcemia
- Calcium >11.5
- Renal insufficiency
- Age <50 years

- Nephrolithiasis
- Osteoporosis
- Malignant hypercalcemia

It is important to note that preoperatively, in the absence of a history of previous neck surgery, there is *no* need to image the parathyroid glands to localize the responsible adenoma.

Hypocalciuric hypercalcemia is an autosomal dominant disorder characterized by decreased calcium secretion by the kidney (<200 mg/day). These patients have asymptomatic and mild hypercalcemia. The diagnosis is made when the calcium clearance/creatinine clearance is less than 0.1.

Hyperparathyroidism can be a manifestation of the multiple endocrine neoplasia (MEN) syndromes:

- MEN I consists of hyperparathyroidism (hyperplasia), pituitary tumors, and pancreatic tumors.
- MEN II consists of hyperparathyroidism (hyperplasia), pheochromocytomas, and medullary carcinoma of the thyroid.
- MEN IIb consists of pheochromocytomas, medullary carcinoma of the thyroid, and mucous neuromas.

Case 9

25-year-old man for evaluation of new-onset hypertension. Exam significant for central obesity, muscle wasting, and multiple bruises. Bluish markings on the patient's abdomen. Labs:

Na^+: 137	WBC: 17.5
K^+: 2.9	Differential: Low lymphocytes
HCO_3^-: 23	Glucose: 276

1. Most likely diagnosis?

2. Best initial test?

3. Next test in the evaluation of this disease? Why?

4. 46-year-old man is treated with long-term inhaled corticosteroids for severe asthma. He develops hypertension, moon facies, and abdominal striae. Which laboratory test will distinguish exogenous corticosteroids from Cushing syndrome?

   A. ACTH cosyntropin stimulation test
   B. High-dose dexamethasone suppression test
   C. Low-dose dexamethasone suppression test
   D. Serum aldosterone
   E. Serum cortisol and urinary cortisol

   Answer:

5. When is surgery the answer?

6. When is ketoconazole or metyrapone the answer?

Summary: Case 9

The history of new-onset hypertension associated with central obesity, muscle wasting, and easy bruising strongly suggests Cushing as the most likely diagnosis in this case. The presence of hyperglycemia and hypokalemia on laboratory investigation also suggests the diagnosis.

The low-dose dexamethasone or the 24-hour urine-free cortisol tests are the initial tests for the diagnosis of Cushing syndrome. While they are extremely sensitive tests, they are not very specific. This means that a negative test rules out the diagnosis with a 98% certainty, whereas a positive test may be falsely positive (due to obesity, stress, alcoholism, estrogen, pregnancy). The other test approved for screening is the midnight salivary cortisol. The premise behind this test is that cortisol naturally nadirs around midnight in humans. If the midnight salivary cortisol is elevated, it is suspicious of Cushing syndrome.

Once hypercortisolism is established, the next diagnostic question is whether the hypercortisolism is ACTH-dependent or -independent. This is determined by measuring the ACTH level. If the ACTH is low (<5 pg/mL), then the hypercortisolism is ACTH-independent, i.e., from the adrenal gland. The main differential for adrenal causes of Cushing is adrenal adenoma versus carcinoma. Adrenal carcinoma can be differentiated by high levels of DHEA as the tumor usually arises in androgen-producing cells. If the ACTH is elevated (>10 pg/mL), then the hypercortisolism is ACTH-dependent, i.e., ectopic versus pituitary in origin. Since elevated ACTH stimulates all 3 levels of the adrenals, patients will also complain of hirsutism.

In ACTH-independent disease, the next step will be to order a CT scan of the adrenal glands to localize an adrenal mass or tumor. In ACTH-dependent Cushing, the next step is to get an MRI of the brain to localize an adrenal adenoma as the source of the ACTH. If a pituitary abnormality is identified, surgical excision of the mass is indicated. If no pituitary abnormality is identified, then inferior petrosal sinus sampling can be used to differentiate between ectopic ACTH production and a pituitary source of the ACTH. All glucocorticoids, including potent inhaled and topical glucocorticoids, can result in the inhibition of ACTH secretion. Thus, in order to differentiate iatrogenic Cushing from Cushing syndrome, the plasma ACTH, serum cortisol concentrations, and cortisol excretion will all be low.

Overall, pituitary Cushing disease accounts for approximately 70-80% of cases, while adrenal Cushing accounts for 10-15%.

In Cushing disease with a pituitary source of the ACTH, transsphenoidal resection of any adenoma is the treatment of choice. In ACTH-independent adrenal disease, laparoscopic excision of the adrenal mass is the treatment of choice. The larger the adrenal mass (>6 cm), the higher the likelihood of malignant disease. Ketoconazole and metyrapone can be used to treat Cushing syndrome in cases where surgical resection is impossible (metastatic adrenal carcinoma).

The management of the incidental adrenal mass depends on the size of the mass on presentation. Masses that measure less than 4 cm in size can be followed with a repeat CT scan in 6 to 12 months. In addition, any adrenal incidentaloma greater than .8 cm requires a full hormone evaluation with measurement of ACTH, low-dose dexamethasone test/24-hour urine free cortisol, and aldosterone/plasma : renin ratio. All masses greater than 4 cm in size should be surgically resected regardless of endocrine abnormalities. With masses that are smaller than 4 cm in size and accompanied by hypertension, surgery is indicated only when the endocrine evaluation is abnormal.

Case 10

25-year-old man presents for evaluation of new-onset hypertension. Complains of muscular weakness and frequent urination. No significant PMH. PE normal. Labs:

Na^+: 134

K^+: 2.7

HCO_3^-: 32

WBC: 7.3

Differential: Normal

1. Diagnosis?
   A. Coarctation of the aorta
   B. Hyperaldosteronism
   C. Hypercortisolism
   D. Pheochromocytoma

   Answer:

2. Best initial test?
   A. Adrenal vein aldosterone
   B. CT scan of abdomen
   C. Aldosterone suppression test
   D. Plasma renin activity and aldosterone concentration
   E. 24-hour urine potassium

   Answer:

3. Most appropriate confirmatory test?
   A. Adrenal vein aldosterone
   B. CT scan of abdomen
   C. Aldosterone suppression test
   D. Plasma renin activity and aldosterone concentration
   E. 24-hour urine potassium

   Answer:

4. Next step in evaluation of primary aldosteronism?

5. What laboratory abnormality suggests secondary hyperaldosteronism (e.g., renovascular disease)?

   A. Increased plasma renin activity; increased plasma aldosterone concentration
   B. Decreased plasma renin activity; increased plasma aldosterone concentration
   C. Decreased plasma renin activity; decreased plasma aldosterone concentration
   D. PAC/PRA ratio is >20.

   Answer:

6. What is the gold standard in differentiating adrenal hyperplasia versus adrenal adenoma?

7. When is surgery the most appropriate step in management?

8. Drug of choice in management of hyperaldosteronism?

   A. Amiloride
   B. Epleronone
   C. Spironolactone
   D. Triamterene
   E. Furosemide

   Answer:

9. Patient with adrenal incidentaloma on CT for pneumonia. Next steps to test if functioning?

   Cushings ➔
   Pheochromocytoma ➔
   Conn's syndrome ➔
   Adrenal Carcinoma ➔

Summary: Case 10

New-onset hypertension accompanied by hypokalemia and metabolic alkalosis strongly suggests the diagnosis of primary hyperaldosteronism, or Conn syndrome. An elevated plasma aldosterone concentration (PAC) accompanied by a low plasma renin activity (PRA) and a PAC:PRA ratio >20:1 suggests the diagnosis of Conn syndrome. Secondary hyperaldosteronism (e.g., renovascular disease) should be considered when both the PRA and PAC are increased and the PAC/PRA ratio is <10. Once the diagnosis of primary hyperaldosteronism has been made, a unilateral aldosterone-producing adenoma or carcinoma must be distinguished from bilateral hyperplasia. Thus the next step is to obtain a CT scan of the adrenal glands to localize adenomas that may be present. Measuring aldosterone in samples of adrenal venous blood is the "gold standard" test to distinguish between an adenoma

and hyperplasia. In hyperplasia, the aldosterone will be elevated in both venous samples. In adenomatous disease, aldosterone will be elevated in the venous sample of the affected gland. For unilateral adrenal adenomas causing primary aldosteronism, the most effective surgical excision. For patients with bilateral adrenal hyperplasia, surgery will correct the hypokalemia but will fail to correct the hypertension. Spirinolactone is the most appropriate therapy for adrenal hyperplasia and also is the most appropriate initial therapy preoperatively for adrenal adenomas. Epleronone is a highly selective mineralocorticoid receptor antagonist which may be used if side effects of spirinolactone prevent its use.

Case 11

25-year-old man with new-onset hypertension. He complains of headache "attacks" associated with profuse sweating and palpitations. Also complains of paroxysmal attacks of abdominal pain and chest pain. 3-month history of weight loss. Physical examination normal. Labs:

Na^+: 135

K^+: 3.7

HCO_3^-: 24

WBC: Normal

Differential: Normal

1. Diagnosis?

2. Best initial test?
   A. Serum epinephrine
   B. Serum aldosterone
   C. Urine vanillylmandelic acid
   D. Urine metanephrines

   Answer:

3. Next step in diagnosis?

4. When is surgery the answer?

5. When is phenoxybenzamine the answer?

6. When is beta blocker used?

   A. Prior to use of phenoxybenzamine
   B. After use of phenoxybenzamine
   C. After use of calcium channel blockers
   D. Postoperative management of hypertension

   Answer:

7. 38-year-old Asian woman with 4 cm incidental right adrenal nodule found on an abdominal CT scan. 24-hour urinary free catecholamines shows metanephrines of 5 times normal, and normetanephrines of 4 times normal. Next test?

   A. Thyroid sonogram
   B. Prolactin
   C. TSH
   D. Gastrin
   E. Pituitary MRI

   Answer:

Summary: Case 11

The history of episodic headache, chest pain, and abdominal pain is highly suggestive of a pheochromocytoma. The best initial test for the diagnosis of a pheochromocytoma is 24-hour urine for vanillylmandelic acid (VMA), metanephrines, or catecholamines. The most accurate test for the diagnosis of pheochromocytoma is to measure, via direct assay, urine and blood levels of epinephrine and norepinephrine during or shortly after an attack. The next step in diagnosis is to obtain a CT scan of the adrenal glands. Approximately 90% of all pheochromocytomas occur in the adrenal gland.

The treatment of choice for all pheochromocytomas is surgery. Preoperatively, phenoxybenzamine is the therapy of choice. The introduction of phenoxybenzamine has drastically reduced the perioperative mortality associated with surgery.

Case 12

52-year-old man presents with appendicitis and is found to have a 2-cm adrenal mass preoperatively. Referred to his primary care doctor for followup of his adrenal mass. He has otherwise been in his usual state of health. Labs:

Na^+: 139

K^+: 4.2

HCO_3^-: 22

Glucose: 92 mg/dL

1. What is the most appropriate next step in management?
   A. 24-hour urinary cortisol
   B. FNA of adrenal mass
   C. Repeat CT scan in 3 months
   D. Repeat CT scan in 6 months
   E. Serum prolactin

   Answer:

2. Repeat CT scan reveals mass is now 4 cm in diameter. Next step in management?
   A. 24-hour urinary catecholamine
   B. MRI of adrenals
   C. Serum cortisol
   D. Urinary 17-keto steroid

   Answer:

3. 29-year-old presents with chronic abdominal pain, recent weight gain, and easy bruising. BP of 152/89 mm Hg. Coagulation profile is normal. Basic chemistry profile normal. CT scan of her abdomen reveals 1-cm mass in the right adrenal gland. The most appropriate initial test?
   A. ACTH level
   B. FNA biopsy of mass
   C. High-dose dexamethasone suppression test
   D. Serum aldosterone
   E. TSH

   Answer:

Patient with 3.4 cm mass on adrenal found incidentally on CT. All hormone levels are within normal limits. Next step?

Repeat CT scan in 6 mos

Summary: Case 12

Incidental adrenal tumors are seen in approximately 1.5% of CT scans performed. The 2 most important factors in the diagnostic workup of an incidental adrenal mass are its size and "functioning". Since most adrenal tumors are benign lesions less than 3 cm in diameter without any accompanying symptoms may be followed with a repeat CT scan in 3 months and then every 6 months for 2 years, if found to be stable. Lesions >3 cm in diameter or increase in size of lesion from prior study requires MRI imaging and endocrine evaluation based on symptoms. Lesions larger than 4-cm diameter are more likely to be malignant and require surgical removal. Functioning lesions are lesions that result in one of 3 conditions:

1) Cushing syndrome
2) Hyperaldosteronism
3) Pheochromocytoma

Initial step in endocrine assessment is to evaluate for functioning tumors based on symptomatology. Cushing syndrome is suggested by hypertension, central obesity, proximal muscle weakness, easy bruisability. The appropriate screening test in workup of adrenal mass with these presenting symptoms is a 24-hour urinary free cortisol or low-dose dexamethasone suppression test. Hyperaldosteronism presents with hypertension, hypokalemia, and hypernatremia. Workup should include plasma renin activity and plasma aldosterone. Pheochromocytoma is suggested with hypertension, episodic headaches, palpitations, and diaphoresis. Initial workup for pheochromocytoma is urinary catecholamines. Patients with abnormal screening laboratory results should be referred for surgical excision, regardless of the size of the mass.

Case 13

43-year-old woman complaining of weakness and generalized fatigue, nausea, vomiting, low-grade fever, and some joint pain. BP of 94/56 mm Hg. Sparse axillary hair and diffuse hyperpigmentation of the skin. Labs:

Na^+: 127

K^+: 5.7

HCO_3^-: 18

WBC: 2.2

Differential: Eosinophils 343

1. Diagnosis? Why?

2. Best initial test?
   A. 24- hour urine free cortisol
   B. A.M. cortisol
   C. Random cortisol
   D. Serum aldosterone
   E. Serum DHEA-s

   Answer:

3. When would you measure ACTH?

4. When is abdominal CT used?

5. When is MRI or CT of the head used?

6. Treatment?

7. For the patient above, the ACTH returns are 57, and A.M. cortisol returns as .8. Which of the following tests would help confirm the etiology of the patient's condition?
   A. Anti-TPO antibodies
   B. Antigliadin antibodies
   C. Transglutaminase antibodies
   D. Renal and adrenal sonogram
   E. Anti-CYP21 antibodies

   Answer:

Summary: Case 13

Hypotension accompanied by hyperkalemia, a non-anion gap metabolic acidosis, and increased skin pigmentation make the diagnosis of adrenal insufficiency quite likely. It is important to note that the presence of both skin pigmentation and hyperkalemia implies that the level of failure is at the adrenal gland itself rather than at the level of the pituitary. As the adrenal gland fails, the pituitary responds by increasing its secretion of ACTH. ACTH stimulates the melanocytes in the skin, resulting in hyperpigmentation. The same process in the adrenal gland that compromises its ability to produce steroid also causes a reduction in the adrenal gland's ability to produce aldosterone, resulting in hyperkalemia.

An A.M. cortisol is the best initial screening test for adrenal insufficiency. The ACTH (cosyntropin) stimulation test is the test to confirm the presence of adrenal insufficiency. The 8 A.M. cortisol is useful for diagnosis only if it is extremely high (>18 μg/dL), when it can rule out adrenal insufficiency; or if it is extremely low (<3 μg/dL), when it confirms the presence of adrenal insufficiency. The random serum cortisol is no longer considered useful unless the patient is under physiologic stress and the cortisol should be >18 μg/dL. If the random serum cortisol does not rise in response to physiologic stress, then adrenal insufficiency should be suspected.

After establishing the diagnosis of adrenal insufficiency, the ACTH should be measured to determine whether the failure is primary (ACTH increased) or secondary (ACTH normal or decreased). The abdominal CT scan is the next step when primary adrenal insufficiency is diagnosed. Small adrenals imply an adrenalitis as the etiology of gland failure, whereas enlarged glands imply tumor or granulomatous disease (TB, sarcoid) as the etiology of the gland failure. When there is evidence of secondary failure of the adrenal gland, the pituitary should be imaged to determine the etiology.

Treatment for acute adrenal insufficiency is IV fluids and hydrocortisone. Patients who are taking steroids for the treatment of chronic disease may acquire the inability of their adrenal to respond adequately to stress. Generally, a dose of at least 15 mg/day for 4 weeks is needed to produce any element of adrenal suppression requiring stress doses of steroid.

Case 14

25-year-old woman comes to clinic complaining of nervousness and restlessness. States she constantly feels hot and continually reports an irregular menstrual period. PE: enlarged, nontender thyroid gland, and a thyroid bruit is present. Fine tremor of both hands bilaterally and the patient's hair is very fine. Labs:

TSH < 0.1 mU/L Free T_4: 2.9 mcg/dL (normal 0.8–1.7)

1. Most likely diagnosis?
   A. Toxic multinodular goiter
   B. Hashimoto's thyroiditis
   C. Autonomous thyroid nodule
   D. Grave's disease

   Answer:

2. When is the diagnosis subacute thyroiditis?

3. Best initial treatment?

4. When is iodine the best treatment?

5. When is radioactive iodine the best initial treatment?

6. 26-year-old woman comes to your office complaining of diarrhea, palpitations, and heat intolerance after giving birth to a baby girl 4 months ago. Physical examination is normal except for a tender and swollen thyroid gland. Serum TSH is <0.1 mU/L (normal 0.5–4); and free T_4 is 53 pmol/L (normal 3.5–8). What is the best initial therapy?
   A. Prednisone
   B. Radioactive iodine
   C. Propylthiouracil
   D. Propranolol

   Answer:

7. 42-year-old woman was started on PTU and propranolol 3 weeks ago for symptomatic hyperthyroidism. Which test to follow progress?

   A. TSH
   B. Free T_4
   C. Free T_3 and TSH
   D. T_4

   Answer:

8. Young woman complains of diarrhea and irritability. Lost 15 lbs over the last 3 weeks. Thyroid gland is painless. TSH is decreased; free T_4 is elevated. Radioactive uptake is low; and ESR is <25 mm. Diagnosis?

   A. Factitious hyperthyroidism
   B. Subacute thyroiditis
   C. Toxic multinodular goiter

   Answer:

9. 65-year-old woman with acute shortness of breath and tachycardia. Currently taking amiodarone to control atrial fibrillation. ECG sinus tachycardia at 133 bpm, and troponins negative 3 times over the course of 24 hours. TSH is <.01 (normal 0.5-4). What would you most commonly expect to see on a thyroid uptake and scan?

   A. Increased uptake
   B. Decreased uptake
   C. Normal uptake
   D. Multiple "hot" nodules

   Answer:

   Elderly patient presents with A fib and low TSH. Patient also admits to heat intolerance Diagnosis?

   Hyperthyroidism

   Elderly patient brought with apathy, weight loss, arrhythmias, CHD, diarrhea, and muscle weakness. TSH decreased. T_4 low normal. Diagnosis?

   Apathetic thyrotoxicosis

   Can you cardiovert afib during thyroid storm?

   No

   Must wait for 3 months until euthyroid? Why?

   Spontaneous conversion is normal

10. Patient with Graves's disease had radioiodine ablation and then 10 weeks later has 20 lbs. of weight gain.

    A. Wait one month
    B. Wait 3 months
    C. Start T4

    Answer:

    Patient with Graves presents with watery eyes and periorbital edema. Exam reveals an afferent pupillary defect. Pain on eye exams. Diagnosis?

    Thyroid ophthalmopathy with optic nerve impingement

    How to manage thyrotoxicosis and optic nerve impingement

    Surgery

    Patient s/p uncomplicated delivery and breastfeeding 14-week-old child. Has enlarged thyroid and non-tender. Diagnosed with Chronic lymphocytic thyroiditis. Best treatment?

    Beta blocker

    Why?

    Usually transient

Summary: Case 14

Patients who present with tremor, heat intolerance, weight loss, anxiety, and menstrual irregularity should be suspected of having hyperthyroidism. The elevated FT_4 with suppressed pituitary TSH establishes the hyperthyroidism as primary, with the problem at the level of the thyroid gland. Patients who present with primary hyperthyroidism and exophthalmos are likely to have Graves disease. Toxic nodular goiter is diagnosed in patients with a hot nodule on radioactive iodine scanning. Subacute thyroiditis should be diagnosed when you see a low uptake scan with primary thyrotoxicosis and a tender thyroid gland on physical examination.

Propranolol is the best initial therapy for any patient with thyrotoxicosis. Propranolol inhibits peripheral conversion of T_4 to T_3 and improves the patient's symptoms. Methimazole and propylthiouracil are effective only for treatment of high-uptake thyrotoxicosis. In a pregnant woman, propylthiouracil will **always** be the treatment of choice. Iodinated contrast agents are effective in the treatment of both high-uptake and low-uptake thyrotoxicosis. Treatment of high-uptake thyrotoxicosis with ablative radioactive iodine or surgery should be undertaken only if the patient has already received medical therapy. Proceeding directly to ablative therapy can induce thyroid storm. For all patients with high-uptake primary hyperthyroidism, the ablative therapy of choice is radioactive iodine. Surgery is the ablative therapy of choice in patients with airway obstruction secondary to goiter or pregnancy and when there is a high likelihood of thyroid cancer. The effectiveness of therapy is followed with the FT_4.

Patients with subclinical hyperthyroidism should not be treated initially, and their thyroid function studies should be repeated in 6 to 12 months.

Thyroid Function Tests

	Free T_4	Serum TSH
Primary *hypo*thyroidism	Low	High
Secondary *hypo*thyroidism	Low	Normal or low
Primary *hyper*thyroidism	High	Low
Secondary *hyper*thyroidism	High	Normal or high

Thyrotoxicosis

Suspect Hyperthyroidism

The next diagnostic test is...

Low FT_4 Low TSH ← Serum TSH, FT_4 → High FT_4 nl/high TSH

High FT_4 Low TSH

The next diagnostic test is...

Radioactive Iodine Uptake

High Uptake
Graves disease
Toxic multinodular goiter
Levothyroxine

Low Uptake
Subacute thyroiditis
Acute Hashimoto
Iodine loading

Case 15

56-year-old with 1.5-cm nodule in the right lobe of the thyroid gland. The patient denies any history of fatigue, cold intolerance, or weight gain. History of anxiety, palpitations, or diarrhea. There is no history of neck irradiation. Physical examination is otherwise normal. You note no lymphadenopathy in the head or neck. TFTs are normal.

1. Why are TFTs essential in any patient with a thyroid nodule?

2. Next step in the management of this patient?
   A. Sonogram-guided FNA
   B. Surgical biopsy
   C. Levothyroxine
   D. Repeat sonogram in 6 months

   Answer:

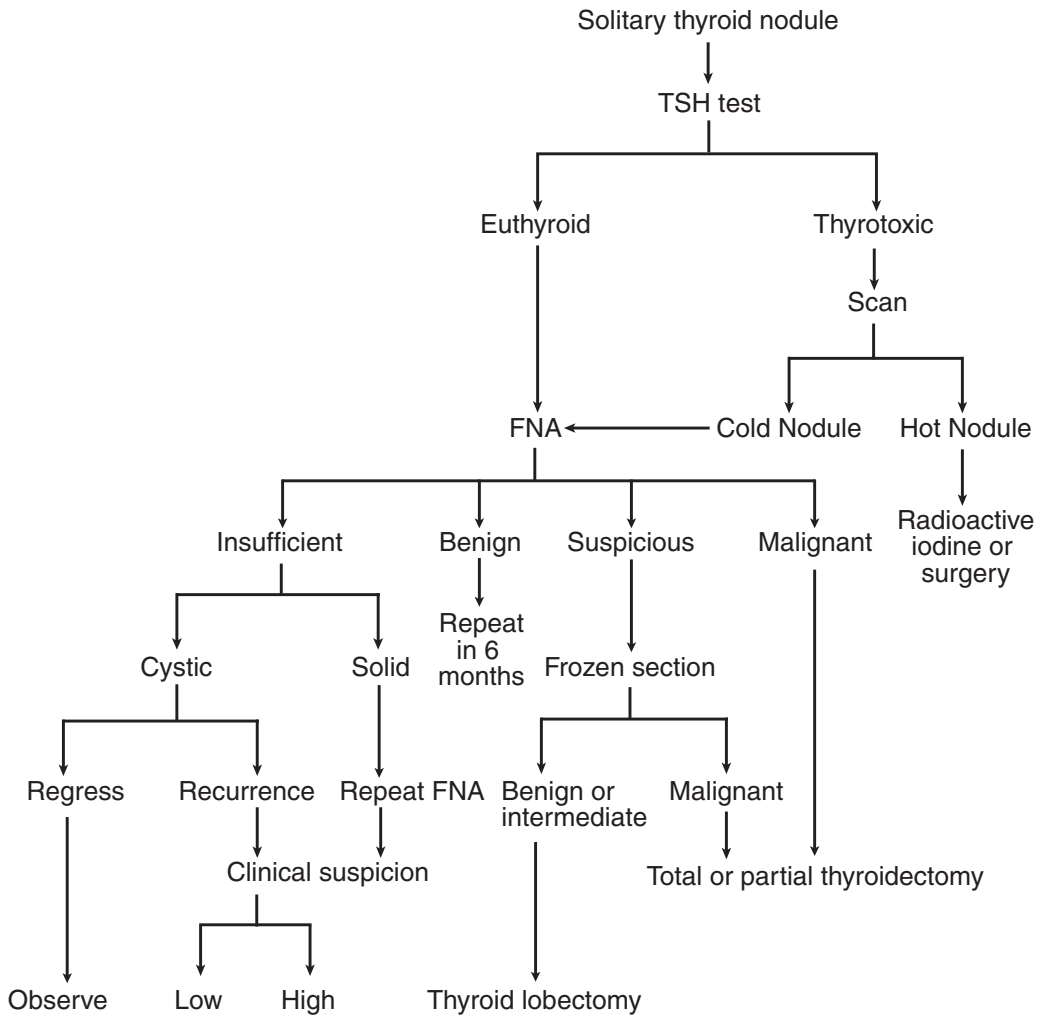
Summary: Case 15

Thyroid function studies are essential to the management of a thyroid nodule, because if the TSH is found to be suppressed, then the workup and management of thyrotoxicosis applies. Only when the TSH is normal does the workup focus on determining the histology of the thyroid nodule. Once the TSH test returns normal, the next step in the evaluation of a thyroid nodule is to perform an FNA. Thyroid ultrasound is the imaging modality of choice that may precede the FNA to assess for the likelihood of malignancy. Radioactive thyroid scanning is no longer indicated in the workup of a thyroid nodule.

The decision to send a nodule for surgical excision should be based on the results of the FNA. When the FNA shows malignancy, the patient is diagnosed with and should be treated for thyroid cancer. When the FNA shows "follicular neoplasm," then an excisional biopsy should be performed.

Thyroid cancer comes in 4 histological types: papillary, follicular, medullary, and anaplastic. The most common type is papillary carcinoma. Both papillary and follicular carcinoma of the thyroid are considered differentiated and closely resemble normal thyroid tissue. It is not surprising that these differentiated cancers of the thyroid have a much better prognosis than their undifferentiated counterparts. Treatment with surgery followed by follow-up scanning, ablative therapy with radioactive iodine, and suppression with levothyroxine are effective only in patients with differentiated cancer of the thyroid.

Evaluation of Thyroid Nodule



Case 16

34-year-old woman complaining of fatigue, cold intolerance, and constipation. Complains of feeling "low" over the last several weeks. Diffusely decreased tendon reflexes.

1. Diagnosis?

2. Next step in the management of this patient?

3. Treatment for this disease?

4. 72-year-old woman presents with depressed sensorium. Hypothermic and to have a HR of 38 and RR of 10. Na 122 mEq/dL and glucose 52 mg/dL. Next step?

   A. D5W ampoule
   B. Hypertonic saline infusion
   C. Intravenous glucocorticoids
   D. Intravenous T_3
   E. Empiric antibiotics

   Answer:

5. Homeless man brought in on stupurose, hypothermic and bradycardia. + edema around eyes, and no axillary hair. Diagnosis?

   Myxedematous coma

   Treatment?

   Steroids plus IV T4/T3

   Most common cause

   Sepsis

6. Rapidly growing neck mass in pt with Hashimoto's for > 20 years. Most likely diagnosis?

   Thyroid Lymphoma

7. If a nuclear meltdown were to occur what would you give to people in the surrounding area?

   Potassium iodide

Summary: Case 16

34-year-old woman, who presents with fatigue, cold intolerance, and constipation, should raise the possibility of hypothyroidism. Feelings of depression and decreased tendon reflexes further support the diagnosis. Patients with hypothyroidism can present with rare manifestations of the disease, including pericardial effusions, sinus bradycardia, hypoventilation, CHF, and sleep apnea. The best initial test for the evaluation of hypothyroidism is a serum TSH. Treatment for hypothyroidism consists of levothyroxine to normalize the TSH. Unlike hyperthyroidism, where the therapy is followed with the FT_4, in hypothyroidism you should follow your therapy with the serum TSH.

In primary hypothyroidism you expect the FT_4 to be low with an appropriate increase in the TSH, which should be elevated. If the FT_4 is low and the TSH is normal or low, the next step is to order an MRI of the brain to evaluate for any pituitary lesion causing a secondary hypothyroidism. Myxedema coma is a rare complication of hypothyroidism with patients presenting with coma, bradycardia, heart failure, respiratory failure, and hypotension. The treatment is to replace the thyroid hormone with IV levothyroxine. Before giving thyroid hormone, it is imperative to give steroids *first*.

Euthyroid Sick Syndrome

- Free T_4 is normal or low.
- TSH is normal or low.
- T_3 is low.
- rT_3 is high.

Case 17

57-year-old man is admitted to the MICU with hypotension and gram-negative sepsis. Laboratory results are:

TSH: 0.2 mU/mL FT_4: 7 pmol/L Total T_4: 8 μg/dL

1. Diagnosis?

Case 18

46-year-old man states that his father and mother both diabetes mellitus. He denies any history of polyuria or polydipsia over the last several months, but attests to generalized fatigue. Physical examination is normal.

1. How is diabetes mellitus (DM) diagnosed?

2. Best initial test for diagnosis of diabetes mellitus?

3. When is oral glucose tolerance testing indicated?

A. Routine diabetic screening
B. 14 weeks gestation
C. 26 weeks gestation
D. 30 weeks gestation

Answer:

4. When is metformin indicated?

5. When is a sulfonylurea indicated?

6. When are thiazolidinediones indicated?

7. When is insulin indicated, even initially?

8. 65-year-old woman with fasting glucose elevated at >126 mg/dL for the second time. Her HgA1c was measured at 10%. PE is normal; BMI of 32. Best initial therapy?

A. Glyburide
B. Metformin
C. Pioglitazone
D. Insulin

Answer:

9. 56-year-old man is admitted after breaking his hip. Has history. His treatment regimen consists of regular and glargine insulin. What would you recommend before surgery?

A. NPO from 9 P.M., stop regular insulin the morning of procedure and replace with half normal dose of glargine
B. NPO from 9 P.M., IV fluids with 5% dextrose and continue regular insulin and glargine dose the morning of procedure
C. NPO from 9 P.M., IV fluids with 5% dextrose and regular insulin via IV infusion
D. NPO from 9 P.M., IV fluids with 5% dextrose, and give half dose of regular insulin while holding glargine

Answer:

10. 47-year-old man with left ventricular hypertrophy and an EF 37% following a recent heart attack is diagnosed with diabetes. Most appropriate initial therapy?

    A. Metformin
    B. Sulfonylurea
    C. Thiaglitazone
    D. Basal insulin

    Answer:

11. Patient with BIM of 32 and FBS of 115. Best way to prevent onset of DM?

    A. Metformin decreased progression by 30-40%
    B. Diet and exercise decreases progression by 70%

    Answer:

12. 38-year-old woman is newly diagnosed with diabetes that has been uncontrolled despite intensive diet and exercise. Routine workup shows creatinine 2.1, BMI 31, and HgbA1c 8.4. Most appropriate therapy?

    A. Glipizide
    B. Glyburide
    C. Metformin
    D. Thiaglitazone
    E. Long-acting insulin

    Answer:

13. 24-year-old patient with fasting sugar of 140 mg/dl. Relatives have type 2. What is the best test to tell if DM is type 1 or type 2?

    Anti Glutamic acid dehydrogenase antibodies

Summary: Case 18

There are several ways to diagnose diabetes mellitus. Patients, who are symptomatic (polyuria, polydipsia) and have a random serum glucose >200 mg/dL, have a 2-hour postglucose load of >200 mg/dL, or have a fasting glucose of >126 g/dL, are considered to have diabetes mellitus. The preferred diagnostic test for diabetes mellitus is the fasting plasma glucose (FPG). For gestational diabetes or the diabetes associated with polycystic ovarian syndrome, the oral glucose tolerance test is the preferred test.

The best initial therapy in the treatment of diabetes mellitus is diet and exercise. The HgA1c should fall between 0.5–1.0% on an appropriate diet and exercise regimen. Patients with type 1 DM should be treated with insulin from the onset of their disease, because they have an absolute insulin deficiency. When patients with type 2 DM have persistently elevated glucose levels despite diet and exercise, oral hypoglycemic therapy should be started. In type 2 DM, metformin is the initial oral hypoglycemic of choice. In patients who are not obese, a sulfonylurea may be considered, but with updated guidelines; sulfonylureas have fallen out

of favor. In patients already on oral hypoglycemic therapy who need additional medication, the second medication should be metformin if the patient was initiated on a sulfonylurea. Thiazolidinediones are reserved for those patients on both metformin and a sulfonylurea who need further control. Another option is to add bedtime glargine or NPH insulin in these patients. Diabetics who present with symptomatic hyperglycemia that is >280 mg/dL may be started on insulin until better glycemic control is achieved. At that point, they may be switched to a regimen of oral hypoglycemic medications.

Goals for glycemic control include an HgA1c <7%, fasting plasma glucose between 90–130 mg/dL, and a peak postprandial glucose of <180 mg/dL.

Interventions in the Treatment of Type 2 Diabetes Mellitus

Intervention	Primary Mechanism of Action	Common Side Effects	Resulting Decrease in HgA1c (%)
Diet and exercise		Trauma	0.5–2.0
Metformin		GI upset, lactic acidosis	1.0–2.0
Sulfonylureas		Hypoglycemia, weight gain	1.0–2.0
Repaglinide		Hypoglycemia, weight gain	1.0–2.0
Acarbose		Flatulence, GI upset, weight gain	0.5–1.0
Thiazolidinediones		Edema, weight gain	0.5–1.0
Exenatide		Nausea, vomiting	0.5–1.0
Liraglutide		Abdominal discomfort, weight loss, pancreatitis	
Sitagliptin		Abdominal discomfort, pancreatitis	0.5–1.0

Note

What percent does each of the following reduce A1c by if taken properly?

Sulfonylureas 1%

Metformin 1%

Exenatide 1%

Note

In 5% of people what can metformin case?

Lactic acidosis

When is metformin contraindicated?

Serum Creatinine 1.4 in women, 1.5 in men; CHF no longer a contra-indication

Note

Patient is going for CT angio with contrast. What drug do you stop?

Metformin

When do you restart

48 hours after the CATH

Case 19

56-year-old woman with a history of type 2 diabetes mellitus. She is concerned about complications that may arise from her diabetes. She has no complaints. Physical examination: elevated blood pressure.

1. Best initial therapy?
   A. Hydrochlorothiazide
   B. Lisinopril
   C. Amlodipine
   D. Metoprolol

   Answer:

2. Major side effects?

3. How would you screen for diabetic nephropathy?

4. What are other causes of microalbuminuria?

5. What else is important in retarding the progression to renal failure?

The patient heard on the news that her diabetes can affect her eyes and cause blindness.

6. What would you recommend? Are there other conditions that cause blindness in diabetics?

The patient's friend told her that she is at higher risk for amputation.

7. What would you recommend to prevent that eventuality?

Several months later, this patient comes to the clinic complaining of a "burning" sensation in her feet bilaterally. On neurologic examination, you note decreased position and vibration sense and hyporeflexia of both patellar reflexes.

8. What is the most appropriate therapy at this time?

   A. Morphine
   B. Ibuprofen
   C. Acetaminophen
   D. Duloxetine

   Answer:

9. Patient with DM for 11 years on basal bolus regimen presents with hypoglycemic attacks after eating and vomiting. BS is widely varied. Diagnosis?

   Gastroparesis

   Best test

   Nuclear gastric emptying study

   Treatment?

   Small frequent meals with low fat and low in fiber

10. When is sildenafil indicated?

Your patient comes to the clinic complaining of fatigue and generalized weakness.

11. What would you do next? Why?

12. Patient with DM2 and elevated BUN/Cr of 40/3.7. What is the best medication

    Repaglinide

13. Italian male with diabetes and G6PD presents with HBA1C of 6.5 but with fasting sugars of 200. Why the difference?

    2/2 to hemoglobinopathy

14. AA male with MCV of 114 and HBA1C of 11 but fasting blood sugar of 118. Why the difference

    2/2 to decreased RBC turnover in Macrocytosis (low retic)

15. Pt with DM2 and TG of 1500 admitted with pancreatitis. What is the fastest way to control the triglycerides?

    Insulin

Note

Most common wrong answer is high fiber in gastroparesis.

They need low fiber as fiber slows digesting.

Summary: Case 19

In any diabetic patient with hypertension, the first-line therapy is an ACE inhibitor. The major side effects of ACE inhibitors are hyperkalemia, renal failure (especially in the context of renal artery stenosis), hypotension, and angioedema. Diabetic patients who cannot tolerate ACE-inhibitor therapy should be started on an ARB.

A spot urine for albumin and creatinine is the most effective way to screen for diabetic nephropathy. An albumin-to-creatinine ratio that exceeds 30 mg/dL is indicative of abnormal albuminuria. Hematuria, exercise, sustained upright posture, and GU tract infection are all causes of proteinuria. It is for this reason that diabetic proteinuria must be confirmed over a several-month period with repeat urinalysis. Tight glycemic control has been shown to reduce the incidence of the microvascular complications of diabetes. Retarding the progression to overt nephropathy requires tight blood pressure control to <120/80 mm Hg, reduced dietary protein intake, and tight glycemic control.

Diabetic patients have a higher rate of retinopathy than nondiabetics. Annual ophthalmologic evaluation is essential in preventing the progression of the retinopathy to blindness. Tight glycemic control is also important. It should be noted that diabetics also have a higher rate of cataracts and open-angle glaucoma, which are additional factors that predispose diabetic patients to loss of eyesight.

Inspection of the diabetic patient's feet at every visit, with education regarding proper foot hygiene, is important in preventing chronic ulceration that can lead to amputation. Regular podiatry evaluation is also recommended for the care of diabetic patient's feet.

Diabetic neuropathy is peripheral neuropathy characterized by a glove-and-stocking distribution. Autonomic neuropathy can manifest as gastroparesis, urinary incontinence, impotence, and orthostatic hypotension. Treatment of the peripheral neuropathy associated with diabetes consists of gabapentin, pregabalin, and the most recently approved anti-depressant duloxetine. Metoclopramide is given to treat nausea and vomiting associated with autonomic neuropathy of diabetes.

Diabetic patients with erectile dysfunction should be treated with sildenafil. The major contraindication to the use of sildenafil is concurrent use of nitrates.

Diabetics are at increased risk for the development of coronary artery disease. Additionally, they do not present with typical symptoms of CAD. Thus, any typical symptoms, such as fatigue, exertional shortness of breath, or abdominal pain, are indications for cardiac stress testing in any patient with diabetes. The presence of 2 risk factors for CAD in addition to diabetes is also an indication for stress testing, even in the absence of symptoms. Preventing the macrovascular complications of diabetes involves aggressive control of smoking, high cholesterol, and high blood pressure. Goals for lipid control include LDL <100 mg/dL, triglycerides <200 mg/dL, and HDL >45 mg/dL.

Case 20

54-year-old diabetic man complains of nausea, vomiting, and abdominal pain. He has not been taking his medications over the last several days. EKG was negative. Chemistries:

Na: 132	Cl: 97	Glucose: 763
HCO_3: 16	K: 5.4	ABG: 7.14/32/90

1. Diagnosis:

2. Next step?

3. When would you start a glucose infusion in this patient?

   A. Glucose <400
   B. Glucose <300
   C. Glucose <200
   D. Glucose <150

   Answer:

4. When would you initiate potassium infusion? Phosphate infusion?

5. How would you convert the IV insulin to subcutaneous insulin without causing hyperglycemia?

6. When is the answer hyperosmolar nonketotic coma?

7. Which of the following is an indication to delay initiation of insulin infusion?

   A. Anion gap <12
   B. Moderate urinary ketones
   C. Potassium 3.0
   D. Serum bicarbonate >18
   E. Venous pH >7.30

   Answer:

8. 48-year-old man comes for follow-up of his diabetes. He currently takes 24 units of glargine at night and 8 units of asparte insulin before meals. His finger stick log book is as follows:

   - AM 170-210
   - Pre-lunch 120-150
   - Pre-dinner 90-130
   - Pre-bed 65-80

   Next appropriate step in the management of this patient's insulin?

   A. Nothing, the patient is at goal most of the day
   B. Decrease glargine insulin
   C. Decrease pre-dinner asparte
   D. Increase pre-breakfast asparte

   Answer:

9. Patient returns for follow-up 3 months later. His finger stick log book is as follows:

   - AM 150-190
   - Pre-lunch 100-139
   - Pre-dinner 90-130
   - Pre-bed 85-120

10. Next appropriate step in the management of this patient's insulin?

    A. Nothing, the patient is at goal most of the day
    B. Decrease glargine insulin
    C. Decrease pre-dinner asparte
    D. Increase pre-breakfast asparte

    Answer:

11. Patient does well on glargine insulin and metformin. Repeat A1c shows increase. What's the next add on?

    Lispro insulin

Summary: Case 20

In the diabetic, who presents with nausea, vomiting, abdominal pain, and an anion gap metabolic acidosis on regular chemistries, diabetic ketoacidosis (DKA) is the most likely explanation. DKA occurs when there is a complete absence of endogenous insulin with unopposed action of the cortisol, glucagons, and catecholamines that induce the liver to produce ketoacids. This counterregulatory surge is usually induced by some physiologic stress, such as a myocardial infarction, stroke, or occult infection. Patients with DKA are severely dehydrated, are usually hypotensive, and require rapid and enormous amounts of normal saline. The reason for their dehydration is the osmotic diuresis induced by high levels of glucose present in their serum.

The next step in the management of any patient with DKA is to initiate IV-fluid therapy with normal saline or Ringer lactate. After starting IV fluids, the next step is to start an insulin drip. The reason for giving the insulin is to reduce and control the hyperglycemia, but more importantly to oppose the counterregulatory hormones and reduce the severity of the ketoacidosis. It is for this reason that you continue therapy with IV insulin despite normalization of the blood glucose until the anion gap/ketoacidosis resolves. Dextrose is added to the IV infusion when the glucose approaches 250 mg/dL. IV insulin should be continued until the anion gap resolves.

DKA can induce false elevations of potassium when in fact the patient's total body potassium is reduced. In patients with adequate urine output, normalizing renal function, and a potassium<5 mEq/L, potassium should be added to their IV infusion. Phosphorus is generally not given unless the patient has severe hypophosphatemia with signs of rhabdomyolysis, heart failure, or hemolysis.

Conversion to subcutaneous insulin should occur when the patient is beginning to eat. The first dose of subcutaneous insulin should be given 30–60 minutes before stopping the insulin infusion. In Type 2 DM, where insulin is present endogenously, it is very rare to develop DKA. Hyperosmolar nonketotic coma is a metabolic state characterized by hyperglycemia, hyperosmolarity, and an absence of metabolic acidosis. These patients tend to be more dehydrated, requiring a larger amount of fluid, and do not require IV insulin therapy.

Case 21

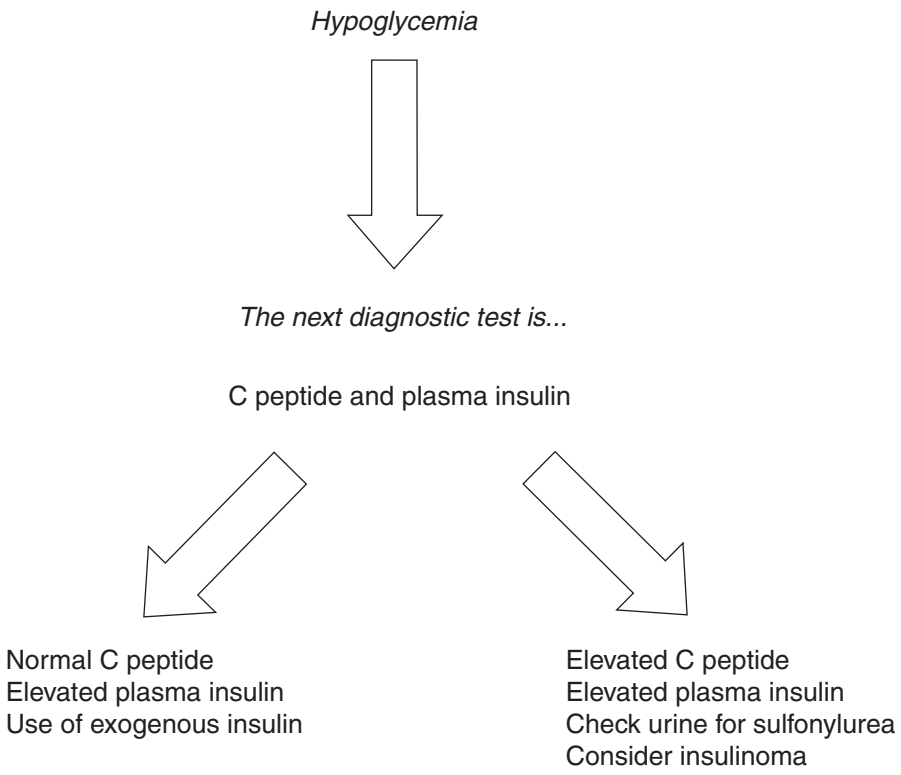
45-year-old woman is brought to the emergency department with complaints of confusion and anxiety. Her blood glucose is measured at 34 mg/dL.

1. Major causes of hypoglycemia?

Summary: Case 21

Patients who present with hypoglycemia can be divided into 3 groups.

1. Diabetics being treated with insulin or an insulin secretagogue. They should have their treatment regimen adjusted and their blood glucose monitored.
2. The second group consists of patients with an obvious systemic disease that predisposes them to low levels of blood glucose. End-stage liver disease, renal disease, sepsis, alcohol abuse, Addison disease, use of pentamidine, or a history of previous gastric surgery are all systemic disorders that can cause hypoglycemia. The management involves treating the underlying disease and providing adequate glucose.
3. In the apparently healthy adult, distinguishing between endogenous and exogenous insulin-caused hypoglycemia involves measurement of the insulin and C peptide in the plasma during a hypoglycemic episode. Elevated C peptide occurs in patients with insulinomas and patients who are taking sulfonylureas. Elevated insulin accompanied by normal level of C peptide implies that the patient is self-administering exogenous insulin.



Case 22

24-year-old woman complaining of a "hairy face." 1 year ago her voice began to deepen and her menstrual periods have become irregular. Significant for hair present on the upper lip and chin. You note severe acne and frontal balding. Patient is also obese.

1. When is laboratory workup indicated?

2. 38-year-old woman presents complaining of excessive course facial hair over the past 3 months. Serum testosterone level is elevated. Serum cortisol and ACTH are normal. Next step?

   A. ACTH stimulation test
   B. CT scan of the adrenal gland
   C. DHEAs
   D. Mechanical hair removal
   E. Spirinolactone

   Answer:

4. 27-year-old woman presents to the gynecologist complaining of irregular menstruations since puberty. Difficult to control hair on her face and abdomen. Blood tests return with a testosterone of 88. She has been married for 2 years. She has been trying to become pregnant without success. How to improve her fertility rate?

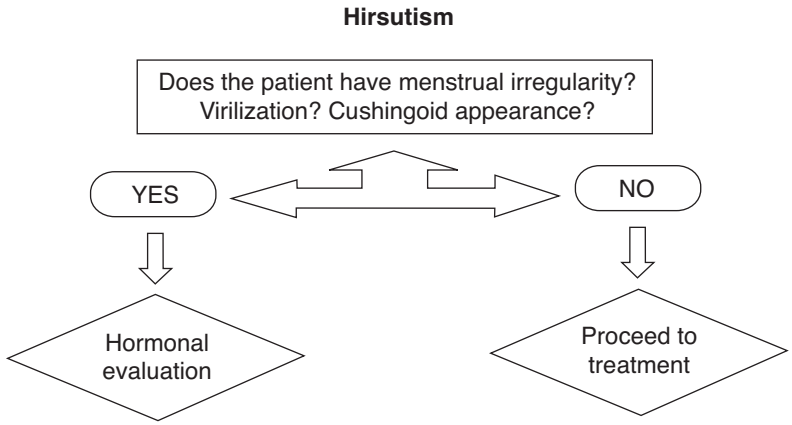
   A. Finasteride
   B. Spironolactone
   C. Oral contraceptives
   D. Metformin
   E. Nothing, just time

   Answer:

Summary: Case 22

Hirsutism is caused by increased concentration of the active metabolite of testosterone, dihydrotestosterone, in the skin. Testosterone is converted to dihydrotestosterone by the enzyme 5 α-reductase. Hirsute women have higher levels of 5 α-reductase than do nonhirsute women. The treatment of mild hirsutism usually consists of mechanical hair removal. Tumors of the ovary, Cushing syndrome, and adrenal tumors can cause hirsutism. Polycystic ovary syndrome is also a common cause of hirsutism. Hirsutism can be caused by various medications, including cyclosporine, steroids, danazol, diazoxide, or phenytoin. The decision to perform a hormonal evaluation is based on the likelihood of finding a serious underlying cause for the patient's hirsutism. The presence of virilization, irregular menses, manifestations of Cushing syndrome, or rapid progression of the hirsutism should prompt further investigation.

For mild hirsutism, treatment consists of mechanical hair removal. Antiandrogen therapy in the form of spironolactone is the medical treatment choice for hirsutism. Finasteride is a 5 α-reductase inhibitor that can be used for the treatment of hirsutism. For patients with polycystic ovary syndrome (PCOS), metformin is sometimes effective in restoring normal menses. If patients with PCOS want to become pregnant, clomiphene can be used to induce ovulation. Most recently, in addition to clomiphene, metformin has been shown to be effective at improving ovulation by 33%; it also improves the insulin resistance associated with PCOS. Likely, the insulin resistance is part of the underlying pathology for the anovulation in PCOS. Patients with congenital adrenal hyperplasia should be treated with antiandrogen therapy, such as spironolactone, cyproterone, or flutamide. In the pregnant female, *all* antiandrogen medication is contraindicated.



Elevated testosterone (>170 ng/dL) = Ovarian or adrenal tumor

Elevated DHEAS = Adrenal source of androgen

Elevated 17-hydroxyprogesterone = Congenital adrenal hyperplasia (21-hydroxylase deficiency)

Ratio of LH to FSH >2.0 = Polycystic ovarian syndrome

Elevated prolactin = Prolactinoma (causing amenorrhea, not hirsutism)

Elevated LH and FSH = Ovarian failure (causing amenorrhea, not hirsutism)

Case 23

38-year-old woman recently "lost" her regular menstruation. Menarche was at the age of 15; and she has had regular menstrual cycles until 1 year ago, when she noted that her cycle had become irregular. She has not had her period for 4 months. Physical examination normal.

1. First step in the workup of secondary amenorrhea?

2. Next step?

3. 32-year-old with amenorrhea for 5 months. She follows a strict diet, and runs 6 days a week in preparation for a marathon. Prolactin level is normal. LH and TSH levels are low. Next step?

   A. Advise cutting down on exercise
   B. Calcium and vitamin D supplementation
   C. MRI of the brain
   D. Progesterone challenge test

   Answer:

4. 24-year-old woman has not had a menstrual cycle for 7 months. Her menses stopped shortly after she began intense training for her college lacrosse team. Serum levels of FSH, LH, prolactin, and beta-hCG are WNL. Next step?

   A. MRI of the brain
   B. Perform a progesterone withdrawal test
   C. Measure TSH
   D. Observation

   Answer:

5. 34-year-old woman complains of severe aching pelvic and rectal pain that is constant and seems to begin 4–5 days before menses. Menstrual periods are also "extremely heavy." Pelvic examination reveals tender, indurated nodules in the cul-de-sac. Next step in the management?

   A. Exploratory laparotomy
   B. Pelvic ultrasound
   C. MRI of the abdomen
   D. Prescribe low-dose oral contraceptives

   Answer:

6. 23-year-old woman comes to your office complaining of irritability, bloating, ankle swelling, and depression that starts 10 days before her monthly menses. Physical examination is within normal limits. Treatment of her mood changes?

   A. Luteal phase danazol
   B. Fluoxetine
   C. A diet that incorporates complex carbohydrates
   D. Diazepam

   Answer:

Summary: Case 23

In evaluating a woman who complains of secondary amenorrhea, the first step is to rule out pregnancy with a beta-hCG. If the patient is not pregnant, a serum prolactin and TSH level should be checked to rule out hyperprolactinemia as the cause of the amenorrhea.

If the prolactin levels are elevated and the thyroid function studies are normal, the next step is to evaluate the pituitary for the presence of a prolactin-secreting adenoma. If the prolactin is within normal limits, the next step is to perform a progesterone withdrawal test.

If withdrawal bleeding is present, then the patient's amenorrhea is secondary to anovulation, most commonly associated with polycystic ovarian syndrome (PCOS).

If progesterone is given and there is no withdrawal bleeding, the next step is to check the LH and FSH levels. If LH and FSH are elevated, the amenorrhea is secondary to ovarian failure. If LH and FSH are found to be low or normal, the next step is to obtain an MRI of the brain to evaluate for CNS/pituitary dysfunction as the cause of the patient's amenorrhea.

Testing for the presence of an outflow obstruction as a cause of amenorrhea is indicated only when there is clinical suspicion of an anatomical problem (e.g., history of uterine surgery). In outflow tract defects, the prolactin will be normal and there will be no withdrawal bleeding even when estrogen **and** progesterone are given together.

Case 24

47-year-old man complaining of decreased desire to have sex with his wife. Diminished erections over the last several months. Physical examination decreased body hair and small testicles.

1. Best initial test?
   A. LH and FSH
   B. Prolactin
   C. Serum free testosterone
   D. Serum total testosterone
   E. Testicular ultrasound

   Answer:

2. Next most appropriate test in the workup?

3. 42-year-old man presents with decreased libido and gynecomastia. Examination reveals small testes. Serum testosterone is normal; however, LH and FSH are elevated. Is testosterone therapy indicated in this patient?

4. Most common sexual dysfunction is premature ejaculation.

5. Which medication can cause retrograde ejaculation SSRI?

6. 35 male has decreased libido and low testosterone levels. What's the next best test?

   FSH

7. pt with impotence and normal testosterone? Next step?

   Stamp test

8. Best initial test after couple comes to you with difficulty conceiving?

   Sperm analysis
   How many days must they abstain
   3 days prior to testing

9. Best way to manage ED with patient on nitrates?

   Penile tumescent devices

10. How soon after using sildenafil or tadalafil can nitrates be used

    24 hours after sildenafil

    48 hours after tadalafil

11. Amenorrhea: Primary- woman never had menarche, secondary- woman had menarche and then menstruation stopped

12. Hirsutism, acute vs. chronic 28/F with significant facial hair and abdominal hair above her belly button over the past 2 months; DHEA-s elevated, testosterone elevated; wtd next?

    Adrenal CT- r/o adrenal ca; 50% adrenal ca productive with DHEA-s, testo, and most commonly cortisol

    Just acute testosterone rise, scan ovaries

Summary: Case 24

Hypogonadism in males can be secondary to testicular failure (hypergonadotropic hypogonadism) or to an inability of the pituitary to secrete adequate amounts of LH and FSH (hypogonadotropic hypogonadism). The best initial test for the evaluation of hypogonadism is to measure the serum testosterone. If the testosterone returns abnormally low, the LH and FSH should be measured. Causes of testicular failure include Klinefelter syndrome, mumps infection, radiation therapy, and testicular trauma. Causes of pituitary failure of LH or FSH secretion in the male include alcohol abuse, leuprolide, Kallmann syndrome, hypothyroidism, hyperprolactinemia, and marijuana use.

Diagnosis	Testosterone	LH	FSH
Hypogonadotropic hypogonadism	Low	Normal or low	Normal or low
Hypergonadotropic hypogonadism	Low	High	High

In testicular failure with hypogonadism, the treatment is to replace testosterone. For hypogonadotropic hypogonadism, management involves evaluating for deficiency or excess of other pituitary hormones. The treatment will be determined by the specific etiology of the pituitary dysfunction.

Testosterone should be administered only to a man who has signs and symptoms of androgen deficiency *and* a distinctly subnormal serum testosterone concentration. Giving exogenous testosterone in a man with symptoms suggestive of hypogonadism, but whose testosterone concentration is normal, will not relieve symptoms and is not currently indicated, even if LH and FSH levels are above normal.

Primary

Pituitary Disease	Craniopharyngioma, Adenoma; low FSH/LH; + HA, visual disturbances
Mullerian Agenesis	Proximal 1/3 of vagina present; distal 2/3 vagina, uterus missing; ovaries are functional and estrogen normal➔ breast development
Testicular Feminization/Androgen Insensitivity	Atrophic/thin labia; small breast development; high testosterone; testes on CT scan visible
Pituitary Disease	HA, visual field disturbances
Imperforate Hymen	Painful, bulging vaginal mass monthly; lower abd pain monthly

Secondary

Pregnancy	Most common cause by far
Pituitary	Adenomas in adults primarily; s/p radiation Tx/surgery; PRLoma
PCOS	Most common pathologic cause in the US; hirsutism, elevated testo, DHEA-s, irregular menstruation since menarche; sonogram NOT NEEDED TO DX!
Thyroid Dysfunction	Hyper or hypothyroidism can cause menstrual abnormalities
Excessive exercise/low body fat	Collegiate or professional athletes if body fat < 4% body thinks woman is starving, and hypothalamic releases change
Psycho-social stressors	Psycho-social history should clarify

Hematology/Oncology

6

MICROCYTIC ANEMIA

Case 1

34-year-old woman comes to clinic for insurance forms. She is occasionally fatigued but otherwise healthy. Uses no medications. Examination normal. CBC (complete blood count): hemoglobin of 10 g/dL and hematocrit of 32%. MCV is 72 fl (low).

If THIS is in the history…	…THIS is the most likely diagnosis…	…And THIS is the best initial and most specific tests…	…And THIS is the best initial therapy
Blood loss, menstruation	Iron deficiency	Iron low, ferritin low, TIBC high	Iron replacement
	Chronic disease	Iron low, ferritin high, TIBC low	Correct underlying cause; erythropoietin for end-stage renal disease
	Sideroblastic anemia		
	Thalassemia	Normal iron studies, Electrophoresis	

1. Which of the following change first with iron replacement?

A. Hematocrit
B. RDW
C. Reticulocytes
D. Hemoglobin level

Answer:

2. A person with iron deficiency does not improve with oral ferrous sulfate. What would you do first?

   A. Blood transfusion
   B. Vitamin C
   C. Folate
   D. Intravenous iron

   Answer:

3. Which will decrease oral iron **absorption**?

   A. Orange juice
   B. Grapefruit juice
   C. PPI
   D. Pregnancy
   E. Blood loss

   Answer:

1. Which is the anemia of chronic disease?

	Iron Level (Normal 45–160)	TIBC (Normal 220–420)	Ferritin (Normal 20–320)
A.	34	450	12
B.	230	275	180
C.	32	440	140
D.	40	210	300

Answer:

2. 63-year-old woman is being evaluated for anemia. She drinks "socially" 6 nights a week. No symptoms. MCV 70. White cell count normal. Platelet count 636,000. Most likely cause of thrombocytosis?

   A. Essential thrombocytosis
   B. Alcoholism
   C. Iron-deficiency anemia
   D. Chronic myelogenous leukemia
   E. Sideroblastic anemia
   F. Anemia of chronic disease

   Answer:

3. Which of the following is most likely to be **Macrocytic**?

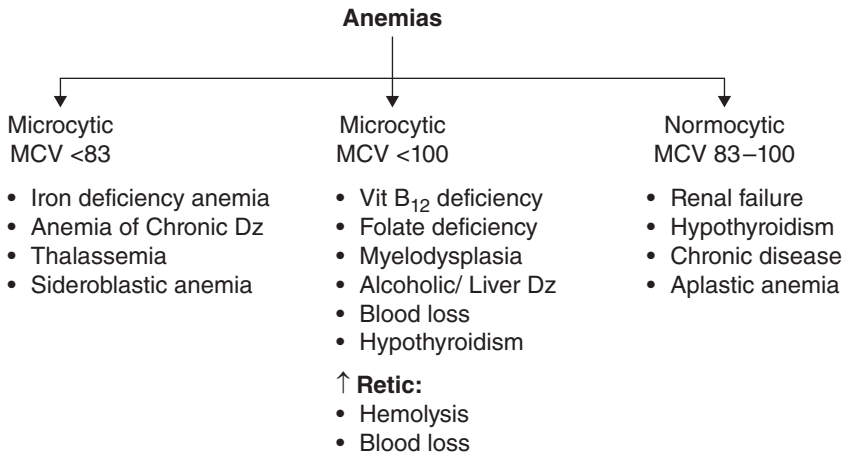
   A. Anemia of chronic disease
   B. Renal failure
   C. Hypothyroidism
   D. One gene deleted alpha thalassemia

   Answer:

NOTE

Iron deficiency

- Pica
- Pagophagia (eating ice)



4. 63 male with Hg 9 (normal 14-17 g/dl), MCV 72. Ferritin low. Stool negative for blood three times. What to do?

   A. No further evaluation needed
   B. Upper endoscopy
   C. Repeat stool test in one year
   D. Colonoscopy

   Answer:

5. Basophilic stippling is most likely to be found in:

   A. Sideroblastic anemia
   B. Folate deficiency
   C. Hemolysis
   D. Splenectomy

   Answer:

NOTE

Iron saturation is: Iron/TIBC
25%-45% normal

Summary: Case 1

It is very difficult to answer the question, "Which of the following is the most likely diagnosis?" of a microcytic anemia by history and physical examination alone. All forms of anemia give the same symptoms if they have an equal severity. Iron deficiency with a hematocrit of 22 gives the same symptoms as the anemia of chronic disease with a hematocrit of 22. A history of blood loss, heme-positive stools, and menorrhagia suggests iron deficiency. Thalassemia is suggested when the case shows a profoundly low MCV with relatively few symptoms. Alcohol overuse in the history suggests sideroblastic anemia, as does lead or isoniazid use. The smear is of very limited utility in the diagnosis of a specific cause of microcytic anemia. All of the causes are hypochromic.

Target cells are most likely associated with thalassemia and can be the answer to the question "What is the best initial test?" The problem with this answer is that alcoholism itself and liver disease can produce target cells as well. In general, microcytic anemia is a laboratory diagnosis. Do not memorize **anything** in physical examination to help you answer the diagnosis question. When preparing for your exam, **focus on the laboratory section**. Iron studies, in general, are the best way to distinguish between the different types of microcytic anemia.

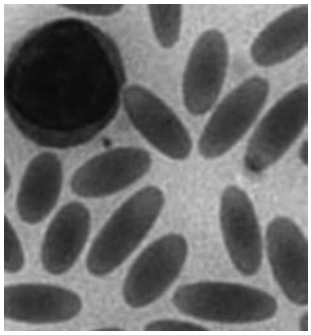
The most specific iron study for iron deficiency is a low ferritin, although it lacks sensitivity. The most specific iron study for sideroblastic anemia is a high iron, although it lacks sensitivity. Although it is rarely done, a bone marrow biopsy is the most accurate test for iron deficiency anemia. Ringed sideroblasts are the most specific finding for sideroblastic anemia, but they are not visible on routine blood smear. That is why the Prussian blue stain is the most specific test for sideroblastic anemia. The iron studies will be normal in thalassemia, and the most accurate test is the hemoglobin electrophoresis.

NOTE

Hepcidin is a gut peptide hormone that regulates iron absorption.

What is the name of this cell?

What causes it?



Case 2

78-year-old alcoholic man comes to hospital from nursing home for confusion, weakness, fatigue, and a pins-and-needles sensation in his hands and feet. He has continued to drink while in the nursing home. Hematocrit 30% and MCV is 122.

1. Diagnosis?
   - A. Alcoholism
   - B. B_{12} deficiency
   - C. Folate deficiency

   Answer:

2. What test next?

   A. B_{12} level
   B. Folate level
   C. Peripheral smear
   D. Methylmalonic acid level
   E. Homocysteine level
   F. Bone marrow biopsy
   G. Schilling test
   H. Anti-intrinsic factor and anti-parietal cell antibodies

   Answer:

NOTE

Phenytoin is associated with folic acid deficiency.

3. Most accurate diagnostic test?

   A. B_{12} level
   B. Folate level
   C. Peripheral smear
   D. Methylmalonic acid level
   E. Homocysteine level
   F. Bone marrow biopsy
   G. Schilling test
   H. Anti-intrinsic factor and anti-parietal cell antibodies

   Answer:

4. Best initial therapy?

   B_{12} or folate replacement

5. Most common initial complication of therapy?

   A. Metabolic acidosis
   B. Alkalosis
   C. Hypokalemia
   D. Hyperkalemia

   Answer:

6. Man comes for evaluation of fatigue. On exam, he is found to have decreased sensation in lower extremities. Hematocrit is 32, MCV 112. Smear shows hypersegmented neutrophils. B_{12} and folate levels are normal. Which is the most specific diagnostic test?

   A. Schilling test
   B. LDH (lactate dehydrogenase)
   C. Bone marrow
   D. Reticulocyte count
   E. Red-cell folate level
   F. Methylmalonic acid level

   Answer:

7. Man has developed anemia with MCV 115. Smear shows hypersegmented neutrophils. No neurologic symptoms. Which medication should be avoided?

   A. Alpha-methyldopa
   B. Vitamin B_{12}
   C. Antibiotics
   D. Quinidine
   E. Trimethoprim

   Answer:

8. Deficiency of which of these increases blood level of homocysteine?

   A. Folic acid
   B. Vitamin B_{12}
   C. Both

   Answer:

9. What medication decreases B_{12} absorption the most?

Summary: Case 2

Macrocytic anemia specifically means an elevated MCV. Megaloblastic anemia means that the MCV is elevated and the neutrophils are hypersegmented. Normally, the average number of lobes in each white cell is 3.5. If the average is >4 or if there is a single 6-lobed neutrophil, the diagnosis of megaloblastic is confirmed. Deficiency of vitamin B_{12} and folic acid cause almost all types of megaloblastic anemia. Myelodysplasia and certain medications, such as methotrexate, azathioprine, 6MP, 5FU, and folate antagonists such as trimethoprim, can also cause megaloblastic anemia. Simple macrocytosis or large cells can be seen with liver disease, alcoholism, hypothyroidism, and anything that leads to an increased reticulocytosis, such as blood loss and hemolysis. Reticulocytes are slightly larger than normal red cells.

After a peripheral smear confirms the presence of a megaloblastic anemia, levels of B_{12} and folate will help confirm a specific diagnosis. Methylmalonic acid levels are elevated in B_{12} deficiency but not in folate deficiency. Methylmalonic acid levels are most useful when you suspect B_{12} deficiency but the level is normal or equivocal. Schilling test is rarely necessary. Antibodies against intrinsic factor and parietal cells have sufficient accuracy in the diagnosis of pernicious anemia that if they are positive, the Schilling test is not necessary. Since B_{12} and folate deficiency are hematologically identical, treatment with folate can correct the hematologic abnormalities of B_{12} deficiency but not the neurologic abnormalities. Beware of the rapid development of hypokalemia when treating a severe megaloblastic anemia. Extremely rapid production of cells leads to the intracellular incorporation of potassium and hypokalemia.

NOTE

Iron: increased reticulocytes

HEMOLYSIS

If the case history says that the patient's anemia, or symptoms of anemia, have developed acutely (in hours to days), then it can only be **these** 2 types of problems: hemolysis and blood loss.

All forms of hemolysis have the following lab tests in common:

- Increased reticulocyte count
- Increased LDH
- Increased indirect bilirubin
- Decreased haptoglobin
- Normocytic (sometimes slightly macrocytic)

1. If hemolysis is **intravascular**, there will also be these other laboratory abnormalities:

2. Which hemolysis will show bilirubin in the urine?

Case 1

Man comes to ED because of several hours of severe chest, back, and thigh pain. He has a history of sickle-cell disease. He denies a history of cholelithiasis, osteomyelitis, or hip problems (aseptic necrosis). Temperature 36.6°C (98°F) orally. No ulcers on legs. Oximeter saturation of 100%.

1. Best initial test to confirm disease?
   A. Hemoglobin electrophoresis
   B. Bone marrow biopsy
   C. Reticulocyte count
   D. Peripheral smear
   E. LDH and bilirubin level

   Answer:

2. Most accurate test?
   A. Hemoglobin electrophoresis
   B. Bone marrow biopsy
   C. Reticulocyte count
   D. Peripheral smear
   E. LDH and bilirubin level

   Answer:

3. Best initial step?

   A. Oxygen, fluids, and analgesics
   B. Ceftriaxone
   C. Hydroxyurea
   D. Folate

   Answer:

4. When will antibiotics be the best initial step in management, besides when there is an obvious complaint or site of infection?

5. What antibiotic?

6. Several hours after starting therapy, patient develops dyspnea, worse chest pain, hypoxia, and a new pulmonary infiltrate. Troponin levels are normal.

   What will you do now?

   A. Heparin
   B. Antibiotics
   C. Exchange transfusion
   D. Hydroxyurea

   Answer:

7. In the following day or two, the man's hematocrit drops from 32 to 21 (excluding those associated with transfusion above).

   What is the most likely diagnosis?

8. Best initial test?

   A. IgM level
   B. Reticulocyte count
   C. IgG level
   D. Bone marrow biopsy
   E. PCR for DNA

   Answer:

NOTE

Howell-Jolly bodies occur when spleen is missing.

9. Most accurate test?
   A. IgM level
   B. Reticulocyte count
   C. IgG level
   D. Bone marrow biopsy
   E. PCR for DNA

   Answer:

10. Best initial therapy?

11. The following day, he is all better. What will you give him on discharge?

12. Sickle cell patient develops sudden HIP PAIN, what is the cause? What test?
   A. Osteomyelitis
   B. Bone infarct
   C. Bursitis
   D. Aseptic necrosis

   Answer:

Summary: Case 1

Sickle-cell disease gives painful crises of unclear etiology. Although hypoxia, acidosis, and infection lead to crises, you can still have a crisis in their absence.

The peripheral smear is the initial clue to the diagnosis because the homozygous disease will have sickled cells and AS disease or trait will not.

You do not have to routinely give antibiotics to all patients. Besides being given to patients with obvious infections, antibiotics are indicated just for a fever or an elevated white cell count because adult patients who have sickle-cell disease have no functioning spleen. Ceftriaxone or the fluoroquinolones, such as levofloxacin, moxifloxacin, or gemifloxacin, are good choices. Patients with life-threatening crises, such as a stroke, priapism, or lung involvement leading to pulmonary infarction and hypoxia, should undergo exchange transfusion.

Parvovirus B19 infection in the presence of a hemoglobinopathy is recognized when there is a sudden drop in the hematocrit that cannot be explained otherwise. Although the IgM antibody to parvovirus is fairly specific, the most specific diagnostic test is the PCR for parvovirus B19 DNA. Severe anemia secondary to parvovirus B19 is treated with intravenous immunoglobulins. For long-term management, all patients with sickle-cell disease should receive pneumococcal vaccination and folic acid supplementation. Those with frequent crises should also receive hydroxyurea to decrease the frequency of crises.

Although bone marrow transplantation can be curative for sickle-cell disease, it is rarely—if ever—performed in an adult.

Case 2

20-year-old man on hemoglobin electrophoresis, is found to have sickle-cell trait or heterozygous disease.

1. What would you find on CBC and smear?

2. Man wants to know what he can expect to happen to him. What do you tell him?

   A. Visual disturbance
   B. Splenic infarction
   C. Renal involvement
   D. Osteomyelitis
   E. Gallstones

   Answer:

3. Could this be SC (sickle-hemoglobin C) disease, and how will you distinguish it from SS (sickle-cell anemia) and AS disease?

4. What presentation is most unique for SC disease?

   A. Visual disturbance
   B. Splenic infarction
   C. Renal involvement
   D. Osteomyelitis
   E. Gallstones

   Answer:

5. Recently married couple each is HETEROzygous (AS) for sickle cell. What is the chance of homozygous (SS) child?

   A. 25%
   B. 50%
   C. 75%
   D. 100%

	A	S
A		
S		

Answer:

Summary: Case 2

Sickle-cell trait is most often a clinically silent disorder. The most common manifestation is painless hematuria and a renal tubular concentrating defect. Sickle-cell trait rarely gives a painful crisis, and this usually occurs only under conditions of extreme hypoxia, dehydration, and acidosis. SC disease is seen in a patient who is heterozygous for both sickle-cell disease and hemoglobin C. SC disease acts as if it were halfway between SS and AS diseases. There is anemia and reticulocytosis, but they are milder than with SS disease. There are painful crises with SC disease, but they occur less frequently and with fewer infections than with SS disease. The most characteristic feature of SC disease is the retinopathy. Life expectancy with SC disease is 20 years longer than with SS disease, and there is much greater preservation of spleen function.

Case 3

If THIS is in the history…	…Then THIS is the most likely diagnosis…	…And THIS is the best initial and most specific tests…	…And THIS is the best initial therapy
Collagen-vasc diseases, SLE, RA, CLL lymphoma, IBD, viral infections; drugs: penicillin, quinidine, methyldopa; 50% idiopathic	Autoimmune hemolysis, drug-induced	Coombs test	Steroids; splenectomy if recurrent; IV immunoglobulins if severe
Mycoplasma, EBV, lymphoma, CMV	Cold agglutinin disease	Coombs positive for complement Agglutination in the cold IgM antibody titer	
	Hereditary spherocytosis		Splenectomy; folic acid supplementation
	Hemolytic uremic syndrome (HUS)		
	Thrombotic thrombocytopenic purpura (TTP)		
	Glucose-6-phosphate dehydrogenase deficiency		
	Paroxysmal nocturnal hemoglobinuria		

Definition of abbreviations: CLL, chronic lymphocytic leukemia; CMV, cytomegalovirus; EBV, Epstein-Barr virus; IBD, inflammatory bowel disease; RA, rheumatoid arthritis; SLE, systemic lupus erythematosus.

1. Woman at 37 weeks of pregnancy with right upper quadrant abdominal pain and vomiting. BP 168/108 mm Hg, normal temperature, and modest peripheral edema. Her hematocrit is 25, with 16% reticulocytes, platelets of 24,000, schistocytes and fragmented cells on peripheral smear, and a urinalysis with marked proteinuria. AST and ALT elevated at 370 and 390. Prothrombin time and aPTT (activated partial thromboplastin time) are normal. What is the diagnosis, and what should you do about it?

   A. TTP; do plasmapheresis
   B. DIC; give platelets
   C. HUS; do plasmapheresis
   D. Pre-eclampsia; give hydralazine or labetalol
   E. HELLP syndrome; perform immediate delivery

   Answer:

Summary: Case 3

Given that all forms of hemolysis have an elevated reticulocyte count, LDH, and indirect bilirubin level, the emphasis in studying the other forms for hemolytic anemia is to assess what one or two things are unique about each one to allow you to decide on the best initial and the most accurate diagnostic tests.

Autoimmune hemolysis is idiopathic in up to half of cases, but it is difficult to ask you a Board question about the idiopathic type unless there is a positive Coombs test or negative tests for all the other diseases. Autoimmune hemolysis is suggested by the presence of other autoimmune diseases, such as SLE, rheumatoid arthritis, viral infections, and lymphocytic malignancies such as CLL or lymphoma. Autoimmune hemolysis is also suggested by the presence of allergen-stimulating medications in the history, such as penicillin, quinidine, alpha-methyldopa, or sulfa drugs. The best initial therapy for autoimmune hemolysis is the same as for the autoimmune disease, namely, steroids. If the hemolysis continues to recur, the best next step in management is splenectomy. Cold agglutinin disease is treated with rituximab or alkylating agents to shut off antibody production.

The most important thing to know about cold agglutinin disease is that it is **not treated with steroids or splenectomy**.

Hereditary spherocytosis is the cause of hemolysis most commonly associated with splenomegaly. This is because it is the type of hemolysis that is most often a chronic, long-term disorder. Splenomegaly needs time to develop. Although autoimmune hemolysis can be associated with the presence of spherocytes, hereditary spherocytosis has the greatest degree of increase in osmotic fragility.

Although hemolytic uremic syndrome (HUS) and thrombotic thrombocytopenic purpura (TTP) are really different spectra of the same disease, HUS is suggested by the presence of *E. coli* 0157:H7 on history. TTP is suggested by the additional presence of fever and neurologic abnormalities in an adult. Ticlopidine in the history suggests TTP. Both HUS and TTP are diagnosed by the clinical/laboratory triad (HUS) or pentad (TTP), and neither really has a unique specific test. Both are treated with plasmapheresis in adults.

TTP should not be treated with platelet transfusions.

Although sulfa drugs lead to hemolysis in glucose-6-phosphate dehydrogenase (G6PD) deficiency, the most common cause of hemolysis is **infection**. Remember that immediately after the hemolysis the G6PD level will be normal. Use the peripheral smear and the presence of Heinz bodies and bite cells to establish a diagnosis. Avoiding oxidant stress in this disorder is the only long-term management.

The most common cause of death in paroxysmal nocturnal hemoglobinuria (PNH) is **thrombosis**.

Do not choose Ham test or the sugar water test as the diagnostic test. Use the CD55-59 assay, which is the decay accelerating factor. Severe PNH is treated with eculizumab.

1. Which form of hemolysis is most likely to occur in men?

2. Which form of hemolysis is most likely to occur in men only? Check spelling? Check with author whether this is what he wanted?

Hemolysis Review Questions

1. A patient is post upper endoscopy and suddenly turns cyanotic and short of breath. EKG normal.

   ABG: pO_2 96, Pulse Oximeter: 85% saturation

   What is the diagnosis?

   What is the treatment?

2. Heinz bodies are found in:

   A. Sickle cell
   B. Alpha thalassemia
   C. Leukemia
   D. Cold agglutinin disease

   Answer:

3. 42 patient comes with dry cough bilateral interstitial infiltrates x-ray. After start of azithromycin, there is a drop in the hematocrit and the smear shows clumping of red cells. What is the most likely diagnosis?

   A. Autoimmune, warm IgG antibodies
   B. Autoimmune, cold IgM antibodies
   C. Glucose 6 phosphate dehydrogenase deficiency
   D. Hereditary spherocytosis
   E. Hemolytic uremic syndrome (HUS)

   Answer:

4. 23 African-American with sickle-cell disease comes with rhinorrhea with clear discharge. Hematocrit drops from 36% to 28%; and platelets drop to 75,000. No rash, but there are severe joint pains. What is the most likely diagnosis?

   A. Acute rheumatoid arthritis
   B. Drug reaction
   C. Parvovirus infection
   D. Allergic reaction
   E. Splenic sequestration

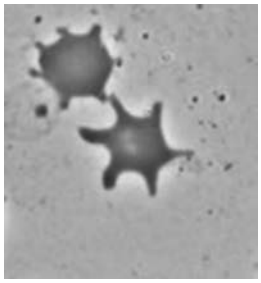
   Answer:

Summary

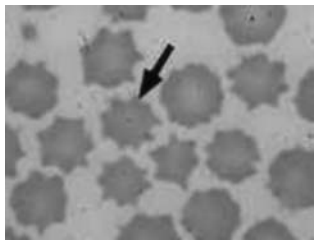
The presence of Heinz bodies on smear after the use of a sulfa medication indicates glucose 6 phosphate dehydrogenase deficiency. Splenomegaly with bilirubin gallstones and increased osmotic fragility indicate the presence of hereditary spherocytosis. Mycoplasma pneumonia is associated with IgM cold antibodies. Sickle cell disease and other forms of hemoglobinopathy put a patient at risk of parvovirus B19 infection. Parvovirus also causes arthralgia.

Methemoglobinemia is an idiosyncratic reaction to anesthetics such as the benzocaine for upper endoscopy or bronchoscopy. The patient becomes cyanotic with dissociation between pO_2 and oxygen saturation. The saturation is even lower than would be expected from the pO_2.

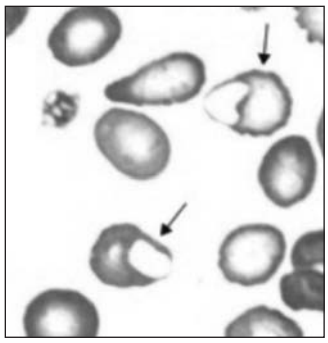
Acanthocytes = SPUR cell = Liver disease



Echinocytes = BURR cells = Uremia/Low Erythropoietin



BLISTER cells = Bite cells



Which of these has schistocytes?

A. ITP
B. DIC
C. Autoimmune
D. Thalassemia
E. Spherocytosis

Answer:

LEUKEMIAS

Case 1

70-year-old man with fatigue over last several months. Spleen is normal. CBC reveals a pancytopenia that is mild. MCV is mildly elevated and reticulocyte count low. Smear shows oval cells. No hypersegmentation to neutrophils, although some are bilobed. Very small number of blasts are seen (<1%). B_{12} and folate levels are normal. Bone marrow shows a hypercellular marrow with ringed sideroblasts on Prussian blue stain and a small number of blasts (<5%).

1. Diagnosis?

2. What will you see on smear?

3. Most important measure of severity or prognosis described?

   A. Platelet count
   B. Hematocrit
   C. Presence of hypersegmentation
   D. Percentage of blasts

   Answer:

4. Most common cause of death?

   A. Bleeding and infection
   B. Acute myelogenous leukemia
   C. Acute lymphocytic leukemia
   D. Leukostasis reaction
   E. Lymphoma

   Answer:

5. Best initial and most effective therapies?

Summary: Case 1

Myelodysplasia is a clonal stem-cell disorder resulting in a hypercellular marrow with pancytopenia. It can resemble B_{12} and folate deficiency and gives an elevated MCV as well as possible megaloblastic changes. The peripheral smear is characterized by macro-ovalocytes as well as the bilobed Pelger-Huet abnormality. The main prognostic factor is the number of blasts. As the number of blasts increases, the disease acts more like acute myelogenous leukemia. The most common cause of death, however, is not AML but rather infection and bleeding from bone marrow failure. Although only 20% of patients respond, it is important to give a trial of erythropoietin. In patients under age 60 with severe disease, allogeneic bone-marrow transplantation may be curative. It is associated with deletions of chromosome 5q and 7.

Case 2

56-year-old woman comes because of fever of 38°C (100.5°F), progressive fatigue, and easy bruising. She was born in Nagasaki in 1945, went to the University of Chernobyl, and worked briefly in Bhopal, India. She is currently a benzene taste-tester in a radon detection company. WBC count 3,000, hematocrit 23, platelet count 34,000.

1. Diagnosis?

2. What test would you do first to confirm her diagnosis?

Diagnosis	**Acute Myelogenous Leukemia (AML)**	**Acute Lymphocytic Leukemia (ALL)**
Specific diagnostic tests		
Treatment		

3. Most important indicator of prognosis in this patient? And what is the impact of that on management?

4. When is ATRA (all-trans retinoic acid) indicated?

5. What therapy in a patient who has relapsed after first remission?

Summary: Case 2

Acute leukemia presents with the signs of pancytopenia, such as fever, infections, fatigue from the anemia, and increased bleeding from the low platelet count. Although more than half of patients with acute leukemia may have a normal or elevated white cell count, the cells are not functioning normally and the patients still have infections. The presence of >20% blasts helps distinguish acute leukemia from other causes of pancytopenia. Stains such as Sudan black, myeloperoxidase, and Auer rods can point to a diagnosis of acute myelogenous leukemia, but using monoclonal antibodies to look for specific antigens is more specific. Daunorubicin (or idarubicin) combined with high-dose cytosine arabinoside (ARA-C) is the most common regimen used in this disorder. Bone marrow transplantation is used in any patient who relapses after initial induction chemotherapy. The hardest question is whether or not to do a transplantation after the initial induction therapy. Primary transplantation is performed initially after chemotherapy when there is the presence of poor cytogenetic markers, such as 9:22 translocation in ALL as well as monosomy 5 and 7 in AML.

43-year-old woman with fever, leukocytosis, and erythematous plaques and nodules on face/extremities. Lesions are tender.

Biopsy shows dense neutrophilic infiltrates. Blood smear shows blasts.

What is the diagnosis?

Case 3

> Man comes because of left upper quadrant pain, early satiety, and fatigue. He has left upper quadrant tenderness and enlarged spleen. CBC reveals a white blood cell (WBC) count of 85,000.

1. Best initial test?

   A differential of the white cell count, which in this case reveals 91% neutrophils

2. Most likely diagnosis?

3. What else on the CBC is characteristic of this disorder?

   Increased basophils and occasionally an elevated platelet count

4. Most accurate diagnostic test?

   A. Bone marrow biopsy
   B. Philadelphia chromosome (BCR/ABL) by PCR
   C. Leukocyte alkaline phosphatase (LAP) score
   D. Beta 2 microglobulin level
   E. Abdominal CT scan

   Answer:

5. Best initial therapy?

   A. Bone marrow transplantation
   B. Interferon
   C. Imitanib (Gleevec®)
   D. Hydroxyurea
   E. Busulfan

   Answer:

6. The following day, before you are able to give any therapy, the patient begins to complain of headache, dyspnea, confusion, and priapism. His white cell count has risen to 218,000.

   What is the best immediate therapy for this man?

7. What other therapy will lower the WBC count?

8. When is busulfan indicated?

Summary: Case 3

Chronic myelogenous leukemia is diagnosed when you find an elevated white-cell count that is mostly neutrophils and a reactive leukemoid reaction has been excluded. The leukocyte alkaline phosphatase will be elevated in reactive leukocytosis but will be decreased with a leukemia. The Philadelphia chromosome will be present in chronic myelocytic leukemia (CML). Initial therapy of CML is with the tyrosine kinase inhibitor imatinib or Gleevec. There is an excellent hematologic response in as many as 90% of cases, and the Philadelphia chromosome becomes negative in as many as 60%. If this response is not sustained, then all patients under the age of 50 with a matched donor should undergo transplantation before the disease converts into acute leukemia.

Interferon is no longer used. It has far less efficacy and far more adverse effects.

Case 4

74-year-old man for routine visit. No specific complaints, beyond a little fatigue. Normal physical exam with no organomegaly. 45,000 white cells that are 98% lymphocytes. Platelet count and hemoglobin are normal. CD5 and CD23 are positive.

1. Most likely diagnosis?

2. Best therapy?
   A. No treatment necessary
   B. Fludarabine
   C. Melphalan
   D. Chlorambucil
   E. Bone marrow transplantation

   Answer:

Case 5

60-year-old man with fatigue and anemia. Coombs test is negative, but you are concerned about the palpable lymph nodes and the white count of 80,000 lymphocytes.

1. Best therapy?
   A. No treatment necessary
   B. Fludarabine
   C. Melphalan
   D. Chlorambucil
   E. Bone marrow transplantation

   Answer:

Summary: Cases 4–5

The therapy for CLL depends upon the stage of the disease. In older patients with early stage-zero or stage-one disease, there is no evidence that treatment alters survival. Older patients with severe disease can be treated with chlorambucil and prednisone as palliation to reduce the cell count. Advanced-stage disease in relatively younger patients (<70) is treated with fludarabine. There is virtually no use of bone marrow transplantation in CLL because the patients are too old to survive an allogeneic transplantation.

Case 6

55-year-old man with gradual onset of fatigue, early satiety, and abdominal pain. Exam massive splenomegaly. CBC shows a pancytopenia, and a bone marrow biopsy shows an inaspirable dry tap.

1. Diagnosis?

2. Most specific diagnostic test?

3. Therapy?

Summary: Case 6

Pancytopenia has a large differential, including any metastatic cancer to the marrow; infections, such as tuberculosis; fungi invading the marrow SLE; HIV; paroxysmal nocturnal hemoglobinuria; and viruses, such as EBV, CMV, and hepatitis B and C. Most of these will be diagnosed by the bone marrow biopsy. When there is a dry, inaspirable marrow combined with splenomegaly and the absence of blasts in a middle-aged male patient, your answer as the most likely diagnosis should be hairy cell leukemia. Aplastic anemia should not have splenomegaly. Splenic sequestration would be associated with a fully productive marrow. Hairy cell is confirmed by finding the cytoplasmic projections on the lymphocytes as well as immunotyping of the cells. The treatment of hairy cell leukemia is 2-CDA or cladribine.

CLL Review Questions

1. 71-year-old man admitted for hernia repair. White cell count is 30,500 with 79% lymphocytes. There are **smudge cells** visible on smear. Platelet count is 146,000, hematocrit 37%. Bone marrow biopsy shows that 70% of marrow is replaced with lymphocytes.

   Best management?

   A. Observation
   B. Chlorambucil
   C. Fludarabine
   D. Prednisone
   E. Bone marrow transplantation

   Answer:

2. 73-year-old man with CLL has recurrent episodes of streptococcal pneumonia. White cell count is 30,000. What is the etiology?

   A. Effects of chemotherapy
   B. Bone marrow infiltration
   C. Hypogammaglobulinemia
   D. Neutrophil dysfunction

   Answer:

3. 78-year-old man with CLL has palpable spleen and anemia with a reticulocyte count of 8%. What is the treatment of his anemia?

   A. Splenectomy
   B. Erythropoietin
   C. Interferon alpha
   D. Prednisone

   Answer:

Summary

Smudge cells are a sign of CLL. The nucleus of the cells is fragile; and when the cover slip is placed, it ruptures the cells so they appear 'smudged'. Stage 0 CLL is the presence of an elevated white cell count only. This does not require specific therapy for the CLL. The main reason people with CLL have recurrent bacterial infections is that the lymphocytes do not produce antibodies. These patients are often treated with monthly infusions of intravenous immunoglobulins. CLL is also associated with Coomb positive hemolytic anemia. This is treated with prednisone. The key to knowing it is autoimmune hemolysis is the elevated reticulocyte count. If anemia is from progression of the CLL, the reticulocyte count will be low.

MYELOPROLIFERATIVE DISORDERS

Case 1

60-year-old man comes because of headache, dizziness, blurred vision, and fatigue. Generalized pruritus, which is especially severe after he comes out of the shower. Does not smoke. Exam: splenomegaly and some dried blood in the nostrils. Hematocrit 62, MCV is 75, white cell count is 19,000, and platelet count is 700,000.

1. Diagnosis?

2. What information in history and physical suggests primary polycythemia?

   A. Pallor
   B. Erythema
   C. Splenomegaly
   D. Lymphadenopathy

   Answer:

3. What tests will you perform first?

   - *Arterial blood gas on room air to exclude hypoxia as a cause of the increased hematocrit*
   - *Renal ultrasound to exclude an erythropoietin-secreting cyst or tumor*
   - *The erythropoietin level should be decreased and the B_{12} level*

4. Most accurate diagnostic test?

   A. BCR-ABL
   B. JAK-2
   C. Myeloperoxidase
   D. Smudge cells
   E. CBC

   Answer:

5. What medication can cause a hematologic picture like this one?

   A. Testosterone
   B. Growth hormone
   C. Erythropoietin
   D. None

   Answer:

6. Best initial therapy?

7. Best medical therapy if patient does not respond?

8. Most common cause of death?

Summary: Case 1

Polycythemia can occur as a reaction to hypoxia, so the first step in diagnosing polycythemia vera is to find an oxygen saturation >92% on room air. Reactive polycythemia is not associated with splenomegaly or an elevation of the white cell or platelet count. In addition, there are only 3 causes of a microcytic erythrocytosis: polycythemia vera, thalassemia, and hypoxia. After excluding hypoxia, an elevated red cell mass confirms the diagnosis.

The most common cause of death in polycythemia vera cases is thrombosis. The mainstay of therapy is phlebotomy. If phlebotomy does not control the red cell count, or if the white cell and platelet counts are very high, then hydroxyurea will help lower the cell counts. Although testosterone can cause an elevated red cell count, it should not elevate either the white cell or platelet count. In addition, reactive erythrocytosis and testosterone effect on the marrow will not enlarge the spleen.

Case 2

73 with polycythemia vera well maintained with phlebotomy for several years. Hematocrit lower over last several months. Now very tired. Spleen big. Hematocrit 28% Blood smear: teardrops shaped cells. Nucleated red cells.

1. Most likely etiology?
   A. Parvovirus B_{19}
   B. Myelofibrosis
   C. Hemolysis
   D. Splenic sequestration

   Answer:

2. What is the therapy?
   A. IVIG
   B. Steroids
   C. Lenalidomide
   D. Hydroxyurea

   Answer:

Case 3

55-year-old woman comes because of painful burning of her hands. Hands are red and there is mild splenomegaly. CBC reveals platelet count of 1,400,000, white blood cell count of 14,000. Hematocrit is normal.

1. Diagnosis?

2. Most common complication of this disorder?

   A. Bleeding
   B. Thrombosis
   C. Both bleeding and thrombosis
   D. Transformation to acute myelogenous leukemia

   Answer:

3. Therapy?

4. Which of the following is most likely to progress to acute leukemia within 5 years?

   A. Polycythemia vera
   B. Essential thrombocythemia
   C. Chronic myelogenous leukemia
   D. Chronic lymphocytic leukemia

   Answer:

5. 34 man with 750,000 platelets on CBC done for other reasons. Feels well. Takes no meds. What to do?

   A. Anagrelide
   B. Hydroxyurea
   C. Observation
   D. Steroids
   E. Thrombopheresis

   Answer:

Summary: Case 3

Essential thrombocytosis is an uncommon disorder in patients over age 50. It presents with either bleeding or thrombosis. If the patient is asymptomatic or has only the painful, red hands known as erythromelalgia, then anagrelide is the best therapy to lower the platelet count with aspirin to control the erythromelalgia. If your question shows a patient who is over the age of 65 with thrombosis, then your answer is hydroxyurea and aspirin. It is better to avoid hydroxyurea in people under age 65 because of the risk of possible secondary malignancy. If your patient presents with bleeding and an extremely high platelet count, then thrombopheresis is the answer.

Which of the following causes of leukocytosis will have a normal vitamin B_{12} level?

A. CML
B. Leukemoid reaction
C. Polycythemia vera

Answer:

PLASMA CELL DISORDERS

Case 1

62-year-old man with sharp pain in his chest when he coughs. X-rays of his ribs reveal several fractures as well as several lytic lesions. Hemoglobin 9, mildly elevated calcium level of 11.7, creatinine 1.8, total protein elevated.

1. Diagnosis?

2. Most specific diagnostic test?

   A. Serum protein electrophoresis
   B. Urine electrophoresis for Bence-Jones protein
   C. Bone marrow biopsy
   D. Skeletal survey
   E. Peripheral smear

   Answer:

3. What other laboratory abnormalities are associated with this disorder?

   Bence-Jones protein in the urine, an elevated beta-2 microglobulin, hyperuricemia, elevated ESR (erythrocyte sedimentation rate), low anion gap, rouleau formation of red cells on peripheral blood smear, and suppression of the other immunoglobulin lines (such as IgM or IgA) on the SPEP

4. Most effective therapy?

   A. No treatment
   B. Melphalan, prednisone, lenalidomide
   C. Thalidomide
   D. Autologous stem cell transplant
   E. Vincristine, adriamycin, dexamethasone

   Answer:

Summary: Case 1

Autologous stem cell transplantation is attempted in patients with myeloma who are under the age of 70. The degree of immunosuppression and the duration of absolute neutropenia are far less with autologous transplantations than with an allogeneic transplantation. Mortality in a bone marrow transplantation is directly related to the duration of the neutropenia. Stem cells engraft much sooner and result in a viable bone marrow and resolution of cytopenias in a few days. In addition, there is no graft-versus-host disease with autologous transplantation. This is why transplantation can be performed even in older patients.

Case 2

You are evaluating a 72-year-old man because of an elevated total protein found on a routine blood test. He has a monoclonal spike of 3.2 g/dL. Hemoglobin, calcium level, and urine for Bence-Jones protein are normal. Skeletal survey normal, and bone marrow biopsy reveals 4% plasma cells.

1. Diagnosis?

2. Management?
   A. No treatment
   B. Melphalan and prednisone
   C. Thalidomide
   D. Autologous stem cell transplant
   E. Vincristine, adriamycin, dexamethasone

   Answer:

Summary: Case 2

As the population ages, monoclonal gammopathy of uncertain significance (MGUS) is only going to become more common because it is a disease seen almost exclusively in those above the age of 70. You recognize the case because of an increased total protein that, on electrophoresis, is found to have an elevated monoclonal spike. The size of the spike is lower than that of myeloma. MGUS does not have any of the usual manifestations of myeloma, such as bone lesions, hypercalcemia, Bence-Jones protein in the urine, or renal failure. In addition, there will be <10% plasma cells in the marrow. Although 1% of MGUS cases per year progress to myeloma, you cannot predict which cases will do so. There is no effective therapy.

Case 3

67-year-old man with fatigue, confusion, vertigo, and blurry vision. Retinal veins are engorged. Hematocrit 32 and total protein elevated. Head CT scan and calcium levels are normal. Protein electrophoresis shows IgM monoclonal spike. Skeletal survey is normal. No Bence-Jones protein in urine.

1. Diagnosis?

2. Therapy?
   A. Steroids
   B. Plasmapheresis
   C. Fludarabine
   D. Melphalan

   Answer:

Summary: Case 3

Waldenström macroglobulinemia has many similarities to myeloma in that it presents with an elevated total protein with a monoclonal IgM spike. One of the main differences is that the spike is IgM, not IgG. Unlike myeloma, there are no bone lesions, hypercalcemia, Bence-Jones proteins, or renal failure. The only clear therapy is plasmapheresis for the hyperviscosity syndrome. This patient has confusion and blurry vision, which suggests the need to rapidly reduce the serum viscosity with plasmapheresis. Long-term therapy is less clear. You can treat with chlorambucil and prednisone or fludarabine, as with CLL, or with cladribine.

APLASTIC ANEMIA

Case 1

48-year-old woman admitted to hospital for fatigue, easy bruising, and multiple recent infections. No past medical history. Uses no medications. Spleen is normal in size. Pancytopenia on CBC.

1. What tests will you perform?

   HIV, EBV, CMV, hepatitis B and C serology, ANA, and B12 and folate levels

2. Most sensitive test?

3. Best therapy?

   A. Autologous bone marrow transplant
   B. Allogeneic bone marrow transplant
   C. Cyclosporine and antithymocyte globulin
   D. Adriamycin and methotrexate

   Answer:

4. Best therapy if she were older (>50)?

   A. Autologous bone marrow transplant
   B. Allogeneic bone marrow transplant
   C. Cyclosporine and antithymocyte globulin
   D. Adriamycin and methotrexate

   Answer:

5. 48-year-old woman lives with her father and a 12-year-old boy who are healthy. The woman has recently undergone an allogeneic bone marrow transplantation for leukemia. She is maintained on prednisone, sirolimus, and azathioprine. Which of the following should **NOT** be used in this family?

   A. Tetanus vaccine
   B. Pneumococcal vaccine
   C. Influenza vaccine
   D. Oral polio vaccine
   E. MMR

   Answer:

6. Deficiency of which of the following vitamins causes pancytopenia?

   A. B_{12}
   B. B_6
   C. C
   D. B_1

   Answer:

7. Woman comes for evaluation of fatigue. CBC reveals anemia, low platelet count, and leukopenia. Which is the most likely etiology?

   A. Cobalamin deficiency
   B. Disseminated intravascular coagulation
   C. Autoimmune thrombocytopenic purpura
   D. Cirrhosis

   Answer:

Summary: Case 1

Aplastic anemia can be caused by a number of toxins, such as benzene, chemotherapeutic agents, and radiation. Several viral infections can also lead to aplastic anemia, such as CMV, EBV, HIV, and hepatitis B or C. If a patient does not have any of these, the disorder is from abnormal function of the T-killer cell. The best treatment in patients who are under age 50 and have a matched donor is allogeneic bone marrow transplantation. If transplantation is not possible, then T-cell suppressive therapy with cyclosporine and antithymocyte globulin is the treatment.

LYMPHOMA

Case 1

22-year-old man with several weeks of increasing neck pain and swelling. No past medical history. Uses no medications. No other complaints besides the isolated neck mass. The mass is in the cervical area and is nontender and rubbery. The lesion persists despite the use of antibiotics over the next 10 days.

1. Next step in management of this patient?

2. What other diagnostic testing is appropriate for this patient?

   Chest x-ray, chest/abdomen/pelvic CT scans, bone marrow biopsy and LDH level. Lymphangiography and laparotomy are no longer used.

3. Which type of Hodgkin has **best** prognosis?

   A. Lymphocyte predominant
   B. Lymphocyte depleted
   C. Mixed cellularity
   D. Nodular sclerosing

   Answer:

4. Which type has **worst** prognosis?

   A. Lymphocyte predominant
   B. Lymphocyte depleted
   C. Mixed cellularity
   D. Nodular sclerosing

   Answer:

5. If all the **other tests are normal**, what is the best initial therapy for this patient?

   A. Radiation therapy
   B. ABVD chemotherapy
   C. CHOP chemotherapy
   D. Bone marrow transplantation

   Answer:

6. What is the best therapy if the diagnostic tests **do** find other disease?

   A. Radiation therapy
   B. ABVD chemotherapy
   C. CHOP chemotherapy
   D. Bone marrow transplantation

   Answer:

7. What is the therapy if the patient **relapses after radiotherapy**?

   A. Radiation therapy
   B. ABVD chemotherapy
   C. CHOP chemotherapy
   D. Bone marrow transplantation

   Answer:

8. What is the therapy if he **relapses after chemotherapy**?

   A. Radiation therapy
   B. ABVD chemotherapy
   C. CHOP chemotherapy
   D. Bone marrow transplantation

   Answer:

9. If the patient has received chemotherapy and is pancytopenic and in need of a blood transfusion, what type of transfusion should he receive?

Summary: Case 1

The diagnosis of lymphoma is the presence of adenopathy that is not warm or tender. An excisional biopsy is necessary because a needle biopsy will reveal only normal-looking lymphocytes. After you find the Reed-Sternberg cells characteristic of Hodgkin disease, then the key is to make sure that the disease is localized to just one or two lymph node groups (stage I or II). Radiation is used to treat localized stage I and II disease. The other stages or the presence of "B" symptoms, such as fever, weight loss, or night sweats, indicate the need for chemotherapy with ABVD (Adriamycin [doxorubicin], bleomycin, vinblastine, dacarbazine). MOPP (mechlorethamine, vincristine, procarbazine, prednisone) was used in the past but is associated with an unacceptably high rate of developing aplastic anemia and leukemia. Laparotomy and lymphangiography are no longer used as a routine part of staging evaluation.

1. Patient underwent **radiation** for Hodgkin disease 10 years ago. Which is the patient at greatest risk for?

   A. Acute leukemia
   B. Lung cancer
   C. Brain cancer
   D. Ovarian cancer

   Answer:

2. Patient underwent chemotherapy for Hodgkin disease 10 years ago. Which is the most common treatment-related complication?

   A. Breast cancer
   B. Lung cancer
   C. Acute leukemia
   D. Hypothyroidism

   Answer:

Case 2

47-year-old woman comes with fever and weight loss. She gets up at night to change her sheets because they get soaked through with sweat. Lymph nodes palpable in cervical and axillary region. Abdominal and pelvic CT scans are normal. Excisional lymph node biopsy reveals diffuse, large B-cell non-Hodgkin lymphoma. LDH level is elevated. Bone marrow biopsy reveals the same lymphoma.

1. Best next step in the management of this patient?

   Start treatment; more tests won't change therapy

2. Best initial therapy?

3. What further tests alter her management?

4. What to do differently if these further tests were positive?

5. What would you do for her if she relapses after the initial therapy?

   A. Re-treat with CHOP
   B. Switch to ABVD
   C. Radiation therapy
   D. Bone marrow transplantation

   Answer:

Summary: Case 2

Non-Hodgkin lymphoma is almost always treated with chemotherapy with CHOP because 80 to 90% of patients present with stage III or IV disease. Rituximab is an anti-CD20 antibody, and it is used with any form of non-Hodgkin lymphoma that expresses this antigen.

Sterility is extremely common in both men and women after chemotherapy. Myelodysplasia and acute leukemia can occur even years after the end of chemotherapy. Radiation treatment can lead to hypothyroidism, accelerated coronary disease, and pericarditis. Lymphoma is also associated with Coombs positive hemolytic anemia. The case will describe an elevated reticulocyte count and spherocytes on smear. Remember that autoimmune hemolysis is also associated with spherocytes as the antibodies remove pieces of the red cell membrane. Interestingly, although non-Hodgkin lymphoma presents in stage III or IV MUCH more often than Hodgkin disease, systemic symptoms are more common with Hodgkin disease.

TRANSFUSION REACTIONS

Case 1

Man with non-Hodgkin lymphoma has become severely pancytopenic after chemotherapy in preparation for autologous bone marrow transplantation. During transfusion he experiences chills, fever, dyspnea, back pain, and dark urine.

1. What is the reaction?

   Major blood group ABO incompatibility

2. Next step in management of this case?

   Stop the transfusion. Recheck the blood type. Hydrate the patient and consider forced diuresis with mannitol. Possible use of bicarbonate.

3. What type of blood transfusion should you use in this patient in the future?

   A. Whole blood
   B. Packed red blood cells
   C. Filtered
   D. Filtered and irradiated
   E. IgA deficient donor blood

   Answer:

4. How will you recognize a minor blood group (Kell, Duffy, Lewis, Kidd, Rh)–incompatible donation?

5. After massive (6–8 units) of transfusion, which is most likely to occur?

   A. Hypokalemia
   B. Hypernatremia
   C. Hypocalcemia
   D. Hyperuricemia

   Answer:

6. Which of the following happens the **FASTEST**?

   A. IgA deficiency reaction
   B. ABO incompatibility
   C. RH incompatibility

   Answer:

Case 2

Patient develops a mild febrile reaction with transfusion. With second unit of transfusion he develops severe shortness of breath and pulmonary infiltrates. Although the dyspnea is severe, it resolves within 24 hours. Hematocrit raises the expected amount with transfusion. Bilirubin and LDH are normal. Smear is normal.

What is the reaction?

A. Febrile nonhemolytic reaction; use white-cell filter
B. Anaphylaxis, IgA deficiency; use washed red cells
C. Leukoagglutination reaction; no treatment necessary
D. Urticarial reaction; diphenhydramine, use washed red cells

Answer:

Case 3

Patient develops mild urticarial reaction after a blood transfusion. No evidence of hemolysis. Bilirubin and LDH are normal. It resolves over the next day.

What is the reaction and how will you treat it?

A. Febrile nonhemolytic reaction; use white-cell filter
B. Anaphylaxis, IgA deficiency; use washed red cells
C. Leukoagglutination reaction; no treatment necessary
D. Urticarial reaction; diphenhydramine, use washed red cells

Answer:

Case 4

Patient develops an anaphylactic type of reaction after a blood transfusion.

What is the diagnosis and how will you treat it?

A. Febrile nonhemolytic reaction; use white-cell filter
B. Anaphylaxis, IgA deficiency; use washed red cells
C. Leukoagglutination reaction; no treatment necessary
D. Urticarial reaction; diphenhydramine, use washed red cells

Answer:

Case 5

Person receiving a blood transfusion develops a 1°C elevation in temperature but is otherwise asymptomatic. No back pain, no dyspnea, and no urticaria, and the blood pressure and pulse are normal.

1. What is the reaction and how will you treat it?

   A. Febrile nonhemolytic reaction; use white-cell filter
   B. Anaphylaxis, IgA deficiency; use washed red cells
   C. Leukoagglutination reaction; no treatment necessary
   D. Urticarial reaction; diphenhydramine, use washed red cells

   Answer:

2. Leukocyte reduction filters are meant to reduce the incidence of which of the following reactions?

   A. Acute hemolytic reactions
   B. Urticarial reactions
   C. IgA reactions
   D. Leukoagglutination reactions
   E. Febrile nonhemolytic reactions

   Answer:

Summary: Cases 1–5

Leukoagglutination reactions (Case 2) occur when the recipient's white cells are bound by antibodies from the plasma of the donor. The recipient's white cells transiently agglutinate in the lung, causing shortness of breath. The disorder resolves spontaneously and there is no specific therapy. This is also known as transfusion-related acute lung injury. Many patients can develop a mild allergic reaction to plasma proteins in the transfused blood. This results in urticaria (Case 3). It is treated with an antihistamine such as diphenhydramine. The management in the future will be to use red cell transfusions that have been washed of all the plasma proteins. Patients deficient in IgA may produce antibodies to IgA (Case 4). If blood that has not been washed is transfused into a patient who is IgA-deficient, an acute anaphylactic reaction may occur. The solution is to use washed red cells or blood from a donor that is IgA-deficient as well. Donor blood contains small amounts of white blood cells. Sometimes a patient will develop a mild reaction to these antigens, resulting in a mild elevation in temperature (Case 5). Because the antibodies are directed against white blood cell antigens and not to red cells, there is no hemolysis. Because there is fever but no hemolysis, it is called a febrile nonhemolytic reaction. The management is to use a filter with future transfusions. The filter removes white cells and the antigens that they carry.

COAGULATION DISORDERS

Case 1

37-year-old woman has come to see you because of epistaxis. The episodes have been recurrent and hard to control. Uses no medications. She has petechiae. Spleen is not palpable. Laboratory tests show:

Platelets: 227,000 PT: 12 sec PTT: 52 sec (prolonged)

1. Diagnosis?

2. What type of bleeding is this?

3. What is the Most accurate diagnostic test?

   A. Bleeding time
   B. Von Willebrand's factor level and ristocetin cofactor assay
   C. Bone marrow biopsy
   D. Anti-platelet antibodies
   E. Mixing study

   Answer:

4. Initial therapy?

   A. Desmopressin (DDAVP)
   B. Factor VIII replacement
   C. Steroids
   D. Plasmapheresis
   E. Cryoprecipitate
   F. Fresh frozen plasma
   G. Vitamin K
   H. Epsilon aminocaproic acid

   Answer:

5. What if this therapy does not work?

   A. Desmopressin (DDAVP)
   B. Factor VIII replacement
   C. Steroids
   D. Plasmapheresis
   E. Cryoprecipitate
   F. Fresh frozen plasma
   G. Vitamin K
   H. Epsilon aminocaproic acid

   Answer:

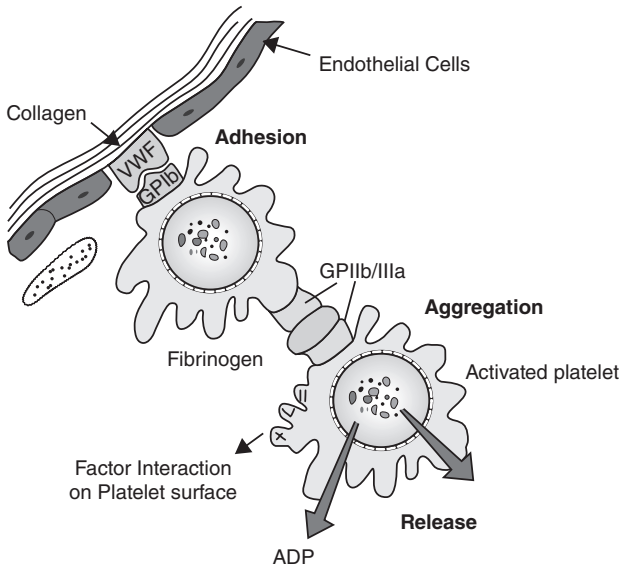
6. Epistaxis and petechiae with a normal platelet count. aPTT normal Platelets don't stick to vessel wall (adherence) Giant platelets, defect of glycoprotein Ib/IX receptor

   A. Von Willebrand
   B. Bernard-Soulier
   C. Glanzmann's thrombasthenia
   D. Heparin overdose

   Answer:

7. Epistaxis and petechiae with a normal platelet count. aPTT normal. Platelets don't stick to each other (abnormal aggregation). Defect of glycoprotein IIb/IIIa receptor

   A. Von Willebrand
   B. Bernard-Soulier
   C. Glanzmann's thrombasthenia
   D. Heparin overdose



   Answer:

8. A patient has a motor vehicle accident and gets 12 units of transfusion. They start oozing at venipuncture sites and have petechiae. Platelets at 24,000 Why?

9. Woman with several children had anemia from heavy periods. A week after blood transfusion she develops purpura and petechiae. Platelets drop.

   Diagnosis?

   Treatment?

Factor	Platelet
Deep	**Superficial**
Muscles, hematoma	Gingiva, gums, mucosa
Joint, hemarthrosis	Epistaxis, skin, purpura, petechiae

Summary: Case 1

Von Willebrand disease (VWD) presents with platelet type of bleeding with a normal platelet count. Because factor VIII and Von Willebrand factor (VWF) travel bound to each other, 50% of patients with VWD will have a prolonged aPTT. Deficiency is confirmed by finding an abnormal Ristocetin cofactor assay, and the diagnosis is confirmed by a low level of VWF. Although it is usually preferable to use DDAVP in the treatment of VWD, you must exclude type IIb VWD first because DDAVP can worsen this subtype. Factor VIII replacement includes VWF. Cryoprecipitate will also treat VWD, but because it is a pooled blood product it carries a higher risk of transmitting disease. Bernard-Soulier has defective adherence to vessel wall. Glanzmann's is defective aggregation to other platelets. Post-transfusion purpura happens in women sensitized by pregnancy and transfusion to human platelet antigen-1. Treat with IVIG.

Case 2

37-year-old woman has come to see you because of epistaxis. Episodes have been recurrent and hard to control. Uses no medications. She has petechiae. Spleen not palpable. Laboratory tests show:

Platelets: 27,000 PT: 12 sec PTT: 32 sec (normal)

1. Diagnosis?

   ITP (idiopathic thrombocytopenic purpura)

2. Best initial test?

3. Best initial therapy?

   Steroids

4. What will you do if the thrombocytopenia continues to recur?

   A. Splenectomy
   B. Romiplostim
   C. Eltrombopag
   D. Vincristine
   E. Platelet transfusion

   Answer:

Summary: Case 2

ITP is largely a diagnosis of exclusion. There is no truly specific test to diagnose the disorder. Antiplatelet antibodies are sensitive but extremely nonspecific because many normal persons can harbor the antibodies. A bone marrow biopsy is useful primarily to exclude other causes of thrombocytopenia. The initial therapy is with steroids. If the patient's thrombocytopenia is serious and continues to recur after stopping the steroids, then the best therapy is with a splenectomy. More than 70% of patients will experience a sustained improvement in the platelet count after the splenectomy.

Bernaud-Soulier

- Giant platelets
- Ib/IX missing
- No adherence to endothelium

Glanzmann's

- IIb/IIIa defect
- No aggregation to other platelets

Post-transfusion purpura

- Women sensitized by pregnancy
- Week after transfusion
- Give IVIG

Case 3

37-year-old woman with epistaxis. Episodes have been recurrent and hard to control. In past 24 hours, she has had a subdural hematoma, an epidural hematoma, melena, a subarachnoid hemorrhage, hemoptysis, hematemesis, and heavy periods. Uses no medications. She has petechiae. Spleen is not palpable. Laboratory tests show:

Platelets: 7,000 PT: 12 sec PTT: 32 sec (normal)

Antiplatelet antibodies: Positive Abdominal ultrasound: Normal

Bone marrow biopsy: Increased numbers of megakaryocytes

1. Best initial therapy?

2. 17-year-old boy admitted with bloody diarrhea. Recently ate a chicken hamburger. Has purpuric spots on his legs. Hematocrit is 27. White cell count 7,200. Platelet count of 23,000 elevated LDH. Smear shows fragmented red cells. BUN and creatinine are elevated normal PT (prothrombin time) and aPTT. Most likely cause?

   A. *Campylobacter*
   B. *Yersinia*
   C. *Salmonella*
   D. *E. coli* 0157:H7

   Answer:

Case 4

22-year-old woman with epistaxis and menorrhagia. She has lifelong history of poor wound-healing and has had several spontaneous abortions. She was told she had increased bleeding at birth, and she has had a lifelong history of easy bruising. The PT, PTT, and platelet counts are normal. The bleeding time is normal.

1. Diagnosis?

2. Diagnostic test?

3. What is the therapy if serious bleeding develops?

   A. Desmopressin (DDAVP)
   B. Factor VIII replacement
   C Plasmapheresis
   D. Cryoprecipitate
   E. Fresh frozen plasma
   F. Vitamin K

   Answer:

Summary: Case 4

Factor XIII is also known as "clot-stabilizing factor." After the initial fibrin clot forms, it is subject to lysis by the body's own natural fibrinolytic system, based on plasmin. Factor XIII normally functions to stabilize the clot and stop the lysis by plasmin. There is increased degradation of the clot in 5-molar urea. Treatment is initially with FFP, although factor XIII–specific replacement does exist. You recognize the case based on increased mucosal bleeding combined with normal PT, PTT, platelet count, and bleeding time. Factor XII deficiency gives, in a way, the opposite presentation: there is an elevation of the PTT but no history of bleeding.

Case 5

32-year-old woman comes to hospital with an episode of increased bleeding after a surgical procedure. She has had two episodes of increased bleeding with trauma in the past several years. Her prothrombin time is normal at 12 sec and the aPTT is prolonged at 52 sec. Her platelet count and bleeding time are normal.

1. Diagnosis?

2. What test will you order first?

   A. Bleeding time
   B. Von Willebrand's factor level and ristocetin cofactor assay
   C. Bone marrow biopsy
   D. Anti-platelet antibodies
   E. Mixing study
   F. Specific factor level

   Answer:

3. Most accurate diagnostic test?

   A. Bleeding time
   B. Von Willebrand's factor level and ristocetin cofactor assay
   C. Bone marrow biopsy
   D. Anti-platelet antibodies
   E. Mixing study
   F. Specific factor level

   Answer:

4. Initial therapy?

   A. Desmopressin
   B. Fresh frozen plasma
   C. Cryoprecipitate
   D. Vitamin K
   E. Steroids

   Answer:

Summary: Case 5

When the aPTT is prolonged and the PT is normal, the possibilities are hemophilia A or B, factor XI and XII deficiency, and Von Willebrand disease and factor inhibitors. The fact that this patient is female virtually excludes hemophilia A or B because these are both X-linked recessive disorders; women are almost exclusively carriers, with men expressing the disease. A mixing study will help greatly in distinguishing a factor deficiency from an acquired factor inhibitor. The mix corrects the aPTT to normal in a deficiency but stays elevated in the presence of a factor-inhibiting antibody. Factor-inhibiting antibodies are treated with plasmapheresis in severe disease and sometimes with steroids and gammaglobulin. Massive infusion of porcine factor VIII should be able to overcome an inhibitor because it does not cross-react with the inhibitor. With Von Willebrand disease there should be mucosal bleeding, and the bleeding time should be abnormally prolonged. Factor XII deficiency gives a prolonged aPTT but never results in bleeding. The lupus anticoagulant should result in thrombosis, not bleeding. Factor XI deficiency gives increased bleeding after trauma and surgery. It is treated acutely with FFP (fresh frozen plasma).

Coagulation Review Questions

1. 41-year-old patient bleeds excessively after dental extraction. aPTT is prolonged at 65 seconds and prothrombin time is normal. After 50:50 mixing study with normal plasma, aPTT is 62 seconds and the bleeding time is prolonged. Most likely diagnosis?

   A. Acquired Von Willebrand's factor antibody
   B. Dysfibrinogenemia
   C. Factor VIII deficiency
   D. Factor XI deficiency

   Answer:

2. Which is consistent with disseminated intravascular coagulation?

	Fibrin split products	D-dimers	Fibrinogen	Platelets	PT	aPTT
A.	High	High	Low	Low	High	High
B.	Low	Low	Low	Low	High	High
C.	High	High	High	Low	High	High

   Answer:

3. Which causes schistocytes?

   A. Autoimmune hemolytic anemia
   B. Disseminated intravascular coagulation
   C. **Uremia**
   D. Folic acid deficiency

   Answer:

4. Man has been on Coumadin for atrial fibrillation. Comes with multiple episodes of hematemesis. INR is 8.0. Besides holding the Coumadin for 2 doses, what else should be done?

   A. Vitamin K orally
   B. Vitamin K subcutaneously
   C. Fresh frozen plasma
   D. Protamine sulfate

   Answer:

5. A patient comes in with massive bleeding requiring multiple transfusions. What would you expect to see on blood testing?

   A. Hyponatremia
   B. Hypocalcemia
   C. Hyperphosphatemia
   D. Hypokalemia

   Answer:

6. Patient for pre-operative evaluation. Prolonged aPTT 90 seconds. PT normal. aPTT corrects with mixing study. What is the most likely deficiency?

   A. VIII, IX, XI, XII
   B. V or VII
   C. II
   D. XIII

   Answer:

7. A patient with mild hemophilia A with 10% factor VIII levels is going for dental extraction, what to do?

   A. Nothing
   B. DDAVP
   C. Transfuse factor VIII
   D. Cancel procedure

   Answer:

8. Patient with A fib on warfarin and INR 5.0 No bleeding.

   A. Lower dose
   B. Hold for three days and restart lower
   C. Vitamin K

   Answer:

9. Patient needs surgery. Has Afib. Warfarin stopped for 3 days. INR 1.4 on morning of surgery.

   A. Cancel procedure
   B. Vitamin K
   C. Proceed with surgery

   Answer:

10. Alcoholic with portal hypertension and ascites from cirrhosis. PT markedly elevated. Platelet 90,000. Hb 9. Needs portocaval shunt. What to do about bleeding?

    A. Nothing, proceed
    B. Cancel procedure
    C. FFP
    D. FFP and platelets

    Answer:

11. Patient with atrial fibrillation for a day. EKG with rate 125/minute. Diltiazem started. What else to do?

    A. Nothing until echo done
    B. Admit for IV heparin
    C. Low molecular weight heparin and warfarin
    D. Warfarin or Dabigatran

    Answer:

12. Patient admitted for syncope. Platelets 200,000 on day one. Second day platelets, 5,000. Normal PT/aPTT/INR. No bleeding. No clotting. What to do?

    A. Steroids
    B. Anti-platelet antibodies
    C. Smear to look for clumping

    Answer:

Summary

Excessive bleeding after dental extraction is a sign of platelet dysfunction. An elevated aPTT and prolonged bleeding time indicate Von Willebrand's disease. If a 50:50 mixing study does NOT correct the aPTT to normal, this is a sign of an antibody inhibitor being present. DIC is associated with elevated PT/aPTT, D-dimers and fibrin split products. Schistocytes are present in DIC, HUS, and TTP. Uremia and autoimmune hemolysis do not give fragmented red cells on smear. If a patient has acute bleeding, such as hematemesis, from Coumadin overdose, fresh frozen plasma is the fastest way to correct the coagulopathy. Multiple transfusions are associated with hypocalcemia from chelation with the citrate buffer in the transfused blood.

Case 6

69-year-old woman was admitted for pulmonary embolus 3 days ago. She was started on intravenous unfractionated heparin and warfarin. On fourth hospital day, her laboratory tests reveal a PTT of 70 sec and platelet count of 115,000. On the following day, her labs show an INR of 1.4 and platelet count of 95,000.

1. Diagnosis?

   Heparin-induced thrombocytopenia

2. Most common clinical manifestation?

   A. Stroke
   B. Myocardial infarction
   C. Venous thrombosis
   D. Arterial thrombosis

   Answer:

3. What would you do next in the management of this patient?

   Stop the heparin

4. What will you use as an anticoagulant for the pulmonary embolus or if the patient develops an arterial clot of her radial artery?

5. Best diagnostic test?

6. 27-year-old woman comes in for evaluation of a coagulopathy. Recently become pregnant. History of a deep venous thrombosis. She is G2, P0020 with two spontaneous abortions. What will lab testing most likely reveal?

   A. Increased aPTT
   B. Protein C deficiency
   C. Increased INR
   D. Thrombocytosis
   E. Thrombocytopenia

   Answer:

Summary: Case 6

Heparin induces thrombocytopenia by two mechanisms. There is a mild thrombocytopenia induced by the direct effect of heparin on the platelets, and a more severe form caused by the induction of antiplatelet antibodies that are heparin-dependent. This can occur with even the smallest amount of heparin, such as heparin flushes of an intravenous catheter or a heparin-coated catheter. Venous emboli occur in 75% of patients developing clots. Only 25% of heparin-induced clots are arterial "white" thrombi. Low molecular-weight heparin has a smaller risk of developing thrombocytopenia, but once the antiplatelet antibodies develop, all forms of heparin must be stopped. On the exam, the most common error is switching to low molecular-weight heparin after the patient develops thrombocytopenia with unfractionated heparin. The test is to try to detect antibodies against platelets that are heparin-dependent. Specifically, you look for antiheparin/platelet factor 4 antibodies, or antibodies that agglutinate platelets only after the addition of heparin. The treatment for clots in those who cannot use heparin is with derivatives of the direct thrombin inhibitor hirudin, such as lepirudin. Another therapy is argatroban.

Case 7

36-year-old woman admitted for severe headache and left-sided weakness. She has livedo reticularis. She denies an increased incidence of bleeding. Her only medication is oral contraceptive pills.

PT: 11 sec; aPTT: 54 sec (elevated) Platelets: 185,000

VDRL: Positive FTA: Negative

1. What is the cause of the hemiplegia?
   A. Oral contraceptives
   B. Complex migraine
   C. Factor V Leiden
   D. Antiphospholipid syndrome

   Answer:

2. Best initial test?

3. Most accurate diagnostic test?

4. What will you prescribe for next pregnancy?
   A. Steroids
   B. Aspirin
   C. Heparin
   D. Heparin and steroids
   E. Aspirin and heparin

   Answer:

Summary: Case 7

A lupus anticoagulant is an IgG or IgM antiphospholipid antibody that causes thrombosis through an unknown mechanism. Although it exclusively causes thrombosis clinically, it results in an elevated aPTT in vitro. On mixing study, there is a failure of the aPTT to correct to normal with a 50% 1:1 mix with normal plasma. All deficiencies will correct with the addition of normal plasma. The lupus anticoagulant often results in a falsely positive VDRL. Russell viper venom assay is the most specific test for the lupus anticoagulant. Treatment for thrombosis is with heparin. When a patient has frequent spontaneous abortions from the lupus anticoagulant, the treatment is to use aspirin and heparin throughout the pregnancy. Steroids have no proven efficacy in decreasing the frequency of spontaneous abortion, and may be harmful. If the lupus anticoagulant or antiphospholipid syndrome has not resulted in a clinical manifestation, then no therapy is necessary.

Case 8

27-year-old woman comes to ED with pulmonary embolus. She has DVT (deep vein thrombosis) on the lower-extremity Doppler. These have each been treated with 6 months of warfarin. No history of cancer or recent surgery.

1. What is the most common cause of this patient's condition?

   A. Antithrombin deficiency
   B. Protein C deficiency
   C. Protein S deficiency
   D. Lupus anticoagulant
   E. Factor V leiden mutation
   F. Homocysteine elevation

   Answer:

2. Therapy?

3. How will you recognize protein C deficiency?

4. How will you recognize antithrombin deficiency?

Thrombophilia Questions

1. Asymptomatic patient comes in for evaluation. His mother has factor V mutation and has had her third episode of clotting. He is homozygous for the mutation. What do you recommend?

   A. Warfarin lifelong
   B. IV Heparin followed by warfarin
   C. No treatment necessary
   D. Low molecular weight heparin subcutaneously lifelong

   Answer:

2. 30-year-old woman, who has been **taking oral contraceptives** for 10 years, is admitted with an acute DVT. Her brother has a DVT at age 35 as well. She is started on heparin and warfarin; and the oral contraceptives are stopped. The warfarin is stopped at 6 months. Two weeks later testing shows factor V mutation. What should you do?

   A. Restart warfarin indefinitely
   B. Restart warfarin, and add aspirin
   C. Advise her not to use oral contraceptive without additional therapy
   D. Restart warfarin indefinitely with an INR of 3–4

   Answer:

3. Which of the following is most likely to have a recurrent clot?

   Which of the following is most likely to need lifelong warfarin?

   A. Factor V mutation
   B. Factor II 20210 defect
   C. Antiphospholipid mutation
   D. Protein C, S
   E. Anti-thrombin III deficiency

   Answer:

Summary: Case 8

Factor V Leiden mutation is the most common cause of thrombophilia. The only cause of thrombophilia that is associated with baseline abnormalities in the coagulation times is one of the phospholipids syndromes, such as a lupus anticoagulant or anticardiolipin antibodies. Protein C deficiency is the answer as the most likely diagnosis when there is evidence of thrombosis and skin necrosis after the start of warfarin. Your answer is antithrombin deficiency when the case describes an unexplained clot and there is no prolongation of the aPTT with the start of heparin. Heparin works through the potentiation of antithrombin. If there is a deficiency of antithrombin, the heparin will not be able to work and the aPTT will remain low.

Asymptomatic factor V Leiden mutations do not need therapy. A single clot only needs 6 months of therapy of the usual intensity of an INR of 2–3. You do NOT give a higher INR or longer duration based on a single clot. Lifelong warfarin would only be considered if there were recurrent clots.

Case 9

Patient maintained on dialysis comes to emergency department with melena. Also has some epistaxis. Endoscopy reveals no specific lesion and he continues to bleed despite the transfusion of blood. PT, aPTT, and platelet count are normal. Hematocrit is 25.

1. What is the cause of bleeding?

2. How will you treat?

Summary: Case 9

Uremia is a cause of bleeding because of platelet dysfunction. There is an acquired storage pool disorder. The platelet count is normal, but uremia inhibits the degranulation of the platelet so the patients have the same manifestations as they would if they were thrombocytopenic or had Von Willebrand disease. The release of subendothelial stores of factor VIII and Von Willebrand factor causes a brief increase in platelet function in uremia.

1. 62-year-old female patient consults you because of recurrent ecchymosis and a large hematoma in gluteal area. Aspiration of knee reveals gross blood. Bleeding time is normal, aPTT is prolonged at 80 seconds, and the PT is normal. When the patient's plasma is mixed 1:1 with normal plasma, the aPTT fails to correct. Most likely diagnosis?

   A. Disseminated intravascular coagulation
   B. Anti-phospholipid syndrome
   C. Acquired factor VIII inhibitor
   D. Acquired factor V inhibitor

   Answer:

Case 10

Young man with:

- Recurrent sinopulmonary infections and immunosuppression
- Eczematous skin lesions
- Mild thrombocytopenia with small platelets
- Petechiae and bruising

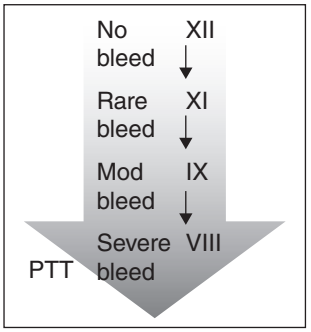
What is the diagnosis?

A. Bernard-Soulier
B. Ouchy-Itchy-Bleedy syndrome
C. Wiskott-Aldrich syndrome
D. Itchiness-Crapsky syndrome

Answer:

Summary: Case 10

Recurrent sinopulmonary infections in young people suggest primary immune defects. With eczema and small platelets in low number we have the Wiskott-Aldrich syndrome. Dysfunctional platelets are removed by the spleen leading to their low number. Severe bleeding needs platelet transfusion or splenectomy. Immune defects need IVIG. Bone marrow transplant is curative.



PROSTATE CANCER

Case 1

65-year-old man comes to office wanting to know what he should do about being screened for prostate cancer. He is not anxious to find anything abnormal, but he wants to be responsible if there is a test that can help him.

1. What do you tell him?

   A. Perform PSA
   B. Refuse to do the PSA because it is not proven to lower mortality
   C. Perform transrectal ultrasound

   Answer:

Man's prostate-specific antigen is mildly elevated at 8. There are no masses found on rectal examination. He wants to "go all the way," since he has already taken the test and he has now started feeling anxious.

2. What do you do next in his evaluation?

   A. Prostatectomy
   B. Transrectal ultrasound with biopsy
   C. Repeat the PSA in 6 months
   D. Flutamide

   Answer:

Case 2

74-year-old man comes in for evaluation of an elevated PSA at 9 and a small mass found in one lobe of his prostate. Transrectal ultrasound reveals a small, isolated lesion limited to one lobe of his prostate. A biopsy finds adenocarcinoma.

1. Most important prognostic finding for this lesion?

2. What would you recommend as therapy for this man's localized disease?

   A. Radiation or surgery
   B. No treatment
   C. Leuprolide
   D. Flutamide
   E. Orchiectomy

   Answer:

Case 3

78-year-old man comes to see you because he has developed locally metastatic prostate cancer after his initial therapy several years ago.

1. Best therapy?

Summary: Cases 1–3

The prostate-specific antigen (PSA) test is not generally recommended as a screening test for prostate cancer. Although it is elevated in prostate cancer, there is still no evidence that screening with this test reduces mortality. The same is true for the digital rectal examination. If the PSA is elevated, the best step is to palpate for a nodule and biopsy that nodule. If no nodule is palpated, then the best next step in management to exclude disease is to perform a transrectal ultrasound. If a lesion is identified, then you should biopsy the lesion found. If the PSA is elevated and no mass can be found by either examination or ultrasound, then the only way to exclude cancer is with multiple blind biopsies. The most important prognostic factor besides the size of the lesion is the Gleason stage. There is still no clear survival advantage confirmed to allow you to choose between a radical prostatectomy, external beam radiation, or implanted radioactive seeds (brachytherapy). Metastatic disease is managed with antiandrogens. The gonadotropin-releasing hormone agonists leuprolide or goserelin can cause a flare initially with the disease, and they should be combined with antiandrogens such as flutamide, ketoconazole, or orchiectomy.

There is no benefit at all to PSA above age 75 and if the question describes someone >75 wanting PSA the answer is: refuse.

TESTICULAR CANCER

1. 22-year-old homosexual man with a painless testicular mass, which is non-illuminating. Ultrasound confirms it to be solid mass. Serum alpha fetoprotein and beta-hCG are elevated. CT scans of the abdomen and pelvis are negative. Which is the best choice?

   A. Scrotal orchiectomy
   B. Inguinal orchiectomy
   C. Observe
   D. Fine needle biopsy via the scrotum
   E. Excisional biopsy via the scrotum

   Answer:

2. 21-year-old man has a growing painless left testicular mass that is solid. **All the serum markers are normal** (hCG, LDH, alpha-fetoprotein). Left orchiectomy shows a **non-seminomatous germ cell cancer**. Patient is asymptomatic. CT scans as well as retroperitoneal lymph node dissection are normal. Which of the following is the most appropriate after surgery?

   A. Regular follow up; no chemotherapy unless it recurs
   B. Empiric adjuvant chemotherapy
   C. Chemotherapy and radiation
   D. Bone marrow transplantation

   Answer:

Case Summary

Testicular cancer presents as a painless mass in the scrotum. The best method of diagnosis is with removal of the gonad through a high inguinal approach. Incisions or needle biopsy of the scrotum should not be done. Seminomatous cancer does NOT raise the level of alpha fetoprotein (AFP). An elevated AFP always means a non-seminomatous cancer. Beta-hCG can be elevated with either of them. LDH can also be used to follow prognosis. Non-seminomatous cancer does not need adjuvant chemotherapy or radiation, if the disease was localized to the scrotum and the lymph nodes are free of disease. Non-seminomatous cancer is cured by orchiectomy alone, if it is limited to the scrotum.

BREAST CANCER

Case 1

A woman comes to see you on her 50th birthday. She has not seen a doctor in 20 years–since her last child was born–and now she is here to have "the works." She still has periods. Her physical examination, including breast exam and stool for occult blood, is negative.

1. What screening tests should you perform?

Mammogram shows several small calcifications. Core needle biopsy shows infiltrating ductal carcinoma. At surgery, she is found to have a 3-cm cancer that is estrogen receptor–positive.

2. What is "sentinel node" biopsy, and how does it change your management?

All of the woman's lymph nodes are freely mobile and not fixed to each other. Three of 14 nodes are found to be positive for cancer.

3. What therapy?

4. What adjuvant therapy?

5. What is trastuzumab?

   A. All women
   B. HER-2/Neu positive
   C. Estrogen-receptor positive
   D. Progesterone-receptor positive

   Answer:

6. When are aromatase inhibitors (anastrazole, letrozole, exemestane) indicated?

7. 52-year-old woman has a mother and aunt with breast cancer. Her last mammogram was normal 6 months ago. How would you best follow this patient?

   A. Mammography now
   B. Mammography yearly
   C. Carcinoembryonic antigen level
   D. CA-125 level

   Answer:

Summary: Case 1

Aromatase inhibitors stop the conversion of androgens to estrogen. Examples of aromatase inhibitors are anastrazole, letrozole, and exemestane. The best evidence for the use of these drugs is in estrogen receptor–positive patients who have received 2 to 5 years of tamoxifen. These aromatase inhibitors are used after tamoxifen to decrease the risk of recurrent disease. The use of aromatase inhibitors is generally limited to postmenopausal women because these drugs have fewer efficacies in overcoming the higher estrogen level produced by the premenopausal patient.

In the general population, screening for breast cancer with mammography should begin at age 50 and be performed every 1 to 2 years. If a breast mass is palpated on examination, an ultrasound is used to exclude a cystic lesion. Solid lesions found on either mammography or ultrasound should be biopsied. At resection, a dye is injected into the operative field. The first node that the dye goes to is the "sentinel node." If this node contains cancer, an axillary lymph node dissection is the best next step. If this sentinel node is free of disease, then the axillary dissection is unnecessary. This sentinel node is an acceptable marker for the occurrence of disease in the other nodes.

Breast Cancer Questions

1. Which most accurately determines prognosis in patient with breast cancer?

   A. Lymph node involvement
   B. Estrogen receptors
   C. Progesterone receptors
   D. Tumor size
   E. Age of the patient

   Answer:

2. 38-year-old woman is found to have a 3-cm breast cancer without lymph-node involvement. Best management?

   A. Mastectomy without chemotherapy
   B. Lumpectomy without chemotherapy
   C. Chemotherapy and radiation
   D. Lumpectomy with adjuvant chemotherapy
   E. Lumpectomy with adjuvant chemotherapy and local radiation

   Answer:

3. 60-year-old woman, who is post menopausal, has lumpectomy and axillary dissection for breast cancer. The estrogen receptors are positive, and 3 of 17 nodes are positive for cancer. What do you recommend?

   A. Radiation followed by tamoxifen and chemotherapy
   B. Tamoxifen alone
   C. Radiation followed by chemotherapy
   D. Chemotherapy alone

   Answer:

Lumpectomy with breast radiation is equal in efficacy to modified radical mastectomy. Tamoxifen should be given to all patients whose estrogen receptors are positive on the cancer. Adjuvant chemotherapy with cyclophosphamide, methotrexate, 5-fluorouracil, and sometimes doxorubicin is given if cancer is found in the lymph nodes in any premenopausal patient. Taxanes, such as paclitaxel or docetaxel, can be used in conjunction with cyclophosphamide and doxorubicin. Adjuvant chemotherapy is also given to any patient with a primary cancer larger than 1 cm. Trastuzumab is a monoclonal antibody against an antigen (known as Her-2/neu) that is often expressed in increased amounts in patients with breast cancer.

Case 2

Healthy 45-year-old woman with breast cancer. Mother was diagnosed at 55 and was estrogen and progesterone receptor–positive. She had one sister with breast cancer.

1. What do you suggest to reduce this woman's risk of cancer?

   A. Soy diet
   B. Low-fat diet
   C. Hormone receptor therapy
   D. Tamoxifen

   Answer:

2. Most common adverse effect of tamoxifen?

3. Which statements concerning BRCA is true?

   A. All patients should receive tamoxifen.
   B. BRCA is associated with ovarian cancer.
   C. BRCA is associated with colon cancer.
   D. Patients who are BRCA positive should undergo mastectomy.
   E. Mammography screening should be done more frequently.
   F. BRCA should be routinely performed.

   Answer:

4. Which is NOT a side effect of tamoxifen?

   A. Osteoporosis
   B. Endometrial hyperplasia
   C. Deep venous thrombosis

   Answer:

Summary: Case 2

There is mounting evidence that for those patients at extremely high risk of breast cancer, tamoxifen and possibly raloxifene as primary prophylaxis will reduce the risk of developing breast cancer. There is no clear evidence that dietary manipulation will reduce the risk of cancer before it has occurred. The most common long-term adverse effects of tamoxifen therapy are DVT and endometrial cancer.

BRCA is associated with ovarian cancer. There is **NO** clear indication of how to use the test clinically. It is **NOT** a routine test. Tamoxifen use in BRCA carriers did NOT reduce the risk of developing cancer; and there is no indication for mammography more often than the usual recommendation of yearly. Other risks for breast cancer are nulliparity, early menarche, late menopause, and first pregnancy after age 30. The only risk in which there is a proven change in management is with family history. Patients with multiple first-degree relatives should be offered tamoxifen.

GYNECOLOGIC MALIGNANCIES

Cervical Cancer

1. Which is the appropriate screening for cervical cancer?

   A. Every year, starting at age 18
   B. Every year, starting at age 21 and stopping at age 65
   C. Yearly for 3 years starting at age 21, then every 3 years
   D. Yearly for 3 years starting at age 21, then every 3 years, then stopping at age 65
   E. Every 3 year from 21–29, then HPV and Pap every 5 years to age 65

   Answer:

2. On Pap smear, a 50-year-old woman is found to have high-grade dysplasia. What is the most appropriate?

   A. Repeat Pap smear
   B. Repeat Pap smear after a course of antibiotics
   C. Hysterectomy
   D. Colposcopy for biopsies
   E. Human papillomavirus typing

   Answer:

3. Which screening test has the greatest reduction in mortality?

   A. Pap smear
   B. Colonoscopy
   C. Prostate-specific antigen
   D. Mammography after age 40
   E. Mammography after age 50

   Answer:

Endometrial Cancer

1. Which is the most common risk factor for endometrial cancer?

   A. Obesity
   B. Oral contraceptives
   C. Multiple sexual partners
   D. Ovarian carcinoma

   Answer:

2. 42-year-old woman comes to see you because of vaginal spotting in between periods for the last several months. Thyroid function tests are normal. She has had yearly Pap smears that were normal for the last 2 years. Most appropriate management of this patient?

   A. Conization biopsy
   B. Colposcopy
   C. Endometrial biopsy
   D. Dilatation and curettage
   E. Observation

   Answer:

Ovarian Cancer

1. Woman with increasing abdominal girth and ascites. There is an ovarian mass; and the ascitic fluid is positive for malignant cells. What is best therapy?

   A. Combination chemotherapy
   B. Chemotherapy and radiation
   C. Bilateral salpingo-oophorectomy, hysterectomy, omentectomy, and maximum tumor removal followed by chemotherapy
   D. Intraperitoneal chemotherapy

   Answer:

Summary: Gynecologic Malignancies

The standard of care for screening for cervical cancer changes somewhat depending on the recommending organization. Screening should, at the least, occur every 3 years between the ages of 21 and 65. It is acceptable to perform screening more frequently for the first 2 to 3 years. Patients with atypical squamous cells of unknown significance (ASCUS) should be treated for infection if it is present and be re-screened in 4 to 6 months. Human papillomavirus (HPV) testing combined with Pap smear extends screening length to 5 years. HPV testing in a person with ASCUS can be used to differentiate between who should go on to colposcopy versus who can just have their tests repeated. If colposcopy is to be performed, there is no point in testing for the specific type of HPV. The boards have avoided controversial areas such as this.

Dysfunctional bleeding should be evaluated by endometrial biopsy. Although Pap smear, colonoscopy, and mammography all lower mortality, mammography above the age of 50 lowers it the most.

Ovarian cancer most often presents at advanced stage. CA-125 is **NOT** specific for ovarian cancer. There is no routine screening test for ovarian cancer that should be offered. Ovarian cancer should undergo maximum cytoreduction at the time of surgery. This is unusual for cancer. Although metastatic, survival and prognosis is based on how much of the tumor can be removed. Chemotherapy will further cytoreduce the malignancy.

Pulmonology/Critical Care

7

Case 1

55-year-old woman with shortness of breath. Progressive 40-year history of smoking. Acutely short of breath and is using her accessory muscles to breathe. Diffuse wheezing noted bilaterally. Arterial blood gas: 7.20 / 80 / 42 / 32.

1. How do you calculate the A–a gradient?

2. What information does it provide regarding this patient's respiratory status?

3. When do you have hypoxia with a **normal** A–a gradient?

   A. Pulmonary embolism
   B. Guillian-Barre syndrome
   C. Acute Respiratory Distress Syndrome
   D. Pneumonia
   E. Emphysema

   Answer:

4. What is this patient's current acid–base status?

Summary: Case 1

In evaluating any patient with hypoxia, the first question to ask yourself is whether the hypoxia is associated with a rise in the partial pressure of carbon dioxide. If the low oxygen is associated with a rise in the PCO_2, the next question you have to ask is whether the A–a gradient is abnormal. The formula to calculate the A–a gradient on room air is the following:

$150 - PCO_2 - \frac{1}{4}(PCO_2) - PaO_2$.

An abnormal A–a gradient establishes the hypoxia as being due to some degree of V/Q mismatch.

When you observe the combination of hypoxia associated with a normal A–a gradient in the presence of elevations in the PCO_2, the hypoxia is due solely to hypoventilation. A normal A–a gradient essentially rules out V/Q mismatching as the mechanism for low oxygenation

in the blood. Hypoxia with a normal A–a gradient establishes the etiology of the hypoxia as being secondary to lower partial pressure of oxygen in the alveolus rather than an intrinsic pulmonary problem. Most commonly, the gas displacing oxygen is carbon dioxide that accumulates when a patient hypoventilates. Common causes of hypoventilation without pulmonary involvement include opioid overdose and neuromuscular disease. High altitude is another explanation for persistent hypoxia with a normal A–a gradient. In summary,

Increased A-a gradient with normal pCO_2	***Normal A-a gradient with increased pCO_2***
Ventilation/perfusion mismatches (V/Q)	Central nervous system trauma/insult
Pulmonary embolism	Neuromuscular disorders
ARDS	Scoliosis
Pneumonia	Demyelinating disorders (i.e., Guillain-Barre, multiple sclerosis)

When you identify acidosis with elevations in the carbon dioxide, the acid–base disorder is most likely to be a respiratory acidosis. To determine the acuity of the respiratory acid–base disorder, it is helpful to calculate the change in pH and change in the HCO_3 concentration relative to the rise or fall in PCO_2.

	Change in pH per 10 mm Hg change in PCO_2	**Change in HCO_3 per 10 mm Hg change in PCO_2**
Acute respiratory acidosis	pH decreases 0.08 per 10 mm Hg increase in PCO_2	HCO_3 increases by 1.0–2.0 per 10 mm Hg increase in PCO_2
Chronic respiratory acidosis	pH decreases 0.03 per 10 mm Hg increase in PCO_2	HCO_3 increases by 3.0–4.0 per 10 mm Hg increase in PCO_2
Acute respiratory alkalosis	pH increases 0.08 per 10 mm Hg decrease in PCO_2	HCO_3 decreases by 2.5 per 10 mm Hg decrease in PCO_2
Chronic respiratory alkalosis	pH increases 0.03 per 10 mm Hg decrease in PCO_2	HCO_3 decreases by 5.0 per 10 mm Hg decrease in PCO_2

Case 2

45-year-old man with abdominal pain and vomiting. Type 1 diabetes mellitus. Smoking two packs of cigarettes. Vital signs are as follows: temperature 38.3°C (101°F), BP 112/54 mm Hg, HR 116, RR 23. + abdominal pain. Stat arterial blood gas analysis with standard chemistries shows the following:

7.05 /	90 mm Hg	132	102	63	
					552
		5.8	8	2.3	

1. What is the primary acid–base disorder?

2. Is there an additional respiratory acid–base disorder?

3. Is there an additional metabolic acid–base disorder?

4. What are the major causes of anion gap metabolic acidosis (AGMA)? Non-anion gap metabolic acidosis (NAGMA)?

Summary: Case 2

The presence of acidemia associated with a low bicarbonate makes the diagnosis of a metabolic acidosis. Once you identify a metabolic acidosis, an easy way to classify the disorder is to calculate the anion gap. The anion gap is calculated by subtracting the serum bicarbonate and chloride from the serum sodium. A normal anion gap is around 12 ± 4. Anything above 16 should be considered to indicate the presence of an anion gap metabolic acidosis (AGMA). Causes of AGMA include: diabetic ketoacidosis (DKA), alcohol, renal failure, lactic acidosis, iron poisoning, starvation, seizures, sepsis, ASA poisoning, rhabdomyolysis, ethylene glycol, isoniazid, methanol, and paraldehyde. Non-anion gap metabolic acidosis (NAGMA) is caused by uretosigmoidostomy, saline, early renal failure, diarrhea, carbonic anhydrase inhibitors, adrenal insufficiency, renal tubular acidosis (RTA), hyperparathyroidism, triamterene, and spironolactone. In this case we have an AGMA. We use Winter's formula and the delta anion gap to determine if there are any concomitant respiratory or metabolic acid–base disorders in addition to the AGMA that we have already identified.

Winter's formula (expected $PCO_2 = 1.5 \times \text{bicarbonate} + 8$) is used to calculate an expected PCO_2 that would result if the only acid–base disorder would be our AGMA. If the actual PCO_2 (as measured on the ABG) is higher then our expected value, then there was a

pre-existing respiratory acidosis. If the actual PCO_2 (as measured on the ABG) is lower than the expected value, then there was a pre-existing respiratory alkalosis. The delta anion gap is used to determine the existence of an additional metabolic acid–base problem. The calculated anion gap minus the normal anion gap gives the delta anion gap. The delta anion gap plus the measured bicarbonate should equal 25 (normal serum bicarbonate). If the delta anion gap plus the measured serum bicarbonate <25, it means there was pre-existing NAGMA. If the delta anion gap plus the measured serum bicarbonate >25, it means there was a pre-existing metabolic alkalosis.

1. A 27-year-old witnessed seizure: sodium 135, potassium 4.2, chloride 95, bicarbonate 18, with a pH of 7.22 and a lactic acid of 12.7 on ABG. Next step?

   A. Infuse bicarbonate intravenously
   B. Begin NS at 200 cc/hour
   C. Observation with repeat chemistries in 2 hours
   D. Dialysis

   Answer:

2. A 23-year-old man found with several bottles of rubbing alcohol opened near him. Lab results are: sodium 141, potassium 4.2, chloride 106, bicarbonate 23, glucose 127. Next diagnostic test?

   A. Urine sodium
   B. Measure serum osmolarity
   C. Urine toxicology
   D. Urinalysis for crystals
   E. Gastric lavage

   Answer:

Case 3

A 63-year-old woman with severe shortness of breath. History of congestive heart failure. Chest x-ray on admission shows cardiomegaly and frank pulmonary edema. Aggressive diuretic therapy initiated. On day 3 ABG: 7.50 / 45 / 85 / 36.

1. What is the primary acid–base disorder?

2. Is there an additional respiratory disorder?

3. What test would you order to confirm your diagnosis?

4. A 19-year-old woman with near syncope. Always "light headed," but worsening. Pregnancy test is negative. Blood pressure 98/58, heart rate 88, respiratory rate 12, afebrile. Labs:

Na^+: 138	Cr 1.1
K^+: 3.2	Ca 8.9
Cl: 103	Mg 0.6 (low)
HCO3 32	Urine potassium elevated
BUN 31	

What is the most likely diagnosis?

A. Conn syndrome
B. Gitelman syndrome
C. Glycyrrhetinic acid excess
D. Cushing syndrome

Answer:

Summary: Case 3

Alkalemia on the ABG in the presence of elevated serum bicarbonate makes the diagnosis of a metabolic alkalosis. To determine whether there is an additional respiratory acid–base disorder, the expected PCO_2 should be calculated using the following formula:

expected $PCO_2 = 0.7 \times \text{bicarbonate} + 20$.

If the actual PCO_2 (as measured on the ABG) is higher than the expected value, it means there is an additional respiratory acidosis. If the actual PCO_2 (as measured on the ABG) is lower than the expected value, it means that in addition to the metabolic alkalosis there is a respiratory alkalosis.

To determine the etiology of a metabolic alkalosis, the next step is to measure a urine chloride. A urinary chloride of <10 mEq/L suggests the presence of a saline-responsive metabolic alkalosis. The metabolic alkalosis would respond to fluid replacement. Most commonly, saline-responsive metabolic alkalosis results from overzealous diuresis. Other causes include vomiting or nasogastric suction. A urinary chloride >10 mEq/L indicates saline-unresponsive metabolic alkalosis. Conn syndrome, Liddle syndrome, and Bartter syndrome are some etiologies of a saline-unresponsive metabolic alkalosis.

Case 4

A 55-year-old homeless man with changed mental status. Unconscious. He is disheveled and obtunded; pupils are midpoint and reactive. CT scan of the head, CBC, and LFTs are normal. ABG:

pH 7.25	Potassium 5.4
PCO_2 30	Bicarbonate 15
PO_2 90	Serum osmolarity (measured) 411 mmol/kg
Serum bicarbonate 15	Creatinine 1.8
Na 135	BUN 43
K 5.4	Glucose 134
Sodium 135	

1. What is the acid–base disorder?

2. What is the differential diagnosis?

3. How do you calculate serum osmolarity?

4. When would you measure serum osmolarity?

Summary: Case 4

In the presence of an unexplained anion gap metabolic acidosis, or when a suspicion of poisoning exists, it is extremely important to measure the osmolar gap. The osmolar gap is defined as the difference between the calculated serum osmolarity and the measured

serum osmolarity. An osmolar gap >10 suggests an exogenous source of an osmotically active substance (methanol or ethylene glycol). Ethylene glycol commonly produces oxalate crystalluria, and methanol will produce visual changes or blindness.

Calculated serum osmolarity = 2[Na] + Glucose/18 + BUN/2.8

Other causes of an increased osmolar gap include poisoning with paraldehyde, ethanol, or isopropyl alcohol (elevated osmolar gap **without** a metabolic acidosis); mannitol ingestion; hyperlipidemia; and hyperproteinemia. To calculate the serum concentration of the unmeasured osmoles the following formula is used:

Serum concentration = change in osmoles × (molecular weight/10).

Molecular weights are: ethanol 46, methanol 32, ethylene glycol 60, and isopropanol 60.

Case 5

45-year-old with community-acquired pneumonia. On day 3 vital signs are 38.8°C (102°F), BP 87/42, HR 124, RR 27.

1. Next step in management?
   A. Norepinephrine
   B. Dopamine
   C. Normal saline
   D. Observation

   Answer:

2. Most likely etiology of hypotension?

3. If fluid resuscitation is unsuccessful, what vasopressor will you begin?

4. What other causes of shock should you consider?

Summary: Case 5, Questions 1–4

The next step in the management of this patient is to initiate aggressive fluid resuscitation with normal saline or Ringer lactate. In this case, the most likely etiology of this patient's hypotension is septic shock, simply because you are given a history of fever associated with a pulmonary infection. If the blood pressure does not respond after aggressive fluid resuscitation, the next step would be to initiate therapy with Norepinephrine. Norepinephrine is the

vasopressor of choice in septic shock. It has recent data supporting improved outcome in septic shock patients, primarily from the surviving sepsis campaign. The second vasopressor of choice is dopamine. Both norepinephrine and dopamine have alpha and beta activity, thus improving cardiac contractility and increasing cardiac output.

In evaluating any patient with hypotension, it is important to categorize the various mechanisms by which shock can occur. Cardiogenic shock is hypotension secondary to arrhythmias, pump failure, acute valvular disease, or a dramatic event such as a ventricular wall rupture. Obstructive shock causes hypotension by reducing venous return to the heart. Common causes of obstructive shock include tension pneumothorax, cardiac tamponade, and pulmonary embolus. Hypovolemic shock causes hypotension by decreased intravascular volume. Common causes include bleeding, burns, and dehydration. Distributive shock is hypotension due to pathologic vasodilation of the peripheral vasculature. It is the only type of shock associated with a decreased systemic vascular resistance (SVR) on Swan-Ganz catheterization. Common causes include septic shock, anaphylactic shock, and acute adrenal insufficiency.

When you have shock with a history of …	**…Then the most likely diagnosis is …**	**And the treatment is …**
Urticaria; insect sting		
Hyperkalemia with hyponatremia and a non-anion gap metabolic acidosis; hyperpigmentation		
Malignancy; DVT immobilization; hip surgery; widely split S2 with loud P2		
Myocardial infarction *or* a new pansystolic murmur loudest at axilla *or* a pansystolic murmur maximal at the left sternal border		
Pneumonia; UTI; cellulitis		
Bleeding anywhere; recent procedure (biopsy, CVP placement, etc.); dehydration; or vomiting		
Distended neck veins; pulsus paradoxus; cardiomegaly with clear lungs on chest x-ray		

A stat EKG shows diffuse ST-segment elevations, and the patient's cardiac enzymes are positive.

5. What is the next step in the management of this patient?

Shock State	Cardiac Output	PCWP	SVR
Hypovolemic			
Cardiogenic			
Cardiac tamponade*			
Pulmonary embolus**			
Distributive			

*Tamponade is characterized by equalization of right atrial and right ventricular diastolic pressure, pulmonary artery diastolic pressure, and PCWP

**Massive pulmonary embolism is characterized by sudden increase in the pulmonary artery pressure with a normal or decreased PCWP

Summary: Case 5, Question 5

When the cardiac enzymes return positive, the etiology of the patient's hypotension becomes unclear. The two possible causes of shock include sepsis and cardiogenic shock secondary to an acute myocardial infarction. It is at this point in time that right heart catheterization would be important in distinguishing between these two possible etiologies of the patient's hypotension.

Case 6

A 23-year-old woman with community-acquired pneumonia. + respiratory distress. You elect to intubate immediately. Chest x-ray shows diffuse bilateral pulmonary infiltrates. Arterial blood gas on 100%:

7.42 / 32 / 150 / 100%.

1. Diagnosis?

2. Next step in the evaluation of this patient?
   A. Right heart catheterization
   B. Left heart catheterization
   C. CT angiogram
   D. 2-dimensional echocardiogram
   E. Start enoxaparin

   Answer:

3. When is increasing PEEP the answer?

4. What are plateau and peak pressures? Why are they important?

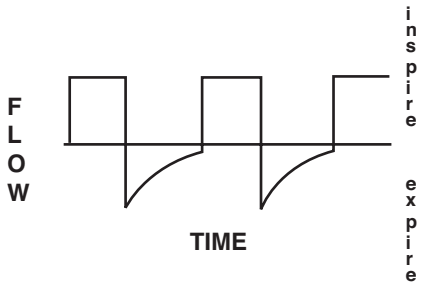
5. When should you suspect intrinsic PEEP?

   A. Chronic obstructive pulmonary disorder
   B. Acute respiratory distress syndrome
   C. Acute lung injury
   D. Pulmonary embolism

   Answer:

6. What can happen to the blood pressure when PEEP is increased?

7. 42-year-old man is intubated for severe exacerbation of COPD. He is found to have infiltrate on chest x-ray. He is found to be hypotensive. The following graph is obtained from the ventilator:



   What is the most appropriate next step in management?

   A. Apply external PEEP
   B. Administer dopamine
   C. Give bronchodilators
   D. Increase tidal volume
   E. Increase respiratory rate

   Answer:

8. What is permissive hypercapnia? Why is it important?

9. An ICU patient is currently being mechanically ventilated. You are required to increase PEEP from 5 to 10 cm H_2O in order to maintain oxygenation status. Which of the following would suggest that increasing PEEP may have a detrimental effect to the patient?

   A. Decrease in (A–a) gradient
   B. Decrease in blood pressure
   C. Increased urinary output
   D. Increase in lung compliance

   Answer:

10. In which of the following conditions will you only see an increase in the peak pressure?

   A. Air leak
   B. Cuff rupture
   C. CHF
   D. Mucus plug
   E. Pneumonia

   Answer:

Summary: Case 6

The acute onset of respiratory failure 12 to 24 hours after an initial lung injury is consistent with the diagnosis of acute respiratory distress syndrome (ARDS). ARDS is characterized by increased oxygen requirements reflected by a PaO_2/FiO_2 ratio of <200. The next step in the evaluation of this patient is to exclude cardiogenic pulmonary edema by performing an echocardiogram or by inserting a Swan-Ganz catheter to document normal left-sided pressures and/or a PCWP <18 mm Hg. Positive-end expiratory pressure (PEEP) is pressure provided by the ventilator at the end of expiration. PEEP improves oxygenation in patients with ARDS by optimally distending collapsed alveoli to optimize gas exchange. In patients who are persistently hypoxemic despite increasing levels of FiO_2 (>50%), PEEP should be added to reduce oxygen requirements.

The management of ARDS consists of treating the underlying cause of the lung inflammation. Supportive therapy consists of respiratory support to keep the PaO_2 at 60 mm Hg or the SaO_2 at 90%. To maintain these levels of oxygenation it is often necessary to increase the PEEP, which, in turn, may cause hypotension by decreasing venous return to the right side of the heart. This may also require the addition of vasopressor therapy to maintain blood pressure at acceptable levels. The concept of permissive hypercapnia consists of reducing tidal volume and thus allowing the levels of carbon dioxide to rise. By reducing tidal volume, the amount of barotrauma is reduced. The mortality of patients with ARDS is thus reduced by up to 10%.

As stated above, PEEP applied through a mechanical ventilator is referred to as applied or extrinsic PEEP to improve oxygenation. PEEP may also be referred to as auto or intrinsic

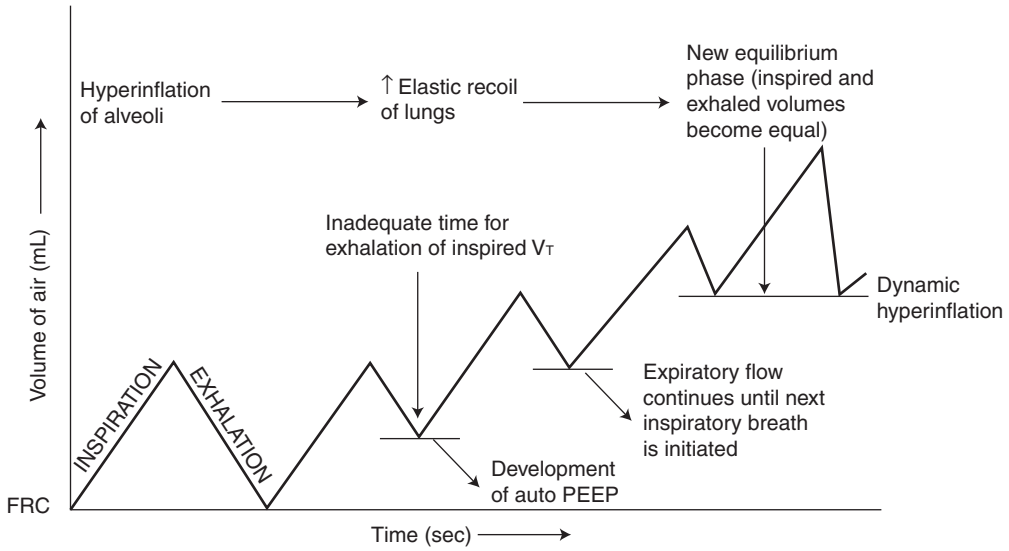
PEEP if it is secondary to incomplete exhalation, usually due to obstructive airways disease. There are three common situations in which auto PEEP is found:

1. **high minute volume ventilation**: large TV (too much air to expire) and/or a high RR (not enough time to exhale)

2. **expiratory flow limitation**: airway collapse, bronchospasm, inflammation (common in COPD)

3. **expiratory resistance**: narrow diameter or kinked endotracheal tube, inspissated secretions

The concept of auto PEEP or intrinsic PEEP can be explained as follows: If after a tidal volume is delivered, the amount of time in expiration is insufficient for the exhalation of the inspired tidal volume, auto PEEP may develop.

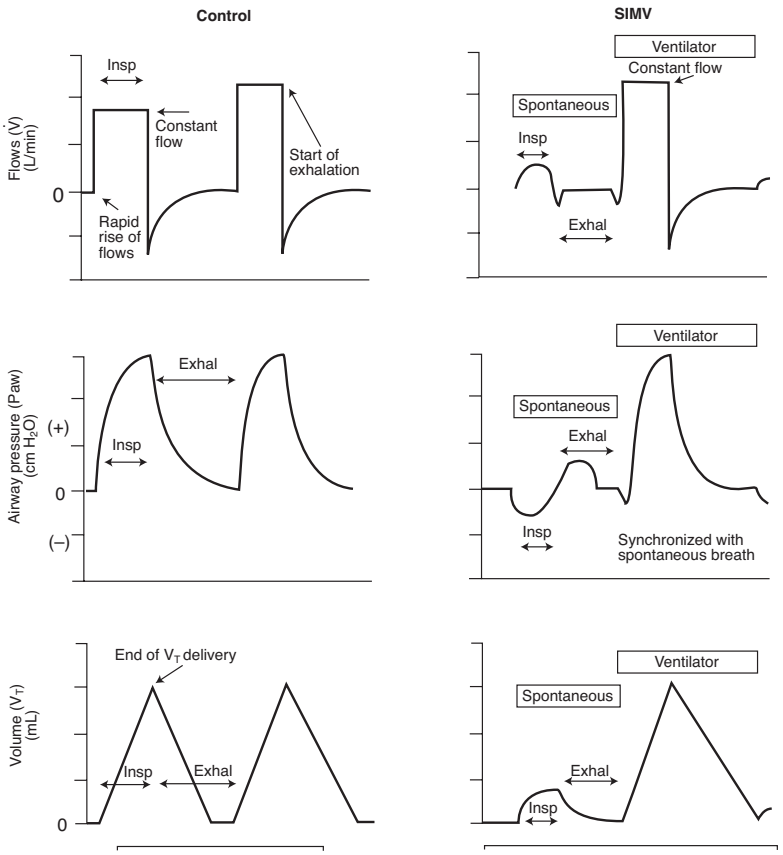


At the end of inspiration, after the entire tidal volume has been delivered, when the expiratory port is occluded and there is no air movement, the plateau pressure can be measured. In absence of flow, airway resistance becomes almost nonexistent. Therefore, the plateau pressure reflects the compliance of the lung parenchyma and chest wall. Higher plateau pressures reflect decreased compliance of the lung parenchyma and chest wall. When auto PEEP occurs, the treatment depends on the underlying cause. Prolonging the expiratory phase is the best ventilatory intervention. This is achieved by decreasing the tidal volume or decreasing the RR to allow the lungs time to exhale. Bronchodilators, steroids, and antibiotics are helpful when the underlying cause is obstructive airways disease. In patients with an expiratory flow limitation, small amounts of applied PEEP (approximately 50% of auto PEEP levels) can counter the effects of auto PEEP. **But only give applied PEEP** in the setting of expiratory flow limitation otherwise it will worsen respiratory dynamics and predispose the patient to barotraumas and hypotension.

The peak inspiratory pressure (PIP) is measured at the end of inspiration while the tidal volume is being delivered. The way to determine whether increased PIP reflects an airway

(bronchospasm) or a parenchymal problem is to measure the plateau pressure. If a parenchymal problem is causing an increased stiffness of the lung, both the plateau and peak pressures will be elevated. In an airway problem, you would expect the PIP to be increased with normal plateau pressures.

Mechanical ventilation can be delivered in various modes. Controlled mechanical ventilation (CMV) and assist/control (A/C) are modes that guarantee delivery of a minimum number of breaths per minute. If the patient triggers the ventilator by attempting to breathe, the machine will deliver the prescribed tidal volume. Synchronized intermittent mandatory ventilation (SIMV) is identical to CMV except that when the patient attempts to breathe on his/her own, the machine will not deliver the prescribed tidal volume. When the ventilator only provides pressure support for the patient's spontaneous breathing, the mode of ventilatory support is called continuous positive pressure ventilation.



1. 65-year-old man intubated for COPD exacerbation. Ventilator alarms off. Peak inspiratory pressure to be 40 cm H_2O and the plateau pressure to be 36 cm H_2O. Diagnosis:

   A. Mucus plug
   B. Worsening obstruction
   C. Increased secretions
   D. Lobar atelectasis

   Answer:

2. 65-year-old man intubated for COPD exacerbation. Ventilator alarms went off. Peak inspiratory pressure to be 40 cm H_2O and the plateau pressure to be 10 cm H_2O. Diagnosis?

   A. Pneumothorax
   B. Cardiogenic pulmonary edema
   C. Occluded ET tube
   D. Pneumonia

   Answer:

3. 78-year-old woman is intubated. ABG showed PaO_2 of 44 mm Hg. Post-intubation, with an FiO_2 of 0.50, the patient's PaO_2 improved to 83 mm Hg. Repeat ABG shows a PaO_2 of 34 mm Hg. PIP and plateau pressures are noted to be 23 cm H_2O and 25 cm H_2O, respectively. Physical exam shows no interim change. Diagnosis:

   A. Pulmonary edema
   B. ARDS
   C. Bronchospasm
   D. Pulmonary embolism

   Answer:

NOTE

Chlorhexidine VAP as well

4. 23-year-old woman with asthma is intubated. What is the best intervention to reduce her risk of ventilator-associated pneumonia?

   A. Continuous suctioning of respiratory secretions
   B. Antibiotic prophylaxis
   C. Frequent respiratory tubing changes
   D. Semi-recumbent position

   Answer:

The following table summarizes the common problems in ventilator management.

Problem	What does it mean?	Examples
Elevation of peak pressure only	Indicates problem or obstruction in the bronchial tree	
Elevation of both peak and plateau pressures	Indicates a problem in the chest cavity of parenchyma	
Decrease in both peak and plateau pressures	Indicates a problem in the air flow through the tube	

Pulmonary Function Testing (PFT)

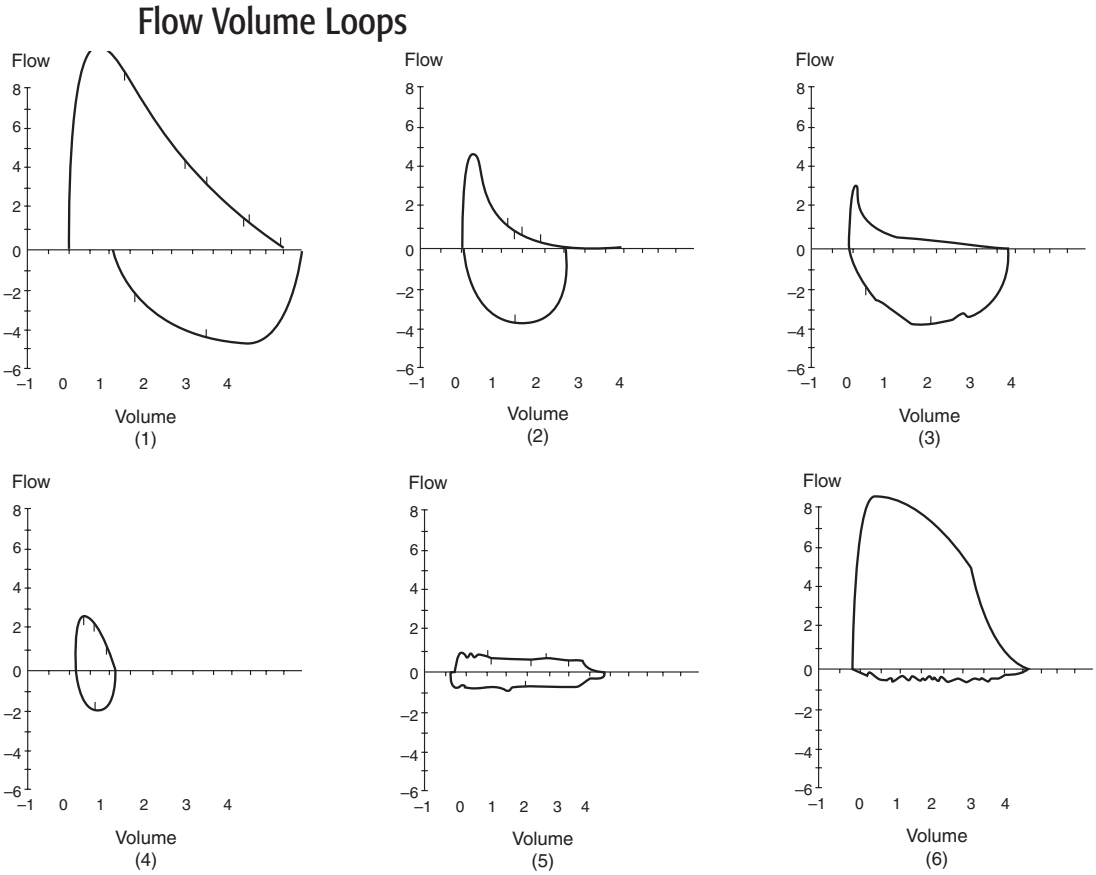
1. What pattern on PFT is consistent with obstructive lung disease?

2. What pattern on PFT is consistent with restrictive lung disease?

Explanations: Pulmonary Function Testing

Pulmonary function testing (PFT) consists of two parts: the measurement of lung volumes, and spirometry. Lung volumes are used as a measure of static compliance and are used primarily to diagnose restrictive lung disease. Spirometry is a measure of dynamic compliance and is used primarily to diagnose obstructive lung disease. It is important to realize that both of these classifications of lung disease have many etiologies. Restrictive lung disease can be caused by fibrosis, sarcoidosis, obesity, or chest wall deformity. Obstructive lung disease can be due to asthma, COPD, or bronchiectasis. Thus, the history and physical exam become essential in arriving at a correct diagnosis.

Spirometry is considered abnormal when the FEV_1 falls below 80% of its predicted value. Lung volumes are considered to indicate restrictive disease when they are less than 80% of predicted.



1. What is the diagnosis?

Match the appropriate flow-volume loops with the following patients:

A. A 17-year-old girl with moderate asthma and nocturnal symptoms undergoes spirometry with methacholine.

B. A 23-year-old immigrant from South America presents with a large goiter. She complains of dyspnea at rest and exercise.

C. A 65-year-old with a 35-pack/year history of smoking undergoes spirometry to assess worsening of symptoms. He has had 4 hospitalizations in the past 12 months for dyspnea and increased sputum production. Baseline oxygen saturation is 86% on room air.

D. A 28-year-old college basketball player has a history of asthma which occurs usually 1–2 times a month and is worse in winter months. There are no nocturnal symptoms.

E. A 68-year-old man suffers a stroke. After the stroke he is noted to have hoarseness in his voice and difficulty swallowing foods and liquids, with frequent episodes of coughing during meals.

F. A 55-year-old man presents with dyspnea at rest which is progressively worsening over the past 2 years. He was previously employed as a subway construction worker for many years. Fine crepitations are heard diffusely on lung examination. Diffusing capacity for carbon monoxide is decreased.

2. 38-year-old man with history of lung cancer and radiation therapy to chest is being evaluated for progressive dyspnea. Restrictive pattern is found on spirometry. Measurement of which of the following can differentiate interstitial fibrosis from pleural fibrosis?

   A. DLCO
   B. FEV_1
   C. FEV_1/FVC
   D. RV
   E. TLC

   Answer:

3. In which of the following patients will you find **reduced lung volume** and **normal DLCO**?

   A. Asthma
   B. Congestive heart failure
   C. Interstitial lung disease
   D. Phrenic nerve paralysis
   E. Pulmonary embolism

   Answer:

4. In which of the following patients will you find **reduced lung volume** and **decreased DLCO**?

   A. Asthma
   B. Emphysema
   C. Neuromuscular disorders
   D. Pulmonary edema
   E. Pulmonary embolism

   Answer:

Summary: Flow Volume Loops

The diffusion capacity of carbon monoxide (DLCO) is used as a measure of the lung's ability to perform gas exchange at the level of the alveolus and capillaries. The amount of CO that is able to diffuse across the alveolus into the capillary depends on the amount of hemoglobin in the blood and the integrity of the alveolar structure. Thus, any process that increases the amount of blood in the pulmonary capillaries will increase the DLCO. Such processes include asthma and heart failure. Diseases that reduce the DLCO include any interstitial process such as fibrosis or inflammation. When reduced lung volumes are measured and the DLCO is also reduced, the most likely diagnosis is some sort of intrinsic lung disease such as parenchymal fibrotic process or pulmonary edema. The presence of a restrictive pattern with reduced lung volumes and a normal DLCO speaks for an extrapulmonary cause of the restrictive disease, i.e., obesity or chest wall deformity, or neuromuscular disease. Decreased DLCO in the setting of obstructive airway disease suggests emphysema.

Case 7

A 57-year-old woman with shortness of breath progressively worsening. Baseline, distance of 3 city blocks. At this time she can walk only one block. Chronic cough that is productive of whitish sputum that has become greenish and more copious over the last several days. 20-year history of smoking. Bilateral wheezing.

1. Most likely diagnosis?

   A. Asthma
   B. Chronic bronchitis
   C. Emphysema
   D. Pulmonary edema
   E. Pulmonary fibrosis

   Answer:

2. Best initial therapy?

   A. Albuterol
   B. Corticosteroids
   C. Oxygen
   D. Mucolytics
   E. Tiotropium

   Answer:

3. Are antibiotics indicated? If so, what antibiotics would you give?

4. Which of the following blood gases is most likely found in this patient?

	pH	PO_2 (mm Hg)	PCO_2 (mm Hg)	HCO_3 (mEq/L)
A.	7.15	98	33	11
B.	7.15	98	24	8
C.	7.30	56	80	38
D.	7.40	100	40	25
E.	7.50	100	33	25

   Answer:

5. All of the following are indications for home oxygen therapy, except

   A. pO2 <55
   B. Left ventricular failure
   C. Right ventricular failure
   D. Hematocrit >56%

   Answer:

6. Upon review of her EKG, she is found to have increased amplitude of P waves in lead II. Which of the following changes in management is indicated?

   A. Diuretic therapy
   B. Home oxygen
   C. Oral prednosine
   D. Prophylactic antibiotics
   E. Theophylline

   Answer:

NOTE

Major risk factor for COPD
Smoking

7. Which of the following is indicated for reduced mortality and progression of COPD?

   A. Long-acting anticholinergics
   B. Lung volume reduction surgery
   C. Influenza vaccine
   D. Inhaled corticosteroids
   E. Smoking cessation

   Answer:

NOTE

Supplemental O2 reduces mortality as well as lung volume reduction surgery

8. 69-year-old man is discharged COPD exacerbation. He is discharged on home O2, inhaled fluticasone, and albuterol. On follow-up arterial blood gas is: pH 7.44, pO2 57, pCO2 51, and FEV1 40% of expected. Next step:

   A. Phlebotomy to goal of hematocrit <56%
   B. Change inhaled fluticasone to oral prednisone
   C. Add ipratropium
   D. Add azithromycin
   E. Recommend possible lung resection surgery

   Answer:

NOTE

Young patient started on salmeterol. Best counseling.

Oral hydration 2/2 to dry mouth

Summary: Case 7

In any patient who presents with progressively worsening shortness of breath associated with wheezing and has a significant history of smoking, COPD should be considered in the differential diagnosis. The history of chronic cough and sputum production also speaks for the diagnosis of COPD. Patients with emphysema complain mostly of dyspnea and rarely complain of cough. Patients tend to be thin and appear short of breath, using accessory muscles of breathing. Peripheral edema is rare. Chest x-ray shows hyperinflation, and the $PaCO_2$ tends to be normal or reduced. Hemoglobin is normal. Spirometry shows obstruction, and the residual volume may be markedly increased. DLCO is usually reduced. In patients with chronic bronchitis, the major complaint is productive cough lasting months at a time. Dyspnea is usually mild, and patients often appear overweight and cyanotic. Peripheral edema is common. $PaCO_2$ can be markedly elevated, and polycythemia is more common than in emphysema. Spirometry reveals obstruction. The DLCO is usually normal.

The best initial therapy for patients with COPD is oxygen via nasal cannula, and ipratropium is the bronchodilator of choice. Antibiotic therapy is indicated for the treatment of acute COPD exacerbations when there has been a documented increase in the amount of sputum or a change in the quality of the sputum. Commonly used antibiotics include doxycycline, fluoroquinolones, and macrolide antibiotics.

The role of steroids in the management of COPD is only during an acute exacerbation. They are generally not useful in the management of chronic disease, with benefit in less than 10% of patients with chronic COPD. The presence of hypercapnia on the ABG is an indication that the FEV_1 has fallen below 50% of predicted. If a room-air ABG shows the PaO_2 to be below 55 mm Hg, oxygen therapy may be initiated. Oxygen therapy may also be started if the PaO_2 lies between 56 and 59 mm Hg and the patient has a hematocrit >56% *or* has a P pulmonale on EKG *or* has clinical evidence of right-sided heart failure on physical exam. Oxygen therapy is the only intervention besides smoking cessation that has been shown to reduce mortality secondary to COPD. Smoking cessation is always a goal that is desirable in the treatment of COPD. It is the only nonpharmacologic intervention shown to reduce mortality and progression of COPD. The main indication for lung resection surgery in patients with chronic COPD is an FEV1 less than 40% of expected, with primarily upper lobe disease. The procedure does not improve mortality, but it improves frequency of exacerbations. It also allows the lower lobes of the lungs with less disease to expand better, thus improving ventilation.

Case 8

A 23-year-old woman with dry cough. She denies any shortness of breath, acid reflux, or heartburn. + "spring allergies." Positive nasal polyps bilaterally.

1. Most common causes of cough?

2. How would you treat this patient's nasal polyps?

The patient is sent for pulmonary function tests (PFTs), which return as normal with no evidence of airways obstruction.

3. What test is indicated at this time?

   A. Methacholine challenge
   B. Ipratropium challenge
   C. Chest CT
   D. Repeat PFTs in 3 months
   E. Repeat PFTs in 6 months

   Answer:

4. Are the normal PFTs inconsistent with the diagnosis of asthma? Why or why not?

Patient with perennial allergies, rhinitis and nasal polyps. He has an allergy to NSAIDs as well. Diagnosis?

ASA sensitivity

Summary: Case 8, Questions 1–4

The most common causes of cough include GERD, postnasal drip, and cough variant asthma. The treatment of nasal polyps includes nasal steroids. Generally, if on spirometry the FEV_1 improves by more than 12% after administration of a bronchodilator, the diagnosis of asthma is made. Because asthma is defined as reversible airways obstruction, normal spirometry does not rule out the diagnosis. Thus, if after spirometry the diagnosis is suspected, then the next step is to perform a methacholine challenge test. This test is very sensitive for the diagnosis, so a negative result excludes asthma with a 95% certainty.

A week later symptoms worsening. She regularly wakes up at night with a dry, hacking cough that is relieved by her inhaler.

5. What medication would you start at this time?

   A. Salmeterol
   B. Fluticasone
   C. Theophylline
   D. Zafirlukast
   E. Omalizumab

   Answer:

NOTE

Most accurate way to treat asthma is to remove the causative agent

NOTE

Empiric PPI have not shown to make a change in the symptoms of asthma

NOTE

Mainstay of therapy for asthma is inhaled steroid

Treatment of Asthma

Classification	Daytime Symptoms	Nighttime Symptoms	Therapy
Mild intermittent			
Mild persistent			
Moderate persistent			
Severe persistent			

You start the patient on a steroid inhaler in addition to her inhaled bronchodilator. Two weeks later she came in complaining of shortness of breath with wheezing.

6. What is the best initial test at this time?

   A. Chest x-ray
   B. Peak flow
   C. Skin allergy testing
   D. Chest CT
   E. Methacholine challenge

   Answer:

7. What is the best initial therapy?

8. When will you give ipratropium bromide?

9. What other medications are indicated at this time?

The resident does an ABG and reads you the following report:

7.35/ 38 / 90 / 25.

NOTE

Post Nasal Drip is now called Upper Airway Cough Syndrome.

10. What is the next step in the management of this patient?

    A. Discharge patient home with oral prednisone for 7 days
    B. Discharge patient home with higher dose inhaled fluticasone
    C. Admit to 23-hour observation unit
    D. Stat MICU consult and probable intubation

    Answer:

11. Young college graduate with history of asthma and eczema moves to NYC and has worsening asthma. Remove rug, carpeting, and use allergy proof warps for mattress, pillows, and box spring.

12. Patient with a history of asthma maxed on medical symptoms, and changed lifestyle to remove allergens. She has a dog but doesn't want to get rid of it. Serum IgE level is high. Next step?

    Add omalizumab

Summary: Case 8, Questions 5–10

The best initial diagnostic test in the management of an acute asthma exacerbation is to measure the peak expiratory flow. This test is quick and provides a tremendous amount of information regarding the severity of the exacerbation. Additionally, it provides a baseline against which to measure the effectiveness of therapy. The best initial therapy for an acute asthma exacerbation is a short-acting beta agonist. Ipratropium is the bronchodilator of choice in asthma exacerbating secondary to beta-blocker ingestion. Steroids should be used for the treatment of an acute asthma exacerbation. The findings on ABG in a patient with asthma should reflect the patient's hyperventilation. Thus, when the pCO_2 is normal and not low, as in the present case, it may be a sign of impending respiratory failure. Thus, the next step in management of this patient would be to intubate and provide mechanical support of her respiratory function.

The difference between the acute management of COPD and asthma is important. In COPD, the bronchodilator of choice is always ipratropium, whereas in asthma the bronchodilator of choice is a short-acting beta agonist. The chronic management also differs between the two diseases. In asthma, the role of inhaled steroids is clearly defined and has proven benefit; whereas in COPD, the only interventions that have been shown to improve mortality are smoking cessation and chronic oxygen therapy.

1. A 32-year-old with medical history of asthma. Severe shortness of breath that began 2 days ago. – fever, + substernal chest pain that worsens with deep inspiration. Diffuse wheezing. What is the best initial test?

   A. Arterial blood gas
   B. Chest x-ray
   C. Pulse oximetry
   D. Pulmonary function testing
   E. Peak flow

   Answer:

2. A 23-year-old man with asthma + nighttime symptoms twice a week and has to use his albuterol inhaler three times per week. Only medication is albuterol inhaler. Next step?

   A. Add an inhaled steroid and theophylline
   B. Add zafirlukast and an inhaled steroid
   C. Add prednisone and salmeterol
   D. Add an inhaled steroid and salmeterol
   E. Add salmeterol

   Answer:

3. A 37-year-old man with asthma that has worsened over the past 8 months. Daily, associated with brown-tinged productive sputum. Symptoms are no longer well controlled with long-acting beta-agonist and inhaled corticosteroids. Elevated eosinophil count and elevated IgE levels. Next step?

   A. Blood cultures
   B. High resolution CT scan of the chest
   C. Serum precipitins
   D. Skin test to aspergillus antigens
   E. Sputum culture

   Answer:

NOTE

If you see a fungus ball on CT but pt asymptomatic = monitor

Fungus ball on CT with hemoptysis = surgery

4. The patient is found to have centrally located bronchiectasis on CT scan of the chest. Which of the following is the most appropriate management?

   A. Omalizumab
   B. Antibacterial agents
   C. Corticosteroids
   D. Iptratropium
   E. Itraconazole

   Answer:

NOTE

Psittacosis Complement fixation and serology = most accurate diagnostic test

Patient with steroid dependent asthma presents with cough wheezing and brownish mucus. IgE is extremely high

Diagnosis?

ABPA

Treatment? Increased Steroids

Young patient who works with birds presents with cough and ground glass appearing CXR. WBC (–) for eosinophils and PFTs are restrictive. Diagnosis?

Bird fancier lung

38-year-old woman with night sweats, and low fever. + cough (–) sputum. CXR – peripheral infiltrates. High eosinophils. ESR 90

Diagnosis?

Chronic eosinophillic PNA

Treatment? Steroids

5. 50-year-old woman with severe asthma requiring long-term corticosteroids presents with rhinitis. + palpable purpuric lesions of extensor surfaces. Chest x-ray reveals patchy opacities in bilateral lung fields. CBC reveals eosinophilia. Next step?

   A. ANA
   B. c-ANCA
   C. p-ANCA
   D. Lung biopsy
   E. High resolution CT scan

   Answer:

6. 45-year-old man with history of diabetes, asthma, allergic rhinitis, and angina presents with worsening of his asthma symptoms. Taking albuterol daily aspirin. Next step?

   A. Add anticholinergic
   B. Add inhaled corticosteroid
   C. Add theophylline
   D. Stop aspirin
   E. Switch to long-acting beta agonist

   Answer:

7. 21-year-old woman complains of dyspnea and coughing during exercise – symptoms at night or during the day. Next step?

   A. Anticholinergic inhalers
   B. Avoidance of strenuous activity
   C. Cromolyn sodium
   D. Long-acting B agonist
   E. Short-acting B agonist

   Answer:

Case 9

43-year-old man with chronic cough. Cough started after pneumonia 6 months ago. Production of copious amounts of sputum, foul-smelling, streaked with blood. Crackles bilaterally at the lung bases.

1. Diagnosis?
   A. Allergic bronchopulmonary aspergillosis
   B. Bronchiectasis
   C. Goodpasture syndrome
   D. Systemic lupus erythematosus
   E. Wegener granulomatosis

   Answer:

2. What is the best initial diagnostic test?

3. What is the diagnostic test of choice?

4. What would you expect to find on PFTs?

5. 22-year-old man with complaints of increased shortening of breath. Mild bilateral basilar rales. Prescribed levofloxacin and an albuterol inhaler. 2 weeks later no improvement, more short of breath. A chest CT reveals multiple bullae in the lower lobes of the lungs bilaterally. A CBC returns:

WBC 6.1	HCT 37
Hgb 11.1	Plt 254

The serum chemistries return:

Na 140	Ca 9.8
K 4.7	AST 145 (elevated)
Cl 110	ALT 233 (elevated)
HCO3 28	Alk Phos 340 (elevated)
BUN/Cr 30/1.2	Total Bili 0.9

What is the next best test in the management of this patient?

A. Sweat chloride test
B. Bronchoscopic lung biopsy
C. Sperm motility test
D. Alpha-1 antitrypsin
E. Anti-neutrophilic antibody

Answer:

Summary: Case 9

In a patient who presents with a history of recurrent pneumonia and chronic productive cough, the most likely diagnosis is bronchiectasis. The best initial test is the chest x-ray. Radiographic findings include "train tracks" and "ring shadows." The diagnostic test of choice is a CT scan of the chest, which shows dilated airways. The findings on spirometry are consistent with an obstructive pattern, with reduced FEV_1. The most common underlying disease predisposing to bronchiectasis is cystic fibrosis. Other immunodeficiencies, such as common variable immunodeficiency, can also predispose to bronchiectasis. Granulomatous infection (TB, histoplasmosis), rheumatoid arthritis, inflammatory bowel disease, SLE, and alpha-1-antitrypsin disease are uncommon causes of bronchiectasis. Treatment for bronchiectasis includes chest physical therapy to mobilize secretions, bronchodilators, and antibiotics based upon sputum cultures.

Case 10

32-year-old African-American complaining of chest pain. Pain began suddenly yesterday. EKG, cardiac enzymes, and all subsequent lab work are negative. Slightly elevated calcium level. Chest x-ray reveals bilateral hilar lymphadenopathy. PE: NL.

1. Diagnosis?

2. Test?

   A. Lymph node biopsy
   B. ACE levels
   C. Serum calcium
   D. Chest x-ray
   E. Chest CT

   Answer:

3. When are steroids the answer?

4. What do you expect to find on PFTs?

Summary: Case 10

In a young African-American patient who is found incidentally to have hilar lymphadenopathy on CXR, the diagnosis of sarcoidosis is likely. The diagnostic test of choice is a biopsy of mediastinal or hilar lymph nodes to identify noncaseating granulomas. Measuring ACE levels is not sensitive or specific enough to be relied upon for the diagnosis. ACE levels are only used after treatment to determine efficacy of therapy. Indications for therapy for patients with sarcoidosis include ocular, cardiac, CNS involvement, or symptomatic Stage II pulmonary disease. Also, patients with malignant hypercalcemia and constitutional symptoms should be treated with systemic steroid therapy. The appropriate management of the asymptomatic patient with Stage I sarcoid is to withhold therapy; 75–80% of these patients will go into spontaneous remission on their own. Most patients with pulmonary involvement demonstrate a restrictive pattern when lung volumes are measured.

Sarcoidosis Staging

Stage	Findings
0	No radiologic findings
1	Hilar lymphadenopathy and no pulmonary infiltrates
2	Hilar lymphadenopathy and pulmonary infiltrates
3	No lymphadenopathy and significant pulmonary infiltrates
4	Diffuse pulmonary fibrosis

Case 11

35-year-old man with sudden onset of chills, fever, cough, and shortness of breath. Nausea that began yesterday evening. Works in a cork factory. Symptoms began 5 hours after first day. Tachycardic and tachypneic, and lung auscultation reveals that he has bibasilar crackles. Chest x-ray is significant for small nodular densities sparing the bases and apices of the lungs.

1. When is the most likely diagnosis hypersensitivity pneumonitis?

2. When is the most likely diagnosis bacterial pneumonia?

3. What laboratory findings will distinguish hypersensitivity pneumonitis from bacterial pneumonia?

4. What is the best initial test for diagnosis of hypersensitivity pneumonitis?

   A. Blood cultures
   B. Pleural biopsy
   C. Skin antigen testing
   D. Anti-neutrophilic antibody

   Answer:

5. What is the treatment for hypersensitivity pneumonia?

Summary: Case 11

Hypersensitivity pneumonitis is characterized by sudden onset of chills, malaise, cough, and shortness of breath 4 to 8 hours after exposure to the occupational hazard. The white blood cell count is usually elevated with a left shift. Notably, there is mild eosinophilia associated with hypersensitivity pneumonitis. Diagnosis is made by the presence of precipitating antibody in the serum to the offending agent. Treatment is with oral steroids.

Case 12

57-year-old man with difficulty breathing over the last 9 months. + exertional symptoms that have limited his ability to walk. + cough, dry. No history of heart disease or smoking. Worked as an accountant for the last 35 years. No medication. Clubbing of his fingers and bilateral "dry" crackles over both lung bases.

1. What is the best initial test?

2. What is the most sensitive non-invasive test?

3. What is the best test for the diagnosis of this disease?

4. What would you expect to find on PFTs?

5. 49-year-old man with idiopathic pulmonary fibrosis. Patient is on oral prednisone and inhaled albuterol daily with little improvement in FEV1 and SO2. Next best treatment option?

   A. Start methotrexate
   B. Start infliximab
   C. Start rituximab
   D. Refer for a heart-lung transplant

   Answer:

Summary: Case 12

In a 57-year-old man who presents with insidious onset of shortness of breath associated with clubbing and "Velcro" rales on lung auscultation, the most likely diagnosis is idiopathic pulmonary fibrosis. The best initial test for the diagnosis is a chest x-ray that may reveal increased linear or reticular opacities. Areas of normal lung may be present next to areas of significant fibrosis. Pathologically, the pattern is referred to as usual interstitial pneumonia (UIP) characterized by patchy, non-uniform distribution of fibrosis. CT scanning of the chest can, in certain situations, obviate the need for a biopsy to establish the diagnosis. In patients who are over 65 years of age and have progressive fibrosis and honeycombing on chest CT scan and a restrictive pattern on pulmonary function testing, a biopsy to diagnose pulmonary fibrosis may be unnecessary. The most accurate test for the diagnosis is a lung biopsy. Treatment for pulmonary fibrosis consists of steroid therapy. The response to steroids depends on the histological type. Patients with UIP respond to steroid therapy 15% of the time. Their prognosis is poor, and median survival is approximately 3 years from the time of diagnosis.

Additional cases

> 45-year-old man comes to your office complaining of SOB and a dry cough that began 3 months ago after an URTI. Complains of fatigue and weight loss over the same period of time. PE is significant for respiratory crackles noted bilaterally. Chest x-ray shows diffuse opacities with normal lung volume.

The most likely diagnosis in this case is bronchiolitis obliterans organizing pneumonia (BOOP). The relatively acute onset of symptoms following a flu-like illness strongly suggests the diagnosis. The best initial test is a chest x-ray, and the most accurate test is lung biopsy showing buds of loose connective tissue (Masson bodies) and inflammatory cells filling the alveoli and distal bronchioles. Treatment consists of steroids.

> 42-year-old man comes to your office complaining of progressively worsening SOB, fatigue, and weight loss. He also complains of a nonproductive cough. Physical exam is significant for crackles auscultated bilaterally in both lung fields. Chest x-ray is significant for bilateral symmetrical lower-lobe opacities in a "bat-wing" distribution.

The most likely diagnosis is pulmonary alveolar proteinosis. This condition is characterized by accumulation of phospholipids within the alveolar spaces. The "bat-wing" appearance on chest x-ray is typical. The most accurate test is a bronchoalveolar lavage that demonstrates PAS-positive material. Treatment is whole-lung lavage through a double lumen endotracheal tube.

32-year-old woman comes to the office complaining of progressively worsening shortness of breath. PMH is significant for several spontaneous pneumothoraces, and chest CT scan reveals thin-walled cysts surrounded by normal lung.

In a young woman with recurrent pneumothoraces and thin-walled cysts on CT scan of the chest, the most likely diagnosis is pulmonary lymphangioleiomyomatosis. The disease is characterized by atypical proliferation of smooth-muscle cells and subsequent cyst formation. Other complications include early-onset emphysema, chylothorax, chylous pleural effusions, and chyloperitoneum. Disease typically accelerates during pregnancy and is retarded by oophorectomy. Treatment consists of oophorectomy, luteinizing hormone, tamoxifen, or progesterone. The most effective therapy is lung transplantation.

Occupational Lung Disease

When there is interstitial lung disease and the history is . . .	. . . Then the most likely diagnosis is . . .	Characteristics unique to the disease are . . .
Rock mining, quarrying, stonecutting, sandblasting		Eggshell calcifications on chest x-ray; higher risk of pulmonary TB
Mining, insulation, construction, shipbuilding		Pleural plaques and calcifications on chest x-ray; barbell-shaped fibers on lung biopsy
Coal mining		Caplan syndrome: necrotic rheumatoid nodules in the periphery of the lung in a coal worker with RA
Machining and handling beryllium alloys. *Beryllium miners do not get berylliosis.*		Can mimic sarcoidosis and show noncaseating granulomas on lung biopsy. Lymphocyte proliferation test diagnostic. Responds to early treatment with prednisone.

Case 13

27-year-old man with daytime sleepiness. Sudden inability to stay awake that occurs sometimes during important meetings. Describes falling down while laughing at a friend's joke. Describes being unable to move, despite being fully alert, while waking in the morning. Begun to hear voices before falling asleep in the evening. Physical exam is normal.

1. Diagnosis?

2. Diagnostic test of choice? What do you expect to find?

3. Treat this disorder?

Patient with daytime sleepiness and moderate muscular weakness and hallucinations at sleep onset.

Diagnosis?

Narcolepsy

Treatment?

Modafinil

Summary: Case 13

Narcolepsy is characterized by the following tetrad of symptoms:

- Sleep attacks
- Cataplexy—sudden loss of muscle tone with emotion
- Sleep paralysis—temporary paralysis upon waking
- Hypnagogic hallucinations

The diagnostic test of choice is sleep studies. The finding indicative of narcolepsy is the onset of REM sleep within minutes of falling asleep. Treatment consists of methylphenidate for sleep attacks and SSRIs for cataplexy, sleep paralysis, and hallucinations.

Case 14

47-year-old brought by wife who says her husband's snoring keeps her up at night. He sometimes stops breathing at night and "chokes" until he clears his throat and begins to breathe again. Patient complains of excessive sleepiness during the day, morning headaches, and some confusion. Past medical history for high blood pressure and obesity. Physical exam elevated blood pressure.

1. Diagnosis?

2. What is the best initial test?

3. What is the most sensitive test?

4. What is the best initial treatment?

   A. Oxygen
   B. Tracheostomy
   C. Albuterol
   D. Continuous positive airway pressure
   E. Uvulopalatopharyngoplasty

   Answer:

5 A daytime arterial blood gas shows the following: 7.35 / 50 / 78 / 28. Do these results change your diagnosis?

6. What medications can you give at this time?

Patient with daytime sleepiness and irritability with leg edema. Wife says he snores and stops breathing at night intermittently. Diagnosis?

OSA

Summary: Case 14

In a 47-year-old obese man who complains of daytime somnolence and has apneic episodes witnessed by others, the most likely diagnosis is obstructive sleep apnea. The best initial test is overnight pulse oximetry. In the absence of any overnight desaturations, the likelihood of having obstructive sleep apnea is very low. The most accurate test is sleep studies documenting at least 30 overnight apneic episodes lasting 10 seconds each. The best initial therapy is CPAP. Uvulopalatopharyngoplasty is the next step in management when CPAP therapy fails. Tracheostomy is the most effective therapy and is generally reserved for those patients who are refractory to medical treatment or whose disease is associated with malignant cardiac arrhythmias.

The presence of carbon dioxide retention on an ABG is diagnostic of obesity hypoventilation, or Pickwickian syndrome. In patients with obesity hypoventilation, the treatment consists of acetazolamide or progesterone to stimulate the central respiratory centers.

Case 15

46-year-old man with cough. Began 2 months ago progressively worsening over the last 2 weeks. Nonproductive. Denies cigarette smoking or heart disease. Decreased breath sounds in the right lower lobe with dullness to percussion and decreased fremitus. Chest x-ray shows right-sided pleural effusion.

1. Diagnosis? Why?

2. Next step in the management?

3. When is thoracentesis the answer? What tests would you order on the pleural fluid? Why?

A thoracentesis is performed and 200 mL of serosanguineous fluid is drained. The following results are obtained:

Serum LDH: 120	Pleural fluid LDH: 80
Serum protein: 6.2 g/dL	Pleural fluid protein: 4.5 g/dL

Cytology: Negative for malignant cells

Stain for AFB: Negative

Pleural fluid amylase and glucose: All normal

4. Transudate or an exudate? Why?

5. Which of the following is a cause of transudative effusions?

   A. Pneumonia
   B. Pancreatitis
   C. Ovarian cancer
   D. Rheumatoid arthritis
   E. Cirrhosis

   Answer:

6. What are the most common causes of exudative effusions?

7. 22-year-old woman with large, bilateral pleural effusions right greater than left. Saturating 92–94% on 2L nasal cannula. A pleurocentesis is performed, with the following results:

Pleural LDH 800	Lipase negative
Pleural protein 6.1	Fluid stain and culture negative
Pleural WBC 0-2	Pleural biopsy negative for culture
Pleural glucose 23	Serum LDH 930
Pleural amylase	Serum protein 7.5

   What is the most likely underlying diagnosis causing this patient's pleural effusions?

   A. Post-obstructive pneumonia
   B. Rheumatoid arthritis
   C. Pancreatitis
   D. Esophageal rupture
   E. Cholangiocarcinoma

   Answer:

A V/Q scan is done and shows a low probability for pulmonary embolus.

8. What would you do next?

9. When is the answer pleurodesis?

10. What is a complicated parapneumonic effusion? How will it change your management of this case?

Summary: Case 15

In any unexplained pleural effusion, the next step is to obtain a decubitus film. The purpose of this study is to ascertain the presence of free-flowing fluid in the thorax. If the fluid layers and is >10 mm thick, then a blind thoracentesis may be performed to obtain pleural fluid for analysis. If on the decubitus film the fluid is not free-flowing, then the thoracentesis should be performed under ultrasound guidance. When an underlying systemic disease is identified that can cause a pleural effusion, the underlying disease is usually treated before a thoracentesis is performed. Only if the effusion is asymmetric, is persistent after treatment of the underlying disease, or is associated with a fever is thoracentesis done immediately before initiating therapy for the underlying disease.

The distinction between a transudative effusion and an exudative effusion is made by measuring the LDH protein in the pleural fluid. Transudative effusions have a pleural fluid LDH-to-serum LDH ratio of less than 0.6, a pleural fluid protein-to-serum protein ratio of less than 0.5, and an absolute LDH level that is below 200. To classify an effusion as exudative, only one of the above criteria must be consistent with an exudative effusion. The most common causes of a transudative effusion are heart failure, cirrhosis, nephrotic syndrome, hypothyroidism, and pulmonary embolus. Exudative effusions are caused by pneumonia, malignancy, tuberculosis, sarcoidosis, and pulmonary embolism.

Typically, a patient with a pleural effusion secondary to rheumatoid arthritis will have pleural fluid glucose <40 g/dL. When the amylase is elevated in the pleural fluid, you should suspect pancreatitis or esophageal rupture as the cause of the pleural effusion. In complicated parapneumonic effusions (frank pus, glucose <60 g/dL, pleural fluid pH <7.2, pleural fluid pH 7.2–7.3, and LDH >1,000), the next step is to place a chest tube for drainage. If the fluid does not drain, then lavage with streptokinase may be attempted to break down the loculations. If this is unsuccessful, then surgical debridement and drainage are indicated.

In any unexplained pleural effusion the next step is to rule out a pulmonary embolus, which can cause both a transudative or exudative effusion. If the workup for a pulmonary embolism is negative, the next step is to pursue the diagnosis with a video-assisted thoracic surgical (VATS) biopsy or open pleural biopsy. The most accurate test for the diagnosis of the etiology of a pleural effusion is the open pleural biopsy.

1. 33-year-old female immigrant complaining of gradual onset of shortness of breath began 4 months ago. + low-grade fever and night sweats. Chest x-ray reveals a right-sided pleural effusion. Thoracentesis is performed, which shows an exudative effusion. Cultures for viral, acid-fast bacillus (AFB), and bacteria are all negative. Next step?

   A. Open pleural biopsy
   B. Repeat thoracentesis
   C. Begin empiric treatment for pulmonary TB
   D. Ventilation perfusion scan
   E. Begin IV heparin

   Answer:

2. 47-year-old man with HIV and tuberculosis develops recurrent pleural effusions. 2 therapeutic pleural taps in the past 3 weeks. Next step?

   A. Chest tube drainage
   B. Pleurectomy
   C. Pleurodesis
   D. Pleuroperitoneal shunting
   E. Thoracic duct ligation

   Answer:

3. 32-year-old woman presents with fever, cough, and dyspnea. Chest x-ray shows small right-sided pleural effusion that layers on right lateral decubitus film. Pleural fluid analysis shows pH 7.28. Gram stain and culture results and sensitivities are obtained. Next step?

   A. Antibiotic therapy
   B. Chest tube drainage
   C. Decortication
   D. Pleurodesis
   E. Thoracoscopy

   Answer:

4. 53-year-old man presents with fever, cough, and dyspnea. Chest x-ray shows moderate right-sided pleural effusion with irregular contour. The effusion does not layer on lateral decubitus film. Pleural fluid analysis shows pH 7.19. Gram stain and culture results and sensitivities are obtained. Next step?

   A. Antibiotic therapy
   B. Chest tube drainage
   C. Decortication
   D. Pleurodesis
   E. Thoracoscopy

   Answer:

Case 16

56-year-old man comes to your office for evaluation of a 2-cm "coin lesion" found on chest x-ray. The surrounding lung appears normal and without infiltrate, atelectasis, or adenopathy. The patient states that he has not had any chest x-rays performed previous to the present one.

1. What is the central question in the management of the solitary pulmonary nodule?

2. What will you do next?

3. When is infection the answer?

   A. Doubling time <30 days
   B. Doubling time <90 days
   C. Doubling time <180 days
   D. Doubling time <360 days

   Answer:

4. When is hamartoma the answer?

5. When is a granuloma the answer?

6. The patient subsequently has a high definition chest CT done, showing a 2.4 cm spiculated mass with irregular borders ~5 mm from the right hilum. What is the next appropriate step in the management of this patient?

   A. Bronchoscopy
   B. Trans-thoracic needle biopsy
   C. Mediastinoscopy
   D. CT/PET scan

   Answer:

7. 57-year-old man newly discovered pulmonary nodule during a pre-operative evaluation for a voluntary cholecystectomy. + smoker. CT of the chest shows a 2.8 cm mass in the lateral aspect of the right middle lobe. Next step?

   A. Bronchoscopy
   B. PET scan
   C. Trans-thoracic needle biopsy
   D. Wedge resection/partial lobectomy

   Answer:

Summary: Case 16

The evaluation of a solitary pulmonary nodule centers on determining the likelihood of malignancy. The answer to this question is determined by the history and radiographic appearance of the pulmonary nodule. Patients who smoke, are older than 30 years of age, and have history of previous malignancy are at increased risk for having a malignant pulmonary nodule. Radiographically, the first step in the evaluation of a solitary pulmonary nodule is to compare the current x-ray with previous studies. If the nodule demonstrates stability and no growth for 2 years or more on chest radiography, the nodule is not malignant. Comparison with old radiographs also helps in determining the doubling time. If the doubling time is <35 days, infection becomes the likely cause of the pulmonary nodule. If the doubling time is >465 days, then the nodule is likely to be benign. A doubling time between 35 and 465 days suggests a malignancy as the underlying diagnosis. After reviewing previous chest x-rays, the next step is to obtain a CT scan of the chest. The CT scan provides essential information regarding the radiological appearance of the nodule, which determines the likelihood of malignancy. Margins that are smooth-appearing suggest a benign lesion, whereas unclear or spiculated margins suggest malignancy. A peripheral halo or a lobulated appearance also suggests an underlying malignancy. Laminated or dense central calcifications suggest a benign diagnosis; eccentric or stippled calcification suggests malignancy. Popcorn calcifications are characteristic of hamartomas. An "onion-skin" or "bull's-eye" calcification suggests an underlying granuloma.

Patients who have pulmonary nodules that have a high likelihood of malignancy should have excisional biopsy performed. This procedure is both diagnostic and therapeutic. Patients with pulmonary nodules that have a low probability of malignancy should be followed with serial chest radiography and CT scans. Intermediate risk nodules traditionally have been managed either with transthoracic needle biopsy (if located in the periphery) or bronchoscopy (if located centrally). PET scanning is an emerging modality for evaluation of the solitary pulmonary nodule and is used for intermediate risk nodules that are greater than 1 cm in size.

Case 17

65-year-old woman complaining of cough productive of blood-streaked sputum. 20-lb weight loss that has occurred over the last 3 months. Denies shortness of breath. + 40-pack-year history of cigarette smoking. Physical exam is significant for bronchial breath sounds in the left lower lobe. + palpable supraclavicular lymph nodes on the left side.

1. What is the next step in the management of this patient?

A chest x-ray reveals a left lower lobe mass. CT scan of the chest reveals hilar lymphadenopathy with several nodes 2–2.5 cm in size.

2. What would you do next?
   A. PET scan
   B. MRI of chest
   C. Mediastinoscopy
   D. Send for surgical resection

   Answer:

A diagnosis of adenocarcinoma of the lung is made after biopsy.

3. What is the next step in the management of this patient?

4. Would your management change if the diagnosis were small cell carcinoma? How?

5. When is surgery the answer?

6. Before resection, what must you check?

Summary: Case 17

The next step in the evaluation of a patient who presents with hemoptysis is to obtain a chest x-ray. Chest CT scan and bronchoscopy are indicated only after the chest x-ray **does not** reveal an underlying cause of the hemoptysis. The amount of hemoptysis does not reflect the seriousness of the underlying disease. Thus, even a small amount of hemoptysis should be evaluated aggressively. Once a pulmonary mass is identified, the next step is to pursue a tissue diagnosis. The preferred site of biopsy is the site that is associated with the least morbidity.

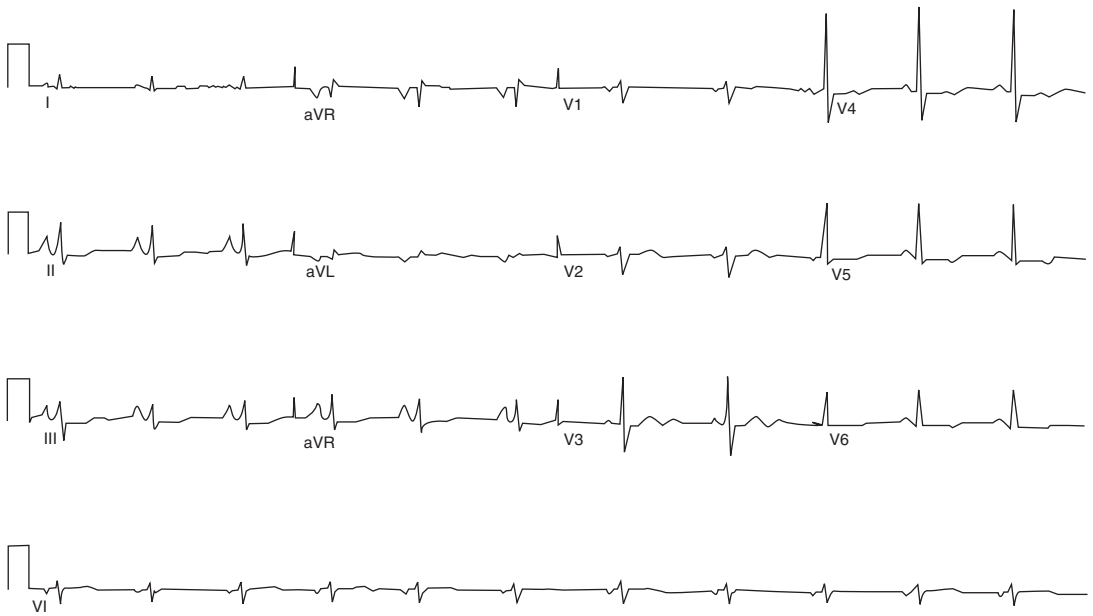
In the management of lung cancer, the most important distinction to make is between small cell carcinoma (which is sensitive to chemotherapy and radiation but tends to metastasize early in the disease course) and non–small cell carcinoma (which is resistant to chemotherapy and radiation and whose definitive treatment consists of surgical excision). Thus, if the biopsy returns as a non–small cell carcinoma of the lung, the next step is to determine the stage of the lung cancer. This is important because surgery is indicated only in Stage I, II, and IIIa disease. Staging of non–small cell cancer of the lung consists of a CT scan of the chest and abdomen up to the adrenal glands. If mediastinal lymphadenopathy greater than 1 cm in size is identified, then mediastinoscopy with lymph node biopsy is indicated. The therapy for lung cancer is summarized in the table below.

Treatment of Lung Cancer

Stage	Feature	Non–Small Cell Carcinoma	Stage	Small Cell Carcinoma
I	<3 cm	Surgery	Limited	Etoposide, cisplatin, and radiotherapy of hemithorax
II	3-5 cm (A) 5-7 cm (B)	Surgery	Extensive	Etoposide, cisplatin, and palliative radiotherapy
IIIa	Ipsillateral and carinal lymph nodes	Surgery (if non-bulky disease) plus carboplatin, etoposide		
IIIb	Contrallateal lymph nodes	Radiation plus carboplatin, etoposide, no surgery		
IV	Distant mets	Carboplatin, etoposide with good performance status, otherwise palliative care		

Case 18

A 23-year-old woman complaining of shortness of breath started 7 months ago. She also complains of fatigue, and recently had a fainting spell while walking briskly down the street. – heart disease and – family history of heart disease. Physical exam is significant for splitting of the second heart sound with a loud pulmonary component and a parasternal heave. EKG:



Chest x-ray shows enlarged central pulmonary arteries.

1. What is the most likely diagnosis? Why?

2. What is the next step in the management of this patient? What is the logic?
   A. Two-dimensional echocardiogram
   B. Right heart catheterization
   C. Chest CT
   D. Aspirin
   E. Enoxaparin

   Answer:

3. After establishing the diagnosis, what would you do next? How would the results affect your management of the case?

4. When is warfarin the answer?

5. When is prostacyclin the answer?

6. When are calcium channel blockers the answer?

7. When is heart–lung transplantation the answer?

Summary: Case 18

In a young woman who presents with exertional shortness of breath, syncope, and fatigue associated with a prominent P2 and evidence of elevated right heart pressures on EKG, the most likely diagnosis is pulmonary hypertension. At this point the etiology of the pulmonary hypertension is unknown. The next step in the management of this patient is to account for the pulmonary hypertension that is being observed clinically. Initially, a 2-dimensional echocardiogram is necessary to assure proper left ventricular function. Lung disease, acidosis, chronic hypoxia, chronic recurrent pulmonary emboli, decreased LV systolic function, diastolic dysfunction, and increased blood viscosity are all causes of pulmonary hypertension that should be considered and excluded in this patient. Only after all causes of pulmonary hypertension have been excluded can the diagnosis of primary pulmonary hypertension be considered. The management of primary pulmonary hypertension is determined by the response of the vasculature to vasodilatation during right heart catheterization. If when the patient is given adenosine, prostacyclin, or nitrous oxide there is a marked reduction in the pulmonary vascular resistance, the next step is to challenge with calcium channel blockers. If the vasculature responds, then the treatment of choice is calcium channel blockers. If there is no response to IV vasodilators, then the management depends on the functional status of the patient. In patients with New York Heart Association (NYHA) Class I or II symptoms, the treatment is sildenafil. In patients with NYHA Class III symptoms, the treatment is with bosentan. For Class IV symptoms, treatment is prostacyclins or prostacyclin analogue. Transplantation should be considered only for those patients who progress to right-sided heart failure while being treated with prostacyclin, or those patients who cannot tolerate medical therapy.

Categories of Pulmonary Hypertension

Idiopathic (treat with warfarin)
- Primary pulmonary hypertension
- HIV

Pulmonary-Venous Disease (treat left heart disease)
- Left heart disease
- Compression (tumors)

Hypoxic (treat with oxygen)
- COPD
- Interstitial lung disease
- Obstructive sleep apnea
- High altitude

Embolic Disease (treat with warfarin)
- Chronic pulmonary embolism

Pulmonary Vascular Disease (treat underlying process)
- Inflammation
- Sarcoidosis
- Schistosomiasis

Case 19

56-year-old man is admitted after falling and breaking his hip. Has an uncomplicated postoperative course. Patient states that he is experiencing SOB, associated with chest pain that worsens with deep breathing. Five minutes prior no distress. Physical exam tachycardia, lungs are clear to auscultation bilaterally. ABG:

7.49 / 28 / 90 / 24.

Chest x-ray shows no significant cardiopulmonary disease.

1. What is the most likely diagnosis? Why?

2. When is thrombolytic therapy the answer?

3. Which of the following will confirm the diagnosis?

   A. Cardiac stress test
   B. Echocardiography
   C. Pulmonary function tests
   D. Right heart catheterization
   E. V/Q scan

   Answer:

4. If the patient is a pregnant female, what will you use for long-term treatment?

   A. Warfarin
   B. Aspirin
   C. IVC filter
   D. Dalteparin
   E. Lepirudin

   Answer:

5. How long would you treat?

6. What are the major risk factors for this disease?

7. A 19-year-old woman presents to the emergency department with acute shortness of breath. She has just returned on an 8-hour-flight from a business trip to Greece. In the emergency department she has an oxygen saturation of 89–91% on room air. What is the next best step to diagnose this patient?

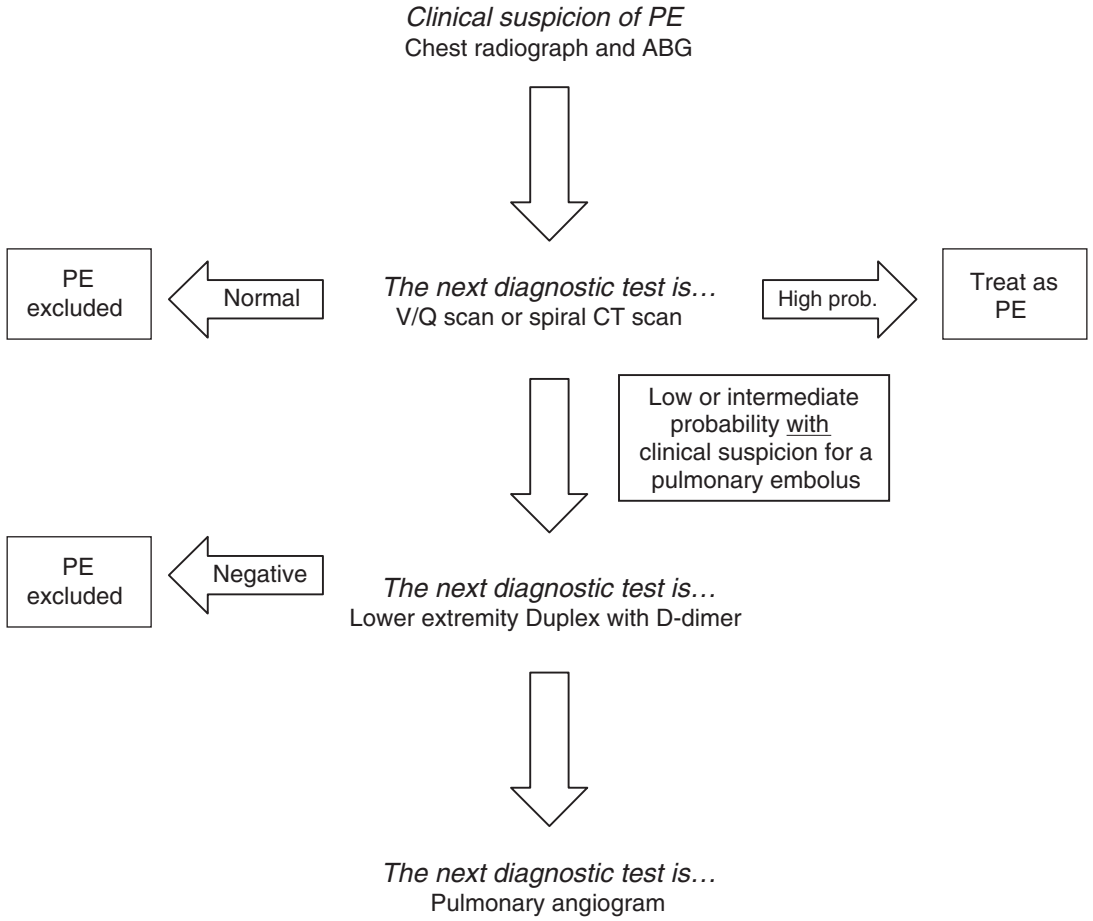
   A. 2-dimensional echocardiogram
   B. Spiral CT
   C. D-dimer
   D. V/Q scan
   E. Lower extremity Doppler

   Answer:

Summary: Case 19

In any patient who presents with unexplained shortness of breath, hypoxia, or tachycardia, the diagnosis of pulmonary embolism should be suspected. Thrombolytic therapy in the treatment of PE is indicated when there is hemodynamically unstable PE in the absence of any contraindications to thrombolytic therapy. For the pregnant female who requires chronic anticoagulation after a thromboembolic event, low molecular-weight heparin for 6 months is the treatment of choice. Major risk factors for the development of a pulmonary embolism include immobility, malignancy, nephrotic syndrome, oral contraceptives, pregnancy, obesity, hormone replacement therapy. and heart failure. The imaging modality of choice is a high

resolution spiral CT, which provides the best sensitivity and specificity for clinically significant pulmonary emboli. The "gold standard" is still a pulmonary angiogram, but this is a very high risk procedure, and rarely done. The diagnostic workup of pulmonary embolism is summarized below.



- *The best initial test for PE is V/Q scan or spiral CT scan*
- *The most sensitive test for PE is pulmonary angiogram*

1. 63-year-old woman complaining of right lower extremity swelling. History is significant for recent GI bleed that required multiple blood transfusions. Lower-extremity duplex shows right superficial femoral vein thrombosis. Next step in the management?

   A. Subcutaneous heparin
   B. Warfarin and IVC filter placement
   C. Low-dose warfarin
   D. IVC filter placement
   E. Observation

   Answer:

2. 46-year-old woman evaluation of difficulty breathing that began suddenly after flying. Upon arrival at the emergency department, IV heparin is started and she is sent for a V/Q scan, which shows an intermediate probability for a pulmonary embolism. Next step in the management?

   A. Chest CT scan
   B. Pulmonary artery magnetic resonance angiography
   C. Lower-extremity ultrasound
   D. Begin warfarin to INR 2.0–3.0

   Answer:

3. 52-year-old with breast cancer presents with acute dyspnea and tachypnea. BP is 80/55 mm Hg and is unresponsive to intravenous fluids and vasopressors. CT angiogram confirms pulmonary embolism. EKG shows high amplitude P wave in lead II and right axis deviation. Most appropriate next step in management?

   A. Low-molecular-weight heparin alone
   B. Unfractionated heparin
   C. Thrombectomy
   D. Thrombolytic
   E. Warfarin

   Answer:

4. 49-year-old man with history of renal cell carcinoma with brain lesions presents with cough, hemoptysis, and dyspnea. Exam reveals S_3, prominent JVD. Hypotension is not responsive to fluid resuscitation. CT angiogram confirms large pulmonary embolus. Most appropriate next step in management?

   A. Thrombolytic
   B. Thrombectomy
   C. Low-molecular-weight heparin alone
   D. Low-molecular-weight heparin with thrombolytic
   E. IVC filter placement

   Answer:

Case 20

A 42-year-old man presents with cough, fever, and dyspnea of 4 days duration. Chest x-ray shows diffuse alveolar opacities. Laboratory profile shows increased WBC and creatinine, and decreased hematocrit. DLCO is increased. Urinalysis reveals 2+ proteinuria.

1. Which of the following is the most likely diagnosis?

   A. Alveolar hemorrhage
   B. Interstitial fibrosis
   C. Septic emboli
   D. Pleural effusion
   E. Pulmonary edema

   Answer:

2. Which of the following is the most appropriate initial diagnostic test?

   A. Blood cultures
   B. Bronchoalveolar lavage
   C. CT scan of chest
   D. Pulmonary function tests
   E. Renal ultrasound

   Answer:

3. Renal biopsy is performed and shows IgG along the glomerular capillaries. Which of the following is most likely to have positive serological tests?

   A. Anti-GBM antibodies
   B. Antiphospholipid antibodies
   C. Antistreptococcal antibodies
   D. Antinuclear antibody
   E. Rheumatoid factor

   Answer:

4. Which of the following illicit drugs should be suspected in a patient with fever, dyspnea, cough, and patchy infiltrates on chest x-ray?

   A. Crack cocaine
   B. Heroin
   C. LSD
   D. Marijuana
   E. Opium

   Answer:

Summary: Case 20

Diffuse alveolar hemorrhage (DAH) presents with cough, fever, dyspnea, and unexplained diffuse alveolar infiltrates present less than a week. Vasculitis should be considered in such patients particularly with new-onset renal insufficiency or known connective tissue disorder. Up to one-third of patients with diffuse alveolar hemorrhage do not have hemoptysis. Diagnosis is made with bronchoalveolar lavage, with samples showing a persistently bloody fluid. Chest x-ray shows new patchy or diffuse alveolar opacities. A sensitive marker for DAH is an increase in diffusing capacity for carbon monoxide (DLCO). An elevated white blood cell count and falling hematocrit are also common. Based on the history, you should consider the following underlying conditions and appropriate workup:

- **Wegener granulmomatosis** in patients who present with upper and lower respiratory tract lesions and glomerulonephritis (proteinuria, hematuria, oliguria, and elevated creatinine). Antineutrophil cytoplasmic antibodies, (c-ANCA) favors the diagnosis. The p-ANCA suggests microscopic polyarteritis or Churg-Strauss syndrome.
- **Goodpasture syndrome** in patients with glomerulonephritis. Anti-glomerular basement membrane antibodies (anti-GBM) is diagnostic.
- **SLE** in patients that present with multiple organ vasculitis, including purpuric skin lesions, joint disorders, kidney, neurological involvement. Antinuclear antibodies and anti-DNA antibodies are diagnostic.
- **Antiphospholipid syndrome** when the patient has a history of venous or arterial thromboses, recurrent fetal loss, or thrombocytopenia. Presence of anticardiolipin antibodies, anti-β2-glycoprotein I, and/or a lupus anticoagulant diagnostic.
- **Poststreptococcal glomerulonephritis** in a patient with fever, malaise, and history of throat infection 1–2 weeks ago (suggesting group A beta hemolytic streptococcus). Antistreptococcal antibodies aid in the diagnosis.
- **Cocaine**-induced pulmonary hemorrhage when drug abuse is suspected.

Corticosteroids are the management of choice. Plasmapheresis is generally used in the treatment of DAH associated with Goodpasture syndrome. Recurrent episodes of DAH may lead to pulmonary fibrosis and interstitial opacities.

Pt develops SOB and pulmonary edema while skiing at 7800 ft. Next step?

O2

Next step?

Bring him to lower altitude

Best way to prevent future occurrence

Acetazolamide

Case 21

A 26-year-old mountaineer presents prior to leaving for Nepal. He is planning a hiking trip at the base of the Himalayas. He reports that on his last trip he developed nausea, headaches, and difficulty sleeping.

1. Which of the following is an appropriate therapy for the prophylaxis of his symptoms?

   A. Acetazolamide
   B. Albuterol inhaler
   C. Furosemide
   D. Metaclopramide
   E. Aspirin

   Answer: The correct answer is A. Acetazolamide

2. On ascent, he complains of dyspnea, headache, and nausea. Which of the following is the most appropriate next step in management?

   A. Bed rest
   B. Descent to lower altitudes
   C. Furosemide
   D. Oxygen therapy
   E. Mannitol

   Answer:

The most common form of high altitude illness is acute mountain sickness (AMS) and is usually mild. Acetazolamide should be considered the first-line medication for AMS. Dexamethasone should be used in individuals who cannot tolerate sulfa. However, the most important prevention is slow ascent, hydration, and rest.

More severe forms of altitude disease include high altitude pulmonary edema and high altitude cerebral edema (HACE). They require immediate descent as soon as possible. Medications (nifedipine, inhaled nitric oxide, and dexamethasone), oxygen, and use of the portable hyperbaric chamber may be very helpful, but they should never be used to delay transporting a victim to lower altitude.

General Internal Medicine

8

Case 1

40-year-old woman brought to ED by husband after she ingested bottle of pills in attempt to commit suicide. She came 30 minutes after the ingestion. Exam normal.

1. What to do first?

   Ipecac is always wrong. Perform a gastric lavage if she has an altered mental status after prophylactic intubation to protect her airway. About 25 to 50% of the ingested pills can be removed within the first hour of ingestion. There is no efficacy of gastric emptying after 2 hours.

2. In whom is this intervention contraindicated?

3. When is charcoal dangerous?

4. When will your answer be hydration and simple forced diuresis?

Summary: Case 1

Gastric emptying is rarely used any more in the management of overdoses. With gastric emptying, only 50% of pills at 1 hour after ingestion can be removed and only 15% at 2 hours, with nothing significant removed after that. Ipecac is never an emergency department therapy; it is mostly used for people at home, too far from the hospital, or in children immediately after the ingestion. Charcoal is the mainstay of toxicology management. It has no adverse effects and can remove toxins from the bloodstream even after they have been absorbed.

Case 2

40-year-old woman brought to ER after she ingested a bottle of pills. She is severely confused and lethargic. Comes within 30 minutes after the ingestion. On exam, she is **sleepy, dopey, stuporous, disoriented, and obtunded**.

1. What to do first?

2. What will you do if your answer to question 1 has already been done?

3. When will your answer be flumazenil?

4. Most common complication of flumazenil use?

Case 3

72-year-old man comes to emergency department (ED) because of altered mental status, dyspnea, tinnitus, and hyperventilation developing over the last several hours. History of severe osteoarthritis. 38°C (100.3°F) orally. Chest x-ray noncardiogenic pulmonary edema. Mildly elevated BUN and creatinine, low serum bicarbonate of 14, mildly elevated prothrombin time, and a blood gas with pH 7.49 and a pCO_2 of 23.

1. Likely diagnosis?

2. Best initial therapy?

Summary: Case 3

The key to the diagnosis is hyperventilation combined with metabolic acidosis and tinnitus. Salicylates are a complex metabolic poison. They directly stimulate the brain stem, causing hyperventilation, and are toxic to the lungs as well, causing adult respiratory distress syndrome (ARDS) with a chest x-ray that looks like pulmonary edema. Analgesics in general are toxic to the kidney tubule, resulting in acute tubular necrosis (ATN). Aspirin also interferes with the vitamin K–dependent production of clotting factors, resulting in prolongation of the prothrombin time. The outcome is a lactic acidosis, resulting in a metabolic acidosis with an increased anion gap.

1. Elderly woman with bilateral hearing loss and tinnitus. She has to turn the volume higher on the TV. Takes aspirin for rheumatoid arthritis. What is the diagnosis?

   A. Aspirin toxicity
   B. Presbycusis
   C. Cerebellopontine angle tumor
   D. Cerumen impaction

   Answer:

Case 4

Woman with long history of depression comes after attempting to commit suicide by ingesting bottle of amitriptyline.

1. Most important step now?

   A. Blood level
   B. Urine level
   C. Bicarbonate
   D. EKG
   E. Charcoal

   Answer:

2. Best initial therapy if at toxic level?

Summary: Case 4

Tricyclic antidepressants are directly toxic to many parts of the body because of their anticholinergic effects. Although you get blurred vision, dry mouth, urinary retention, and constipation, you don't die from them. When questions ask you for "the most URGENT" or "the most IMPORTANT" step for an overdose patient, they are asking if you know how the patient will die first. Tricyclics kill via seizures and arrhythmias. The first clue to an imminent cardiac problem is a wide QRS.

Case 5

Escaping from very tall burning building, a 64-year-old man walks down more than 50 flights of stairs. Many floors are on fire. No direct burns. History of aortic stenosis that has been moderate in severity. Carboxyhemoglobin level is 32%.

1. What to do first?

2. Most important diagnostic test at this time? (or, how is he going to die first?)

3. What will a pulse oximeter show?

Alternate for Case 5

Elderly man and family live in a house that uses a **wood stove** for heat. They have not been able to get out of the house because of heavy snow. They now have headaches, dizziness, nausea, and shortness of breath. **The father feels better when shoveling snow**.

1. What to do?
   A. Switch to oil heat
   B. Open the window
   C. Call an ambulance
   D. Give supplemental home oxygen
   E. Check RBCs

   Answer:

Case 6

A 31-year-old Marine captain has been brought because of heavy terrorist activity at Madison Square Garden, where chemical agents may have been released. He has shortness of breath, excessive salivation, diarrhea, weak muscles, polyuria, and abdominal cramping. Exam: constricted pupils and wheezing.

1. Most likely diagnosis?

2. What should you do first?
   A. Remove clothes
   B. Wash the patient
   C. Atropine
   D. Pralidoxime
   E. Red cell cholinesterase level
   F. Intubation

   Answer:

3. Most specific treatment?

Case 7

78-year-old woman with congestive heart failure is brought to the emergency department with several days of confusion, nausea, abdominal pain, vomiting, palpitations, and altered color perception, such as yellow halos around objects. She is maintained on an ACE inhibitor, digoxin, furosemide, and metoprolol. Digoxin level is elevated.

1. Most common manifestation of digoxin toxicity?

   Gastrointestinal disturbance

2. What cardiac rhythm disturbances are possible?
   A. Atrial
   B. Ventricular
   C. Ectopy
   D. Anything

   Answer:

3. Most common cardiac dysrhythmia with digoxin toxicity?

4. Most urgent step in this patient?

   EKG

5. What will patient's potassium level be?

6. Strongest indication for digoxin immune Fab (Digibind®)?

Case 8

47-year-old man lives in rural West Virginia being one of the 2% of Americans left without indoor plumbing. As he is sitting in his outhouse, he experiences sudden pain in perineum. Bitten by local insects. He develops waves of muscular pain that extend to his abdomen. Abdomen extremely painful and rigid.

1. Diagnosis?

2. Most common electrolyte abnormality?

   A. Low magnesium
   B. High sodium
   C. Low calcium
   D. High potassium
   E. Low potassium

   Answer:

3. What are the initial and most effective therapies?

Case 9

It is February in Chicago and one of the local homeless alcoholics has been brought in because of lethargy worse than his usual episodes of drunkenness. His body temperature is found to be 31.1°C (88°F).

1. What is the most urgent test?

   A. Urinalysis
   B. EKG
   C. Arterial blood gas
   D. Calcium
   E. Urine toxicology

   Answer:

2. What would be the most specific finding?

Case 10

82-year-old homebound woman brought to ED because of bleeding gums, ecchymoses on her legs, and several nonhealing ulcers. She is malnourished and gives a history of living on a "tea and toast" diet. PT, PTT, and platelet count are normal.

1. Most likely diagnosis?

Case 11

Generally healthy athlete comes to ED because of headache, bone pain, nausea, vomiting, and vertigo. Found to have papilledema. His only medications are numerous vitamin tablets. Head CT scan is normal. There is some ataxia, alopecia, and laboratory evidence of hepatic toxicity. He also has dry skin, dry eyes, and mild confusion.

1. What is the most likely diagnosis?

Case 12

34-year-old man on skiing trip in Swiss Alps at altitude 14,000 feet. He is a healthy nonsmoker but develops severe shortness of breath. Rales heard on lung exam. EKG unremarkable. Chest x-ray consistent with vascular congestion.

1. Best management?
   A. Rapid descent to a lower altitude
   B. Oral acetazolamide
   C. Intravenous diuretics
   D. Corticosteroids
   E. ACE inhibitors
   F. Diphenhydramine

   Answer:

Case 13

57-year-old vegetarian is visiting her family from the ashram where she has become a devout Hindu. She has memory loss, diarrhea, malnutrition, and thick skin that is hyperpigmented.

1. Which is the Most likely etiology of her problem?
   A. Zinc deficiency
   B. Atopic dermatitis
   C. Riboflavin deficiency
   D. Nicotinic acid deficiency

   Answer:

Case 14

Patient on long-term total parenteral nutrition (TPN) develops new-onset hyperglycemia.

1. Deficiency of which of these caused it?
   A. Selenium
   B. Chromium
   C. Copper
   D. Zinc

   Answer:

Case 15

An Elderly hypertensive man maintained on chronic hyperalimentation and captopril. He develops dermatitis of extremities and altered taste (dysgeusia).

1. What is the cause?
   A. Selenium
   B. Chromium
   C. Copper
   D. Zinc

   Answer:

Case 16

Following ingestion of home canned food, a young woman has sudden onset of blurred vision, diplopia, dysarthria, dysphagia, and constipation. She has muscle weakness in a descending fashion. Tongue is dry and pupils are fixed and dilated.

1. Diagnosis?
   A. Guillain Barré syndrome
   B. Myasthenia gravis
   C. Botulism
   D. Salmonella
   E. Ciguatera food poisoning

   Answer:

Case 17

1. Which is consistent with ethylene glycol toxicity?
   A. Increased osmolar gap
   B. Increased anion gap
   C. Calcium oxalate crystals in urine
   D. Low serum calcium
   E. All of the above

   Answer:

ACETAMINOPHEN OVERDOSE

Case 1

35-year-old man comes to hospital **4 DAYS** after he ingested bottle (60 tablets) of acetaminophen. He came today because of developing nausea, vomiting, and abdominal pain. Mildly elevated bilirubin, AST, and prothrombin time, with mildly decreased albumin level.

1. Next step in management?

Case 2

35-year-old man comes to hospital **4 HOURS** after he ingested bottle (60 tablets) of acetaminophen. He came because of developing nausea, vomiting, and abdominal pain.

1. Next step in management?

Case 3

35-year-old man comes to hospital **30 MINUTES** after he ingested a large bottle (60 tablets) of acetaminophen. He came because of developing nausea, vomiting, and abdominal pain.

1. Next step in management?

ADVERSE EFFECTS AND DRUG TOXICITY

Case 1

1. Which juice increases blood levels of cyclosporine?

   A. Orange
   B. Tomato
   C. Grapefruit
   D. Apple
   E. Pineapple

   Answer:

Case 2

A 36-year-old woman with long-term inflammatory bowel disease is about to start using infliximab to close up a fistula she has developed.

1. What to do prior to starting the infliximab?

   A. Start prednisone
   B. PPD skin testing
   C. Increase the mesalamine
   D. Start azathioprine

   Answer:

Case 3

Man with a history of bipolar syndrome comes because of unsteady gait, muscle twitching, tremor, dysarthria, and fasciculations.

1. Which caused this presentation?

   A. Fluoxetine
   B. Amitriptyline
   C. Lithium
   D. Prochlorperazine

   Answer:

Alternate for Case 3

Patient who is disoriented and confused is brought to the emergency department **unresponsive** with muscle **twitching**. He has a history of bipolar disorder. He is dehydrated and mildly hypotensive. There is a mild **leukocytosis** and the **serum sodium** is 170 with a potassium of 4.0.

1. Diagnosis?

   A. SIADH
   B. Nephrogenic diabetes insipidus
   C. Dehydration
   D. Salicylism
   E. Central diabetes insipidus

   Answer:

Case 4

20-year-old man is brought to ED in comatose state. He was visibly intoxicated at a party with his friends earlier in the evening. Serum bicarbonate is low at 22, but **anion gap is normal**. Ethanol level is zero, and there is an elevated osmolar gap. Urinalysis is normal.

1. Diagnosis?

   A. Isopropyl alcohol
   B. Methanol
   C. Ethylene glycol
   D. Aspirin

   Answer:

Case 5

32-year-old man with sexual dysfunction. He is able to achieve erection but not orgasm. History of depression and recently started on new antidepressant.

1. What led to this problem?

   A. Bupropion
   B. SSRIs
   C. Mirtazapine
   D. Risperdal
   E. Tricyclic antidepressants

   Answer:

Case 6

50-year-old man with schizophrenia is brought to emergency department because of confusion and a temperature of 40.4°C (104.8°F). Recently started on chlorpromazine. He has some muscular rigidity, and CPK is elevated. Urinalysis is normal.

1. What is most appropriate management?

   A. Head CT scan
   B. Lumbar puncture
   C. Brain biopsy
   D. Stop chlorpromazine and use cooling blanket
   E. Stop chlorpromazine and use bromocriptine and dantrolene

   Answer:

Case 7

46-year-old woman is brought to ED for nausea, diarrhea, agitation, disorientation, tremor, and restlessness. She is usually on nefazodone for her depression. Recently started on new medication for her depression, but she does not recall the name.

1. Which medication was most likely started?
   A. Bupropion
   B. Methylphenidate
   C. SSRIs
   D. Tricyclic antidepressants
   E. Valproic acid

   Answer:

Case 8

37-year-old man with generalized discomfort. Has pupillary dilation, lacrimation, rhinorrhea, piloerection, and yawning. In addition, he has diarrhea and needle-sticks on his arms. He admits to abusing pills, but he refuses to tell you the specific names.

1. Most appropriate therapy?
   A. Benzodiazepines
   B. Naloxone
   C. Methadone
   D. Flumazenil

   Answer:

Case 9

1. Most common adverse effect of bupropion?
   A. Rhythm disorder
   B. Headache
   C. Seizures
   D. Xerostomia

   Answer:

Case 10

Patient comes to ED because of nausea from gastroenteritis. Patient is treated with metoclopramide and develops distortion of the neck and eyes.

1. How to treat?

   A. Benzodiazepines
   B. Diphenhydramine
   C. Prochlorperazine
   D. Chlorpromazine

   Answer:

2. 82-year-old patient has recently started to take aspirin, vitamin E, glucosamine, ginkgo biloba, and calcium carbonate. He comes to you with the recent onset of constipation. Which caused the constipation?

   A. Aspirin
   B. Calcium carbonate
   C. Ginkgo biloba
   D. Glucosamine
   E. Vitamin E

   Answer:

3. Which is associated with pulmonary fibrosis?

   A. Quinolone
   B. Quinidine
   C. Warfarin
   D. Amiodarone
   E. Cholestyramine

   Answer:

4. Why should metformin be stopped in diabetic patients with renal failure?

   A. Hyperkalemia
   B. Lactic acidosis
   C. Hypoglycemia
   D. Ketoacidosis
   E. Renal toxic

   Answer:

5. 55-year-old woman with severe shortness of breath and low oxygen saturation. Temperature is normal. Earlier she had an outpatient, upper endoscopy, which included xylocaine spray. What is the cause?

   A. Aspiration pneumonia
   B. Pulmonary embolism
   C Diaphragmatic paralysis
   D. Methemoglobinemia

   Answer:

6. Which of the following is most likely to have an increased end-tidal CO_2?

   A. Asthma
   B. Malignant hyperthermia
   C Anemia

   Answer:

7. A patient with hypertension and coronary disease takes an overdose of 40 metoprolol pills. BP 76/40, pulse 36/minutes with AV block. After IV fluids, the BP is still low. What would you add to therapy?

   A. Norepinephrine
   B. Epinephrine
   C Glucagon

   Answer:

8. Overdose of diltiazem. BP 70/40, pulse 44/minute. In addition to IV fluids, what should you do?

EPIDEMIOLOGY

1. What is the fastest growing segment of the US population?

   A. 15–25
   B. 35–45
   C 65–75
   D. > 85

   Answer:

2. What is the most common reason to be admitted to the hospital in the United States?

   A. MI
   B. CHF
   C Falls
   D Pneumonia

   Answer:

3. Most common hospital acquired infection?

   A. Urine
   B. Lung
   C Skin

   Answer:

IMMUNOLOGY

Case 1

43-year-old farmer from rural area is being discharged after an immediate hypersensitivity (anaphylactic) reaction secondary to a bee sting. He was treated with epinephrine, fluids, and steroids.

1. What is the best long-term management?

   A. Reassurance that all will be well
   B. Chronic oral steroids
   C. Recommend that the patient change professions
   D. Desensitization (immunotherapy)
   E. Chronic antihistamine use (diphenhydramine, ranitidine)

   Answer:

Summary: Case 1

Venom-specific immunotherapy offers 98% protection from immediate hypersensitivity reactions. This is done after specific allergic testing to confirm the precise etiology of the immediate hypersensitivity reaction. This patient has no guarantee that he will not be stung again by a bee even if he does change his profession. Patients with anaphylaxis should not be maintained on beta blockers. These drugs block the effect of the epinephrine that is used in the management of acute anaphylactic reactions.

1. Patient with a history of allergic rhinitis is coming to the office for immunotherapy to desensitize him to an environmental allergen. He has a history of hypertension maintained on propranolol and hydrochlorothiazide. What is most important prior to the initiation of immunotherapy?

   A. Stop hydrochlorothiazide
   B. Stop propranolol
   C. Start oral prednisone
   D. Admit to intensive care unit

   Answer:

Case 2

Patient recently been started on multiple medications after admission to nursing home. The patient has developed swollen lips consistent with angioedema.

1. Which of the following is most likely responsible?

   A. Vitamin E
   B. Aspirin
   C. Beta blockers
   D. Nifedipine
   E. Enalapril

Answer:

Case 3

Anaphylactic shock occurs is a 53-year-old man, following a bee sting. His is on labetolol for hypertension. Epinephrine and diphenhydramine are given in the emergency department, but the BP is only 85/60 and the pulse is 56. What should you do next?

A. More epinephrine
B. Ephedrine
C. Glucagon
D. Ranitidine

Answer:

Case 4

Patient with asthma and other allergies wants to avoid exposure to mites. Which is most useful?

A. Vacuum carpets frequently
B. Wash clothes once a week
C. Use insecticide
D. Keep humidity in the room at 75–80%
E. Encase mattress, pillows, and box spring in zippered covers

Answer:

Summary: Case 2–4

Most chronic urticaria is caused by pressure, cold, vibration, and exercise. The medication most likely to be associated with angioneurotic edema is ACE inhibitors. This is usually due to the patient having a hereditary deficiency of C1 esterase. Patients with hereditary deficiencies of C1 esterase inhibitor are treated with anabolic steroids or with infusion of the deficient inhibitor.

Beta blockers can be reversed with the use of glucagon. Glucagon can also be effective in beta–blocker overdose.

COMPLEMENT DEFICIENCY

Case 1

31-year-old patient with SLE comes with pleuritic chest pain and **yearly sinusitis**. CH50 is undetectable.

1. Which deficiency is most likely?
   A. C2 deficiency
   B. C3 deficiency
   C. C5-C8 deficiency
   D. C9 deficiency

   Answer:

Case 2

14-year-old female student develops non-pruritic and non-pitting facial edema after a pillow fight with roommate. The patient's sister has had similar symptoms.

1. Diagnosis?
   A. Insect sting
   B. C1 inhibitor deficiency
   C. Contact dermatitis
   D. Factor XIII deficiency

   Answer:

Case 3

Child presents with angioedema.

1. What test would you order first?
   A. C2 and C4 levels
   B. IgE levels
   C. Patch testing
   D. C1 esterase inhibitor level

   Answer:

Case 4

1. Most effective treatment of hereditary angioedema?

   A. Doxepin
   B. Danazol
   C. Diuretics
   D. Prednisone chronically

   Answer:

Case 5

14-year-old boy with swollen hand and forearm that developed after **shop class on wood chopping**. He has had **5 trips to the emergency department** with a negative evaluation. Father died at age 30 of unknown cause.

1. Which are you most likely to find?

   A. Increased IgE levels
   B. White count of 7,800 with 10% basophils
   C. Decreased C2 and C4 levels
   D. Abnormal allergic skin tests for dust

   Answer:

Case 6

31-year-old patient has an itchy and runny nose when flowers are blooming in spring.

1. What is your advice?

   A. Nasal steroids
   B. Nasal saline
   C. Monteleukast (singulair)
   D. Nasal oxymetazoline

   Answer:

Case 7

73-year-old man with **fever and hypotension**. Two years ago he was involved in a **car accident** following which he had abdominal surgery for internal bleeding.

1. Why did he get fever and hypotension?
   A. Late complement deficiency
   B. Early complement deficiency
   C. Pneumococcal sepsis
   D. IgA deficiency

   Answer:

Summary:

Complement Deficiency

C2 complement deficiency is the most common in North-American Caucasians. C2 complement deficiency is also associated with SLE and other autoimmune diseases. It is also associated with recurrent sinopulmonary diseases. Hereditary angioedema can be brought on by both physical and emotional trauma. A woman being hit in the face with a pillow can develop an attack of this severe, non-pitting, and non-pruritic edema. It is caused by C1 esterase inhibitor deficiency. ACE inhibitors can also provoke attacks. When initially diagnosing C1 esterase inhibitor deficiency, C2 and C4 levels should generally be done first. If **BOTH** choices are in the answer, then choose C2 and C4 as the best **INITIAL** diagnostic test. C2 and C4 levels are always low due to chronic over-activation. They go even lower during acute attacks. C1 levels can sometimes be artificially normal; and the level of activity can be harder to perform as a diagnostic test. Long-term treatment of hereditary angioedema is best achieved with danazol or stanazol, which are synthetic androgens that have few adverse effects. Allergic rhinitis is routinely treated with nasal steroids. A motor vehicle accident can result in a splenectomy, which markedly increases the risk for pneumococcal sepsis. Complement deficiency cannot result from trauma or surgery and does not begin at an older age, such as 73. A car accident cannot cause or unmask complement deficiency.

Common Variable Immunodeficiency

Common variable immunodeficiency (CVID) is a disease of the of the **second** to **fourth** decade of life; as opposed to X-linked agammaglobulinemia, which starts to show clinical manifestations as early as the first year of life. The clinical manifestations of both diseases are **not** clinically distinguishable, and they consist of an increased frequency of sinopulmonary infections. CVID is characterized by a **normal number of B cells** with a low function. They do not develop into antibody-producing plasma cells. In addition, there is an **increased** incidence of autoantibody diseases such as hemolytic anemia, atrophic gastritis, bronchiectasis, pernicious anemia, **giardiasis**, and gastric carcinoma. CVID is treated with immunoglobulin replacement.

X-Linked Agammaglobinemia

X-linked agammaglobulinemia is a disease of the first year of life. There are no B cells, and there is hypoplasia of the tonsils and lymph nodes. Germinal centers are not present. As with CVID, there is an increased incidence of sinopulmonary infections. X-linked agammaglobulinemia occurs only in males. Treatment is with immunoglobulin replacement.

Selective IgA Deficiency

Selective IgA deficiency is the **most common immunodeficiency syndrome**, with a 1-in-500 incidence. It is characterized by recurrent respiratory infections and a **high frequency of atopic diseases**. There is often a sprue-like diarrheal disease that sometimes responds to a gluten-free diet. There is increased frequency of giardiasis. **There is no specific treatment**; infections are treated as they occur, and the patient must receive IgA-deficient blood or washed red cells.

1. 30-year-old man presents with recurrent sinusitis and pneumonia. He has normal white cell count with normal number of B and T cells. IgG, IgM, and IgA levels are low. Diagnosis?

   A. Malabsorption
   B. Multiple myeloma
   C. Bruton's X-linked agammaglobulinemia
   D. Common variable immunodeficiency

   Answer:

Hyper IgE Syndrome

Hyper IgE syndrome is a disorder characterized by recurrent abscesses involving the skin and lungs. Increased staphylococcal infection is common to all patients. Prophylaxis with anti-staphylococcal penicillins or cephalosporins is the primary management.

1. Which of the following should **not** be given to someone with IgA deficiency?

   A. Pneumococcal vaccine
   B. Influenza vaccine
   C. Intravenous immunoglobulins
   D. Prednisone

   Answer:

Dermatology

9

PSORIASIS

This disorder affects 2% of people throughout the world. One-third of patients have a joint disorder associated with it. Physical examination reveals silvery scale on the extensor surfaces. Psoriasis can also be widely disseminated throughout the entire body. The Koebner phenomenon is a worsening of the disease, with trauma to the skin.

Initial treatment consists of topical steroids to localized disease. In order to have the steroid penetrate the skin, keratolytic agents such as salicylic acid derivatives remove the superficial scales.

Long-term therapy involves the use of vitamin D ointments such as calcipotriene, and vitamin A derivatives such as tazarotene gel. All patients will find emollients to soften the skin useful, such as Aveeno® oatmeal baths, Lubriderm®, and Eucerin®. Coal tars and anthralin can be used for disease not responsive to these measures.

Widespread disease involving >30% of the body surface area is hard to treat with topical therapy alone. These patients can use ultraviolet light and methotrexate. Patients with joint problems should also be treated with methotrexate.

Antihistamines and topical antibiotics are of no use in treating psoriasis.

Lichen Planus

Lichen planus is an inflammatory process usually consisting of violaceous papules that have a polygonal outline and flat top, and it tends to favor flexural surfaces of skin and the buccal mucosa of the oral cavity. It sometimes affects follicles and nail units as well. Just as is the case for all inflammatory diseases of the skin, lesions of lichen planus begin as flat, pink or darker red macules and very quickly become violaceous papules. The papules sometimes become confluent to form plaques. In general, lesions of lichen planus tend to persist for months and usually begin to wane within a year. If lesions are rubbed persistently, as is the situation for what is called hypertrophic lichen planus, the condition may last for years. Vesicles of lichen planus come into being rapidly and also disappear rather quickly.

Topical corticosteroids, intralesional injections of corticosteroids, and, for acute, widespread lesions, even a short course of oral corticosteroids may be appropriate. Other modes of treatment for widespread lesions are phototherapy (psoralen ultraviolet A [PUVA], ultraviolet B [UVB]) and retinoids. Painful oral lesions may be assuaged by topical corticosteroids in a coated base, by a mouthwash that contains cyclosporine, or by topical application of tacrolimus (FK506).

IMMUNE AND HYPERSENSITIVITY REACTIONS

Urticaria

The most common forms of acute urticaria are associated with medications such as penicillin, with infections, and with foods. Chronic urticaria is associated with pressure (dermatographism), cold, and vibration. The therapy is to treat the underlying cause. Acute medical management is with antihistamines such as hydroxyzine and diphenhydramine (Benadryl®). Extremely severe cases are treated like anaphylactic shock, with epinephrine and steroids. Chronic urticaria is treated with nonsedating antihistamines such as loratadine, fexofenadine, and cetirizine. Doxepin is a tricyclic antidepressant with strong antihistaminergic effects.

Drug Eruptions

Drug eruptions can range from a very mild macular rash from an allergic reaction (morbilliform rash) all the way up to life-threatening toxic epidermal necrolysis. When the reaction is more severe, it is called erythema multiforme (EM). EM can occur in association with the drug phenytoin as well as with infections such as herpes simplex. When the disease is even worse and involves the eye, it is known as Stevens-Johnson (SJ). EM and SJ both involve mucous membranes, but SJ is worse and can result in sloughing of respiratory mucosa that might lead to the necessity of mechanical ventilation. Toxic epidermal necrolysis (TEN) is the most severe form of drug-related eruption, although the etiology of all of these disorders includes medications such as phenytoin. There is no specific therapy for any of these disorders except to stop taking the offending drug. Steroids have never proved to benefit Stevens-Johnson.

Morbilliform < EM < SJ < TEN

Specific treatment should be given for the condition that induced the disorder, if known (e.g., antiviral for herpes simplex). Local applications of soothing lotions and general supportive measures are indicated. If systemic corticosteroids are to be used in a patient with severe, widespread, life-threatening disease, they must be given in very large doses. Such a patient is best managed in a burn unit, or in the equivalent of one. Parenthetically, intravenous administration of immunoglobulins is reputed to be beneficial in a circumstance of EM that potentially is fatal.

Pemphigus Vulgaris and Bullous Pemphigoid

Pemphigus vulgaris and bullous pemphigoid are both autoimmune phenomena resulting in antibodies against the epidermis, causing the loss of skin. Pemphigus vulgaris often involves the mouth and is associated with intraepidermal antibodies that split off the skin and result in flaccid bullae that rupture easily. Bullous pemphigoid is associated with antibodies in between the epidermis and dermis; therefore, the bullous lesions are most likely to stay intact because they are thicker.

Depending on their severity, both of these phenomena may need to be treated with steroids. Mortality is higher in pemphigus vulgaris, presumably from a greater loss of the protective skin surface; the condition acts more like a burn.

Erythema Nodosum

Erythema nodosum (EN) is a self-limited disorder most often found in association with sarcoid, pregnancy, and coccidioidomycosis. It is most frequently seen in patients who are taking sulfonamides, penicillin, salicylates, and/or oral contraceptives. Infections such as syphilis and streptococcal disease are also associated with this skin disorder. NSAIDs provide some symptomatic relief.

Pityriasis Rosea

Pityriasis rosea is a generalized macular, red rash that is hard to distinguish from secondary syphilis. The VDRL of RPR will be negative. The clue to the diagnosis is that the rash starts out as a single lesion (or "herald" patch) before it disseminates. Generally, it lasts for 8 weeks and heals without scarring and without therapy. Severe cases with a lot of pruritus can be treated with topical or systemic steroids. Soothing lotions, topical hydrocortisone cream, and ultraviolet light may each ameliorate the signs, but they do not hasten the disappearance of the lesions, which takes about 6 weeks regardless of treatment.

Porphyria Cutanea Tarda

Porphyria cutanea tarda can be caused by a congenital inborn error interrupting the normal production of the hemoglobin molecule. Acquired disease can be associated with hepatitis C, alcohol, estrogen exposure, or iron overload. Light reacts with abnormal precursors of porphyrin, resulting in blistered skin on sun-exposed areas. Treatment consists of stopping the offending drug. Patients who have porphyria cutanea tarda along with hepatitis C are treated with interferon and ribavirin. Those with a metabolic disorder could undergo phlebotomy as a treatment. This will prevent the accumulation of the abnormal free erythrocyte precursors.

ECZEMATOUS DISEASE

Atopic Dermatitis

Atopic dermatitis is an idiopathic disorder that has a prominent hereditary component. Individual patients often will give a history of asthma and hay fever. The disease is more frequent on flexor surfaces. Because of dryness and scratching, the patient will "impetiginize" staphylococcus into the skin. It is like doing a PPD. Patients scratch the staph antigens into the skin, which causes more itching. This is also why topical and occasionally systemic anti-staphylococcal medications can be effective.

Lifestyle alterations in the treatment include avoiding wool-containing fabrics and switching to cotton, which is less irritating. Patients should also avoid excessive soap and hot water use when bathing because this further dries the skin and worsens the itching.

Emollients and lotions to soothe the skin and to make it less dry and itchy are essential to case management. This would basically amount to any form of non-irritating topical, such as Aveeno® oatmeal baths and soaps, Eucerin®, Lubriderm®, Aquaphor®, Dermasil®, Nivea®, or even Vaseline®.

Specific therapy includes:

First-line ("best initial therapy"): Topical steroids, antihistamines (such as loratadine), cetirizine, fexofenadine, and systemic antihistamines (such as doxepin or Chlor-Trimeton®). Emollients.

Further therapy includes tacrolimus, sirolimus, and pimecrolimus.

If the question is "What would you do next if the symptoms persist?": Your answer is topical or oral antibiotics. Tacrolimus and picrolimus are T cell–inhibiting agents that help keep patients off chronic steroids. Coal-tar preparations are also good.

Contact Dermatitis

Contact dermatitis can potentially occur from contact with almost anything, in the sense that a patient could be allergic to any medication. Common etiologies of contact dermatitis include soaps, poison ivy, nickel, and cosmetics. Latex allergy is particularly problematic because it can result in anaphylaxis. Look for a history of a health care worker with unexplained syncope; it results from putting on latex gloves.

Treatment is by avoiding the allergen and by applying topical steroids.

Asteatotic Eczema

Asteatotic eczema, an idiopathic loss of sebaceous glands, results in profoundly dry skin that constantly flakes off. The treatment is topical emollients, as described above for atopic dermatitis.

Seborrheic Dermatitis

Seborrheic dermatitis is what the rest of the world calls dandruff, with yellow, flaky, oily skin. It is treated with topical steroids. There is an unexplained association with the dermatophyte *Pityrosporon ovale*, which is why selenium sulfide and ketoconazole shampoos are effective as well.

Stasis Dermatitis

There's not much you can do for the patient with stasis dermatitis. Try to fix the underlying disease and elevate the patient's legs. Inflammation and secondary infection occur, and then you treat with antibiotics and topical steroids.

Acne

Types of Lesions

Non-inflammatory lesions or primary lesions: microcomedones, closed comedones, open comedones.

Treatment of comedonal acne is with topical tretinoin (Retin-A®) and benzoyl peroxide. For papular or pustular acne, add topical and systemic antibiotics. Cystic acne is treated with systemic antibiotics and isotretinoin (Accutane®).

Side Effects of Isotretinoin (13-cis-retinoic Acid)

- Xerosis, dermatitis, cheilitis, sticky skin, peeling skin
- Epistaxis
- Conjunctivitis
- Hair loss
- Arthralgia/myalgia
- Hyperlipidemia (hypertriglyceridemia and hypercholesterolemia)
- Increased LFTs, leukopenia

Greatest risk: Teratogenicity (patient needs reliable contraception during therapy and for at least 1 month after use of the drug is discontinued)

BENIGN, MALIGNANT, AND PRE-MALIGNANT LESIONS

Seborrheic Keratosis

Seborrheic keratosis is a common hyperpigmented lesion in older patients. These keratoses vary from light to dark brown and have a "stuck on" appearance. They are like a lipoma in that they have no malignant potential and are removed only if they get in the way or are cosmetically displeasing.

Nevi

Benign moles are small (<6 mm) and well circumscribed, with well-defined borders and a single shade of pigment without change for years. They have regular edges and uniform color; they don't change much in size over time; and they are smooth, even, and symmetrical in shape.

When do you consider a mole suspicious? Remember ABCD: Look for **a**symmetry, **b**order irregularity, **c**olor variegation, and **d**iameter >6 mm; or the history of a changing mole. Ulceration and bleeding are ominous signs**.**

Melanoma

When it is the opposite of what is described above for a suspicious mole, it is time for a biopsy. *Do not perform a shave biopsy*. The prognosis is entirely dependent on the lesion's thickness, which cannot be determined if you shave. *Remove* the lesion rather than shaving it. Also, remember that large margins (>5 cm) are *no longer recommended*. Lesions <1 mm in thickness need only a 1-cm margin. Metastatic disease is treated with interferon. Local recurrences are treated with radiation.

Incidence: 13 cases/100,000 persons

What are the risk factors for developing melanoma?

- Fair complexion
- Exposure to sunlight for short, intense periods of time
- Numerous atypical-appearing melanocytic nevi
- Large congenital melanocytic nevi
- Personal or family history of melanoma

What determines the prognosis of melanoma? Clark and/or Breslow levels: Assess the depth of the lesion, measuring directly with a micrometer.

How do you treat melanoma? Treatment of melanoma primarily consists of excision.

After histologic diagnosis, the area is usually re-excised, with margins dictated by the thickness of the tumor, as follows:

- In situ: 0.5-cm border of normal skin
- Breslow's depth of <1.0 mm: 1-cm margin
- Breslow's depth of 1–2 mm: 1–2-cm margin
- Breslow's depth of 2–4 mm: 2-cm margin
- Breslow's depth >4 mm: 3-cm margin

Actinic Keratosis

Actinic keratosis is like cervical dysplasia of the face. These keratoses are premalignant squamous cell cancer lesions of the skin. You will find them in the Scotch/Irish/Australian person who works outside a lot. They are treated with cryotherapy or topical 5-FU for removal. This is similar to what you would do for cervical dysplasia.

Squamous and Basal Cell Carcinomas

Squamous and basal cell carcinomas occur most frequently on sun-exposed areas. The management is primarily to biopsy and then remove them. Both have <1% mortality. Neither has good chemotherapy for the rare person with metastatic disease. These carcinomas are the most common cutaneous malignancies. Basal cell occurs with a 4:1 frequency, as compared with squamous cell carcinoma. Both kinds are of low-grade malignancy. Even when aggressive, they are only locally invasive. They are primarily related to sun exposure.

Clues for recognition: Look for a papule or nodule that may or may not be ulcerated or pigmented. Basal cell gives a waxy, "pearly," or transparent appearance, and telangiectasia.

What is the most effective treatment for basal cell carcinoma? Mohs surgery has the highest cure rates, at 98%. This surgery involves removal of the tumor, followed by immediate frozen section and histopathologic examination of the margins, with subsequent re-examination of tumor-positive areas.

Sunscreen and Protection from Skin Cancer

Besides its acute effect (sunburn), sun exposure has a number of chronic effects:

- Skin wrinkles and abnormal pigmentation
- Precancers (actinic keratoses)
- Basal and squamous cell carcinoma (more related to lifetime cumulative sun exposure)
- Malignant melanoma (more related to history of sunburns)
- Cataracts

Different spectra of UV radiation have different effects on human skin:

- UVB (wavelength: 290–320 nm): causes DNA formation of thymine dimers, leading to carcinogenesis.
- UVA (wavelength: 320–400 nm): causes formation of free radicals, and therefore altered collagen and elastin synthesis, leading to skin wrinkles.

SPF (sun protection factor) is the ratio of the minimal dose of sunlight to cause redness of sun-protected skin divided by the minimal dose of sunlight to cause redness of unprotected skin. So, using an SPF of 15, it takes 15 times more time to achieve the same redness.

Kaposi Sarcoma

Kaposi sarcoma (KS) is most frequently seen in homosexual men with AIDS. It is associated with human herpes virus-8 (HHV-8). KS lesions appear in a widespread symmetrical distribution on the skin and oral mucosa, with red, purple, or brown oval or elongated plaques or nodules on the skin or mucosa, especially the oral mucosa. In most cases of AIDS-related KS, antiretroviral is effective by itself. Other therapeutic options for unresponsive cases and non-AIDS related KS are cryotherapy, intralesional vinblastine, radiotherapy, laser surgery, and systemic chemotherapy.

Mycoses Fungoides

Mycoses fungoides is a cutaneous T-cell lymphoma. Look for localized (rarely generalized) patches or plaques, usually on the trunk, that are associated with pruritus and that don't respond to emollients and topical steroids.

What is the prognosis of mycosis fungoides? It depends on the stage of the disease:

- Patch-and-plaque stage: 12 years
- Tumor stage: 5 years
- Nodal or visceral stage: 3 years

What is the treatment for mycosis fungoides?

- PUVA
- Interferon-alpha
- Oral retinoids
- Electron-beam therapy (radiotherapy)
- Extracorporeal photopheresis for erythrodermic manifestations

INFECTIONS

Dermatophytes

All dermatophytes are diagnosed via a potassium hydroxide test on a scraping, and all require culture for specific confirmation. Dermatophytes take weeks to grow, and seldom is a specific organism identified at the time therapy is initiated. Hair and nail involvement need therapy with terbinafine or itraconazole. Fluconazole does not work well for dermatophytes since it is mostly a yeast (candida) medication. *Beware of liver toxicity for terbinafine.* If there is no hair or nail involvement, you can use any topical antifungal.

Herpes Simplex and Herpes Zoster

When herpes simplex and herpes zoster vesicles are clearly present, your answer should be "Therapy," *not* a Tzanck prep or viral culture, although these are the "best initial" and "most accurate" tests. Acyclovir, famciclovir, and valacyclovir are all equal for both infections. Oral therapy is the answer for zoster, unless it is disseminated or there is ophthalmic involvement. Use foscarnet for acyclovir-resistant herpes.

Scabies and Pediculosis

For diagnosis, scrape the smaller *Sarcoptes* scabies, and use direct visual identification for the larger pediculosis (or crabs). Both are treated with permethrin or lindane solution.

Impetigo and Erysipelas

Impetigo and erysipelas are very superficial infections of the epidermis, so there is weeping, crusting, and draining. Although oral dicloxacillin and cloxacillin are good, *your first answer should be topicals*, such as mupirocin or bacitracin. Erysipelas is often very hard to identify for certain. One clue is a bright red lesion that is swollen and raised. Use penicillin G or VK to treat because it is *Strep pyogenes*.

Cellulitis and Necrotizing Fasciitis

Cellulitis is treated with oxacillin or nafcillin. First-generation cephalosporins, such as cefazolin, are used if the patient has a mild penicillin allergy. Use macrolides or vancomycin where there is a severe penicillin allergy, such as anaphylaxis. Necrotizing fasciitis needs anaerobic coverage *in addition*, with clindamycin and surgical debridement.

SYPHILIS

A primary syphilitic chancre is firm and indurated. It is best diagnosed with a darkfield exam in addition to an RPR and FTA. Treat with single-dose penicillin.

Secondary syphilis is a generalized, copper-colored, maculopapular rash in which the RPR is 100% sensitive. Treat with single-dose penicillin.

CONDYLOMATA ACUMINATA

Remove condylomata acuminata any way you want: freeze, burn, cut, melt with podophyllin, apply imiquimod. No specific test is necessary. Visual appearance is sufficient. Do not routinely subtype the papilloma virus.

Rheumatology 10

CASE 1

35-year-old woman comes to your office with stiffness in her hands that is worse in the morning that lasts approximately 45 minutes. She has symptoms for the last 6 months. Exam significant for joint swelling, redness, and warmth over the PIP and MCP joints in both hands. No nodules found.

1. Most likely diagnosis?
   A. Osteoarthritis
   B. Polymyalgia rheumatica
   C. Systemic lupus erythematosis (SLE)
   D. Reactive arthritis
   E. Rheumatoid arthritis

   Answer:

2. Which is the most common extra-articular manifestation?
   A. Episcleritis
   B. Pleural effusion
   C. Pericarditis
   D. Vasculitis
   E. Skin nodules
   F. Carpal tunnel syndrome

   Answer:

3. What test is the most specific?
   A. Anti–cyclic citrullinated peptide (Anti-CCP)
   B. Anti-dsDNA
   C. Antinuclear antibodies (ANA)
   D. Erythrocyte sedimentation rate (ESR)
   E. Rheumatoid factor
   F. C-reactive protein (CRP)

   Answer:

4. Best initial therapy?

Methotrexate Monitor

- Liver Function Test
- CBC
- Add Folinic Acid

5. What is the disease-modifying antirheumatic drug (DMARD)?
   A. Methotrexate
   B. Sulfasalazine
   C. Hydroxychloroquine
   D. Etanercept (anti-TNF medication)
   E. Anakinra

   Answer:

6. Major side effects of this medication? The major contraindications?
   A. Lung and liver fibrosis
   B. Rash and oligospermia
   C. Ocular
   D. TB reactivation
   E. Bacterial infection

   Answer:

Felty's Syndrome

- RA
- Neutropenia
- Splenomegaly

7. When methotrexate fails, what is the next best DMARD to be used?
   A. Abatacept
   B. Anti-TNF
   C. Hydroxychloroquine
   D. Anakinra

   Answer:

8. Which of the following is most consistent with severe disease?
   A. Nodules, high ESR, fatigue
   B. Knee, hip, shoulder involvement
   C. Ulcer development
   D. Mononeuritis multiplex and lung involvement
   E. High RF or anti-CCP, abnormal x-ray, anemia and >20 joints involved

   Answer:

9. What is the most common eye problem in RA?
   A. Dry eye (sicca)
   B. Uveitis
   C. Optic neuritis

   Answer:

Summary: Case 1

This patient presents with bilateral, symmetrical, and inflammatory arthritis that has lasted more than 6 weeks. Pain swelling and impaired function are typically located in distal joints (PIPs, MCPs, wrists knees ankles, and cervical spine). In the absence of systemic complaints or manifestations of disease, the most likely diagnosis is rheumatoid arthritis (RA). Initial diagnostic workup includes RF, ANA, and hand x-rays to evaluate for the presence of erosions. Anti-CCP is more specific for RA than rheumatoid factor. The presence of nodules also strengthens the diagnosis as RA. The best initial therapy is an NSAID for the arthritis. NSAIDs and steroids provide symptomatic relief but do not alter the progression of disease in RA. DMARDs are the class of medications that have been shown to retard progression. The decision to start DMARD therapy is based upon the prognosis of the patient at presentation. Patients with involvement of more than 3 joints, persistently high levels of acute phase reactants (CRP), high RF titers and anti-CCP, joint erosions, rheumatoid nodules, and functional disability have a poorer prognosis. Early initiation of DMARD therapy is important in management. With poor prognostic signs, the initial DMARD of choice is methotrexate because of its relatively short onset of action (6–8 weeks). After methotrexate, you can add leflunomide, infliximab, etanercept, or the combination of hydroxychloroquine and sulfasalazine. Patients with a better prognosis can be treated with a combination of an NSAID, steroids, and either hydroxychloroquine or leflunomide. X-ray abnormalities are not necessary to establish a diagnosis of RA. That lowers the threshold for early diagnosis and allows earlier treatment with DMARDs.

1. 52-year-old woman with neck pain and stiffness of 4 weeks' duration. She has a history of rheumatoid arthritis. Taking methotrexate therapy for 10 years. On exam, she has weakness of her lower extremities. Tendon reflexes are increased with extensor plantar responses. Which is most appropriate in management?

   A. Discontinue methotrexate
   B. Recommend NSAIDs
   C. Initiate anti-TNF therapy
   D. Increase dose of methotrexate
   E. Spinal fusion

   Answer:

2. Which test is essential in diagnosing rheumatoid arthritis?

   A. Anti-CCP or rheumatoid factor
   B. Normocytic anemia
   C. Abnormal x-ray
   D. Joint fluid aspiration

   Answer:

3. Which is most appropriate on a patient with rheumatoid arthritis who becomes pregnant?

   A. Add methotrexate
   B. Add leflunomide
   C. Use hydroxychloroquine or sulfasalazine
   D. Anti-TNF inhibitors

   Answer:

Note

Tocilizumab is an IL-6 antagonist. Use when resistant to MTX and TNF drug.

Symptoms of C1/C2 Compression

- Altered consciousness
- Loss of bladder control
- Dysphagia
- Vertigo
- "Drop attacks"

4. Which is most characteristic of pleural effusion from Rheumatoid arthritis (RA)?

   A. High protein
   B. Low glucose
   C. High Lymphocyte count

   Answer:

5. Which is the most common cause of death in RA?

   A. Renal failure
   B. Hip fracture
   C. Stroke
   D. Accelerated coronary disease

   Answer:

6. Why does RA cause hoarseness?

   A. Recurrent laryngeal nerve paralysis
   B. Infection
   C. Cricoarytenoid joint involvement
   D. Brainstem stroke

   Answer:

7. When is leflunomide the answer?

   A. Add on to methotrexate
   B. Add to Anti-TNF if they fail
   C. Those intolerant of methotrexate

   Answer:

8. Which of the following is NOT a cardiac manifestation of RA?

   A. Acute pericarditis
   B. Constrictive pericarditis
   C. Myocarditis
   D. Coronary Disease
   E. Infective Endocarditis

   Answer:

9. Patient with RA, sudden calf pain, Doppler negative.

   What is it?
   How to treat?

10. RA + Nodules + Pneumoconiosis = ??

11. 32 year old. **Recurrent** pain in PIP, then MCP and then the knee. A few hours later, joints are swollen. Within 24 hours, pain resolves. In **between attacks, all is well.** What is this?

    A. Reactive arthritis
    B. Behcet's
    C. Palindromic Rheumatism

    Answer:

12. Pregnancy will make RA:

    A. Better
    B. Worse
    C. Unchanged

    Answer:

CASE 2

24-year-old woman comes with joint pain and swelling that started 2 weeks ago after a mild febrile illness. She denies rashes, back pain, or diarrhea. The patient works in a daycare center taking care of young children and has experienced multiple upper respiratory tract infections over the last several months. Exam shows symmetrical tenderness of the PIP and MCP joints.

1. Most likely diagnosis?

    A. Rheumatoid arthritis
    B. Disseminated gonorrhea
    C. Reactive arthritis
    D. Parvovirus
    E. SLE

    Answer:

2. Best initial test?

    A. Bone marrow with giant pronormoblasts
    B. Decreased reticulocyte count
    C. IgM and IgG
    D. Rheumatoid factor
    E. ANA

    Answer:

3. How is this disease differentiated from rheumatoid arthritis?

   A. Absence of skin lesions
   B. Duration
   C. Joint involvement
   D. Anemia

   Answer:

4. What is the most specific diagnostic test?

   A. PCR for DNA
   B. Biopsy
   C. Viral culture
   D. Response to therapy

   Answer:

5. What would you find on x-rays of hands?

6. What other systemic complication is associated with this disease?

   A. Anemia
   B. Stroke
   C. Pericarditis
   D. Meningitis

   Answer:

7. Treatment?

Summary: Case 2

Viral arthropathy is the most likely diagnosis in this case. Many times, the symptoms of dry or itchy eyes may be falsely attributed to conjunctivitis or allergic symptoms. Parvovirus B19 is a common cause of acute arthritis in child care workers. The pattern of arthritis is identical to that of RA. The distinguishing factor between RA and any viral arthropathy is the duration of symptoms. It is impossible to make the diagnosis of RA, if the patient's symptoms have lasted less than 6 weeks. The diagnostic test of choice is serology for parvovirus B19 IgM. Hand x-rays will be negative for any erosions or joint space narrowing. Patients with chronic hemolytic anemias, such as sickle-cell anemia, may experience red-cell aplasia when infected with parvovirus B19. Aplastic anemia is also a complication of parvovirus B19 infection. Treatment is with NSAIDs for symptomatic relief. In many patients, ESR and RF are also elevated.

CASE 3

45-year-old woman comes with itching and burning of her eyes that began 3 weeks ago. The patient thought that she was experiencing seasonal allergies but became concerned when, at a funeral, she was unable to tear when she was crying. She has also been having some difficulty speaking. Exam is significant for bilateral parotid gland enlargement.

1. Most likely diagnosis?

   A. Conjunctivitis
   B. Mixed connective tissue disease
   C. Mumps
   D. Scleroderma
   E. Sjögren syndrome

   Answer:

2. Best initial test?

   A. Erythrocyte sedimentation rate
   B. Schirmer test
   C. Serology
   D. Slit lamp evaluation
   E. Tonometry

   Answer:

3. Most specific blood test?

   A. ANA
   B. RF
   C. SSA and SSB
   D. Anti-centromere
   E. Anti-histones

   Answer:

4. Most accurate test?

   A. Rose Bengal test
   B. Parotid sialography
   C. Salivary gland biopsy
   D. Tear break-up time

   Answer:

5. Which is most likely to be positive?

   A. ANA
   B. Anti-Ro/SSA
   C. Low complement
   D. Anti-smooth muscle

   Answer:

6. Which is the most common manifestation of this disease?

   A. Joint pain
   B. Lung disease
   C. Peripheral neuropathy
   D. CNS
   E. Heart/pericardial

   Answer:

7. What malignancy is associated with this disease?

   A. Colon
   B. Salivary
   C. Lymphoma
   D. Liver

   Answer:

8. Treatment?

Summary: Case 3

The most likely diagnosis of any patient presenting with bilateral parotid gland enlargement associated with reduced tearing and a dry mouth is Sjögren syndrome. The Schirmer test to quantify the amount of tearing is the best initial test. Anti-SSA (Ro) and anti-SSB (La) are the most specific serologic markers for the disease.

Minor salivary gland biopsy is the most accurate test for the diagnosis. Parotid gland biopsy is indicated when there is asymmetric enlargement of the parotid gland. Pancreatitis, RTA Type I, and dysphagia are systemic complications of this disease. Rheumatoid arthritis, primary biliary cirrhosis, scleroderma, and pulmonary fibrosis are associated with Sjögren syndrome. B-cell lymphomas and Waldenstrom macroglobulinemia are associated with Sjögren syndrome. Treatment involves artificial tears; frequent mouth hydration with pilocarpine is rarely used for refractory symptoms.

The most common cancer is lymphoma and the most common serologic test is an ANA, although it is nonspecific. The single most accurate test is a salivary gland biopsy. Although there are many extra-glandular manifestations, the most common is joint pain which is in 50% of patients. Cevimeline is an agonist of acetylcholine which stimulates gland function.

CASE 4

57-year-old woman comes complaining of "aches and pains" that seem to be localized to her wrists and shoulders. She has been feeling "under the weather" for the last several weeks. Swelling of her fingers and states that her hands turn blue when she walks out in the cold without gloves. Exam ulcerations on fingers bilaterally.

1. Most likely diagnosis?
   A. SLE
   B. Rheumatoid arthritis
   C. CREST syndrome
   D. Scleroderma (progressive systemic sclerosis)
   E. Eosinophilic fasciitis

   Answer:

2. Best initial test?

3. What is the hand manifestation in this patient and how is it treated?

4. How can we distinguish between diffuse and limited scleroderma (CREST)?
   A. Sclerodactyly
   B. Gastrointestinal manifestation
   C. Renal and cardiac involvement
   D. Telangiectasia
   E. Raynaud's

   Answer:

5. Treatment for systemic sclerosis?
   A. Prednisone
   B. Penicillamine
   C. Cyclophosphamide
   D. Mycophenolate
   E. No effective therapy

   Answer:

6. What is eosinophilic fasciitis, and how does its diagnosis and treatment differ from that of systemic sclerosis?

7. What disease is associated with taking tryptophan?

8. Which is indicated to treat renal disease?

   A. ACE inhibitor
   B. Penicillamine
   C. Calcium channel blocker
   D. Beta blocker

   Answer:

9. Patient with GERD symptoms, color changes of hands with cold and positive anti-centromere antibodies. He has many fingers with telangiectasias. He has dyspnea most likely secondary to which of the following?

   A. Pulmonary hypertension
   B. Interstitial fibrosis
   C. Cardiomyopathy
   D. Anemia

   Answer:

10. 62-year-old woman presents with progressive gastroesophageal reflux symptoms and chest pain. Shortness of breath on exertion. BP 168/102 mm Hg. Exam reveals diffuse skin thickening and limited range of motion of hands. Echocardiogram shows ejection fraction is 58%; and mild mitral regurgitation. Pulmonary artery pressure is 58 mm Hg. Which of the following is the next step in diagnosis?

    A. Esophagram
    B. High resolution CT scan of chest
    C. Renal arteriogram
    D. Right heart catheterization
    E. Upper endoscopy

    Answer:

Summary: Case 4

In a patient who presents with chronic hand swelling over several months, the most likely diagnosis is scleroderma. The best initial test for the diagnosis of scleroderma is the ANA, which has a sensitivity of 80–95%. Systemic sclerosis is associated with renal involvement, pulmonary fibrosis, and more proximal soft-tissue swelling involving the trunk in addition to the extremities. The specific antibody for systemic scleroderma is anti-Scl 70. Limited scleroderma will never involve the trunk or the kidney. The pulmonary manifestation of the limited form of the disease is pulmonary hypertension. The specific antibody is anticentromere antibody.

Raynaud phenomenon is described as pain in the fingertips induced by cold secondary to arterial spasm, followed by relaxation. Treatment for this disorder consists of a calcium channel blocker. Systemic scleroderma is not treated with steroids; the treatment is supportive. In hypertensive emergencies associated with renal involvement, the antihypertensive of choice is an ACE inhibitor.

Eosinophilic fasciitis presents as an orange peel–like thickening of the skin that can be induced by physical activity. Eosinophilia will be present in the peripheral blood count. The treatment is systemic steroids. Eosinophilia-myalgia syndrome is associated with tryptophan ingestion. Treatment is with systemic steroids.

Scleroderma patients are at risk of pulmonary hypertension. The standard for diagnosing pulmonary hypertension remains right heart catheterization and is performed after an elevated pulmonary artery pressure is found on echocardiographic screening. High resolution CT scanning is performed to evaluate for pulmonary fibrosis.

CASE 5

25-year-old woman with bald spots on her scalp progressively worsened over past 4 months. She also has a rash which seems to be worse in the summer time. She reports feeling more tired than usual. She has had generalized joint and muscle aches over the past 4 weeks. Physical Exam shows symmetric swelling of the bilateral PIP and MCP joints. Laboratory workup shows anemia, thrombocytopenia. Urine pregnancy test is negative. Urine is negative for leukocyte esterase, 2+ proteinuria.

1. Most likely diagnosis?

2. Best initial diagnostic test?

   A. ANA
   B. Double-stranded DNA
   C. Complement levels
   D. ESR

   Answer:

3. Most specific serologic test?

   A. ANA
   B. Double-stranded DNA
   C. Complement levels
   D. ESR

   Answer:

4. What are the major clinical manifestations of the disease?

5. What medication for this patient's joint and cutaneous symptoms?

   A. Hydroxychloroquine
   B. Etanercept
   C. Methotrexate
   D. Cyclosporine
   E. Anakinra

   Answer:

6. What are the major indications for treatment with corticosteroids?

7. What is the main difference between drug-induced disease and routine disease?

   A. Positive ANA and increased ESR
   B. C-reactive protein
   C. CNS and renal involvement
   D. Rash
   E. Joint pain

   Answer:

8. She is found to have elevated PTT and normal PT. Which of the following is the next step?

   A. Antiphospholipid antibodies
   B. D-dimer
   C. Fibrin split products
   D. Fibrinogen

   Answer:

9. What is the best initial test?

   A. Mixing study
   B. Russell viper venom test
   C. Anti-dsDNA
   D. Ristocetin testing

   Answer:

10. A woman with a long history of lupus maintained on hydroxychloroquine has just become pregnant. What do you test for?

    A. Anti-Ro
    B. Complement levels
    C. Anti-Sm
    D. ANA levels

    Answer:

11. What is the only antibody MORE specific than DS-DNA?

    A. Ro
    B. Single stranded DNA
    C. Anti-Sm

    Answer:

Summary: Case 5

Systemic manifestations unique to SLE involve the skin, kidney, and central nervous system. The treatment of SLE depends on the severity of the systemic manifestations. Systemic manifestations including thrombocytopenia, hemolysis, myocarditis, pericarditis, convulsions, and nephritis warrant therapy with corticosteroids. Pulse cyclophosphamide and steroids are the treatment of choice for Stage III and IV lupus nephritis. For isolated rash and arthritis, hydroxychloroquine is the treatment of choice. Drug-induced lupus can be distinguished from systemic lupus on a clinical and serological basis. Drug-induced lupus is associated with chlorpromazine, hydralazine, isoniazid methyldopa, procainamide, quinidine, and minocycline. Antihistone antibodies are the specific way to make the diagnosis. Clinically, drug-induced lupus does not have systemic manifestations, it affects males and females equally, and it resolves when the offending drug is withdrawn. Antihistone antibody is specific for the diagnosis of drug-induced lupus. SLE is associated with the development of the lupus anticoagulant (an immunoglobulin, which binds to phospholipids and prevents coagulation reactions from taking place on the platelet surface). It is associated with arterial and venous thrombosis and recurrent spontaneous abortions, and should also be suspected in patients with elevated PTT and normal PT without bleeding.

1. 36-year-old woman with SLE comes to hospital complaining of shortness of breath and chest pain that began 2 weeks ago. She also complains of low-grade fever and generalized weakness. Exam reveals decreased breath sounds bilaterally. Chest x-ray shows bilateral infiltrates. What would you advise regarding her pulmonary disease?

   A. Likely to develop obstructive pulmonary disease.
   B. Likely to develop restrictive pulmonary disease.
   C. Arthritis will worsen.
   D. Prognosis is very poor.

   Answer:

CASE 6

27-year-old man is admitted because of fever to 40ºC (104ºF) for a couple of weeks. Blood cultures, UA, urine culture, CXR, and multiple imaging studies have been negative. CBC came back with a leukocytosis of 34,200 with neutrophilic predominance and mild anemia. He has a sore throat, cervical lymphadenopathy, and hepatosplenomegaly. Through day 3 of his hospital stay, the patient continues to have high fevers at night, and an intern notices a salmon-colored rash that appears with the patient's rise in temperature.

1. Most likely diagnosis?

2. Best **initial** treatment?

   A. Ibuprofen
   B. Methotrexate
   C. Adalimumab
   D. Prednisone
   E. Cyclosporine

   Answer:

3. Most effective treatment?

   A. Ibuprofen
   B. Methotrexate
   C. Adalimumab
   D. Prednisone
   E. Cyclosporine

   Answer:

4. How is this disease differentiated from Epstein-Barr infection?

   A. Blood cultures
   B. Viral cultures
   C. CBC and ferritin levels
   D. Bone marrow
   E. ANA

   Answer:

Summary: Case 6

In a young man who presents with relapsing fever and the absence of infection associated with a salmon-colored rash, the most likely diagnosis is adult Still disease. The best initial treatment for adult Still disease is NSAID therapy. The most effective therapy is steroids. In Epstein-Barr infection, the peripheral smear will characteristically have atypical lymphocytes with an associated lymphocytosis. In Still disease, the WBC count is elevated, but there is primarily a granulocytosis rather than a lymphocytosis.

S	**S**plenomegaly
T	**T**emperature
I	**I**ll patient
L	**L**ymphadenopathy
L	**L**eukocytosis
S	**S**almon rash

Case 1

22-year-old woman presents to ED with swelling of ears and over the bridge of nose. She has noticed progressive deformity of her nose and ears over the last several months. This is her 5th visit to the hospital for this problem.

1. Most likely diagnosis?
   - A. Polyarteritis nodosa
   - B. Relapsing polychondritis
   - C. Systemic lupus eythematosis
   - D. Syphilis
   - E. Wegener granulomatosis

   Answer:

Case 2

31-year-old man with oral and genital ulcers, blurry vision, and joint pain involving both knees and ankles. You find right-sided third-nerve palsy with uveitis of left eye.

1. Most likely diagnosis?
   A. Behçet syndrome
   B. Crohn disease
   C. Multiple sclerosis
   D. Reiter syndrome
   E. Syphilis

   Answer:

Case 3

37-year-old man burning and aching pain in his right hand. 6 months ago, while horseback riding, he fell on his right hand and sprained his right wrist. The pain worsens when he goes out in the cold. Exam warm and slightly swollen right hand and forearm. The swelling has been spreading up his arm over the last several weeks. Hand radiograph reveals severe osteopenia.

1. Most likely diagnosis?
   A. Median nerve injury
   B. Osteonecrosis
   C. Raynaud disease
   D. Reflex sympathetic dystrophy
   E. Septic arthritis

   Answer:

2. Most accurate diagnostic test?
   A. Bone image (scintigraphy)
   B. Nerve conduction studies
   C. Joint aspiration
   D. Biopsy
   E. ESR

   Answer:

Note

HLA B5 in Behcet's.

Summary: Cases 1–3

Chronic episodic swelling of cartilage, especially on the nose and ears, is consistent with relapsing polychondritis. Patients may also complain of fever or deafness, and the course of the disease is rarely complicated by glomerulonephritis and aortic stenosis. The treatment for this disease is oral steroids.

Oral and genital ulcers associated with cranial nerve palsies, arthritis, and uveitis is consistent with the diagnosis of Behçet syndrome. The clinical course is characterized by a relapsing and remitting pattern. A common complication of this disease is thrombophlebitis with deep vein thrombosis. The treatment is with immunosuppressive therapy (steroids, Colchicine, thalidomide cyclophosphamide, and cyclosporine have all been effective).

Burning or aching pain that is more severe and longer in duration than expected after trauma to an extremity is consistent with the diagnosis of reflex sympathetic dystrophy. The finding of severe osteopenia is also consistent with the disease. The best test for the diagnosis is a bone scan. X-ray, MRI, and CT scanning may also be useful. Patients may also complain of worsening symptoms when the extremity is exposed to cold. Initially, patients should be treated with physical therapy and a mild anxiolytic. Gabapentin and opioid analgesics have also been shown to be effective.

CASE 7

Right hip pain. With difficulty sleeping because of hip pain, and states that the pain began suddenly 2 days ago. Normal internal rotation of the right hip. Range of motion of the affected joint is normal with some focal tenderness at the right hip.

1. Most likely diagnosis?
   A. Hip fracture
   B. Aseptic necrosis of femoral head
   C. Bursitis
   D. Septic arthritis

   Answer:

2. Main causes of this condition?

3. What is the treatment for these patients?
   A. NSAIDs and physical therapy
   B. Methotrexate
   C. Anti-TNF
   D. Hydroxychloroquine
   E. Steroid injection

   Answer:

4. When would you suspect infection?

Summary: Case 7

The most likely diagnosis in this case is acute bursitis of the hip. Bursitis can be differentiated from arthritis by its relatively abrupt onset associated with focal tenderness and swelling. The range of motion is relatively unaffected. The main causes of any bursitis are trauma, infection, rheumatoid arthritis, and osteoarthritis. Infection of an inflamed bursa should be suspected when there is fever, swelling, and redness. If infection is suspected, the next step is to aspirate the affected joint and analyze the joint fluid. To rule out infection, the most useful test is the cell count of the synovial fluid. WBC counts >50,000 speak strongly for an acute infectious process. *Staph aureus* is the most commonly identified pathogen. When the WBC count lies between 3,000 and 50,000, the bursitis is caused by any infectious arthritis. For uncomplicated bursitis, the treatment of choice is an NSAID. If pain persists, steroid injections can be given. For bursitis complicated by infection, appropriate antibiotic therapy is indicated.

1. A 47-year-old obese woman comes to your clinic with pain on the medial aspect of her knee. Her pain is worsened when she climbs up stairs. You note exquisite tenderness over the medial (inner) knee region over the upper tibia.

   A. Jumper's knee (patellar tendonitis)
   B. Plantar fasciitis
   C. Prepattelar bursitis
   D. Anserine bursitis
   E. Achilles tear

   Answer:

2. Housemaid for a local hotel comes with right knee swelling. Redness and swelling superficial to the kneecap.

   A. Jumper's knee (patellar tendonitis)
   B. Plantar fasciitis
   C. Prepattelar bursitis
   D. Anserine bursitis
   E. Achilles tear

   Answer:

3. A 17-year-old high-jumper comes with pain and tenderness of her right knee. You note tenderness over patellar tendon.

   A. Jumper's knee (patellar tendonitis)
   B. Plantar fasciitis
   C. Prepattelar bursitis
   D. Anserine bursitis
   E. Achilles tear

   Answer:

4. 45-year-old man with right heel pain. Pain is worse upon early rising and improves after a couple of steps. Your patient is a postal worker and stands up for most of the day. You note tenderness upon palpation of the medial calcaneal tubercle.

   A. Jumper's knee (patellar tendonitis)
   B. Plantar fasciitis
   C. Prepattelar bursitis
   D. Anserine bursitis
   E. Achilles tear

   Answer:

CASE 8

32-year-old man with low back pain that began 7 months prior. Pain is dull, constant, and radiates down his thighs bilaterally. The pain is associated with stiffness that is worse in the morning and gets better after he walks to the bus stop. More recently, the patient has noticed that it's more difficult to play basketball. Exam shows blowing diastolic murmur and reduced lung expansion. Decreased forward flexion of the spine. No rash, or ocular changes.

1. Most likely diagnosis?

   A. Ankylosing spondylitis
   B. Herniated disk
   C. Psoriatic arthritis
   D. Reactive arthritis
   E. Spinal stenosis

   Answer:

2. Best initial test?

   A. HLA B27
   B. X-ray
   C. MRI
   D. CT

   Answer:

3. Most accurate radiologic exam?

   A. Bone scan
   B. CT scan
   C. MRI
   D. Plain radiograph

   Answer:

4. What laboratory test is specific for diagnosing this disease?

   A. HLA B27
   B. ESR
   C. RF
   D. CRP
   E. None

   Answer:

5. What are the systemic manifestations of this disease?

6. What is the Schober test?

7. Best therapy if NSAIDs do **not** control pain?

   A. Anti-TNF
   B. Methotrexate
   C. Leflunomide
   D. Sulfasalazine
   E. Steroids

   Answer:

8. Which is most accurate to follow response to treatment?

   A. ESR
   B. Clinical symptoms
   C. MRI

   Answer:

Summary: Case 8

Ankylosing spondylitis is the most likely diagnosis. An inflammatory arthritis that involves the axial skeleton points to a seronegative spondylarthropathy. The 4 seronegative spondylarthropathies are ankylosing spondylitis, psoriatic arthritis, Reiter syndrome, and the arthritis associated with inflammatory bowel disease. In the present patient, his age and lack of other extra-articular manifestations speak strongly for the diagnosis of ankylosing spondylitis.

Radiographs of the lower spine and sacrum are the best initial test for the diagnosis of ankylosing spondylitis. The classic "bamboo spine" is a late finding after several years of disease. The most accurate test for the diagnosis is an MRI of the lower spine and sacroiliac joints. Seronegative spondylarthropathies are seronegative. The rheumatoid factor and ANA are negative. These arthritides are inflammatory and an elevated ESR is expected. About 20 to 25% of patients will have uveitis. Aortic insufficiency occurs in another 3 to 5% of patients. Other complications include atrioventricular conduction delays and pulmonary fibrosis.

To perform the Schober test you make two marks, one 10 cm above S1 and one 5 cm below S1. You then ask the patient to bend forward as much as possible. Normally the distance between the two marks should increase by more than 5 cm. If this does not occur, then the patient has significant spinal immobility. There is a clear association between HLA-B27 and the seronegative spondylarthropathies (90% sensitive), but these associations are not considered specific enough to be used for diagnosis (they occur in approximately 8% of the normal population). The best initial therapy for ankylosing spondylitis is NSAIDs and physical therapy. In patients who continue to have pain, the TNF-α receptor blocker can be used for therapy.

1. A 24-year-old man comes to your office complaining of back pain that started 1 week ago. Pain is located in lower back; does not radiate; and is not associated with fever, weight loss, or diarrhea. Exam normal. What is the next step?

   A. Spinal x-ray
   B. Electromyography (EMG)
   C. Begin ibuprofen
   D. Begin carisoprodol

   Answer:

2. Man with history of ankylosing spondylitis presents with sharp back pain in mid-thoracic region which began suddenly. Blood pressure is 185/96 mm Hg. Examination reveals a decrescendo diastolic murmur. Marked tenderness over 5th thoracic vertebra. Which is the most likely diagnosis?

   A. Acute mitral insufficiency
   B. Aortic dissection
   C. Atlantoaxial subluxation
   D. Septic arthritis of the thoracic spine
   E. Vertebral compression fracture

   Answer:

3. The patient's brother wishes to be tested with HLA-B27. Which of the following is correct regarding HLA-B27 testing?

   A. HLA-B27 testing is never indicated.
   B. All first-degree relatives of patients with a confirmed diagnosis of ankylosing spondylitis should be screened for possible disease with HLA-B27 testing.
   C. Any male patient under the age of 35 years with chronic back pain should be tested for HLA-B27 as part of the routine workup.
   D. HLA-B27 is indicated in patients with negative radiographs but with chronic low back pain and decreased lumbar spinal flexion.
   E. HLA-B27 positivity in first-degree relatives predicts a worse disease.

   Answer:

CASE 9

57-year-old man comes to office complaining of pain and swelling in his joints. He has also noticed swelling of his fingers and toes. 1 year ago he began noticing a scaly rash on his scalp. Exam is significant for sausage-like fingers, pitting of nails, and swelling of DIP.

1. Diagnosis?

2. Typical radiographic finding?

3. Typical pattern of joint involvement?

4. What blood test is specific for the diagnosis?

   A. HLA-B27
   B. ESR
   C. Rheumatoid factor
   D. Serum psoriasis antibody
   E. None

   Answer:

Note

Hydroxychloroquine makes it worse.

5. The "sausage" appearance of this patient's fingers is typical of which class of rheumatologic diseases?

6. Best initial therapy?

Summary: Case 9

In a patient who presents with complaints of finger swelling and a scaly rash, the diagnosis is likely to be psoriatic arthritis. The arthritis can be similar in joint pattern to osteoarthritis but is differentiated by the presence of inflammation in the form of morning stiffness lasting longer than 45 minutes. The "pencil in cup" deformity is the typical radiographic finding. The sacroiliac joints are frequently involved asymmetrically. The typical joint pattern is an asymmetric, inflammatory arthritis involving the distal joints of the fingers. Axial skeleton involvement is also common.

There is no serologic test that can be used for the diagnosis. The RF and ANA are always negative. The seronegative spondylarthropathies are characterized by enthesopathy, which is defined as inflammation of the tendon as it inserts into the bone. The major manifestations of enthesopathy are dactylitis ("sausage fingers"), Achilles tendon tendinitis, and plantar fasciitis.

CASE 10

22-year-old Caucasian man with pain and swelling of his right knee that began gradually. He has low-grade fevers and weight loss over last 2 months. He had an episode of gastroenteritis 3 months ago. Exam significant for oral ulcers, redness in both eyes, and tender, swollen erythematous right knee joint.

1. Most likely diagnosis?

   A. Gonococcal arthritis
   B. Gout
   C. Keratoderma blenorrhagicum
   D. Reactive arthritis
   E. Septic arthritis

   Answer:

2. Next step in the management?

   A. Antibiotics
   B. Joint aspiration
   C. Physical therapy
   D. Radiograph
   E. Steroid injection

   Answer:

3. What infectious diseases precede this syndrome? How will that change your management of the case?

4. Best initial treatment for this disease?

Summary: Case 10

Gradual onset of pain and swelling in one isolated joint should prompt you to think of Reiter syndrome or reactive arthritis as the most likely diagnosis. Unlike gonococcal arthritis, Reiter syndrome is associated with oral ulcers, urethritis, and uveitis. Keratoderma blenorrhagicum, a rash that affects the soles of the feet, is a characteristic finding associated with Reiter syndrome.

Other causes of reactive arthritis are:

- Yersinia
- Salmonella
- Shigella
- Ureaplasma
- Campylobacter

E.coli does NOT cause reactive arthritis.

Gonococcal arthritis typically responds dramatically to antibiotic therapy. The history of a previous gastroenteritis or sexually transmitted disease preceding the onset of symptoms is consistent with Reiter syndrome. In any monoarticular arthritis the next step in management is always to aspirate the joint, to rule out an acute infectious process (where the WBC >50,000). In any seronegative spondylarthropathy, HLA-B27 is the gene associated with the disease. Gastroenteritis and chlamydial infections can precede this syndrome. If a chlamydial infection is implicated in the development of disease, then doxycycline can be used for treatment of Reiter syndrome. The best initial therapy for Reiter syndrome is an NSAID. Etanercept may be added if initial therapy with an NSAID fails.

Reactive arthritis

- Oligoarthritis of lower extremities
- Enthesitis (sausage)
- Dactylitis
- Eye problems (conjunctivitis, uveitis)
- Genital problems

Treat with NSAIDs, steroids, or sulfasalazine.

CASE 11

67-year-old man comes into the emergency department complaining of headache, jaw pain when he is eating, and nonspecific throat pain. Also describes tenderness when he combs his hair. Denies fever or malaise. He has been experiencing shoulder and hip stiffness over last several days. Exam is unremarkable.

1. Diagnosis?

   A. Dermatomyositis
   B. Fibromyalgia
   C. Giant cell arteritis
   D. Lambert-Eaton syndrome
   E. Myasthenia gravis

   Answer:

2. Initial diagnostic test?

   A. Antinuclear antibodies
   B. Erythrocyte sedimentation rate
   C. C-ANCA
   D. C-reactive protein
   E. P-ANCA

   Answer:

3. Most sensitive test?

4. Next step in management?

5. How can you differentiate clinically between giant cell arteritis and polymyalgia rheumatica (PMR)? How does their treatment differ?

6. What cardiovascular complication occurs?

Summary: Case 11

The best initial test for the diagnosis of giant cell arteritis is to obtain an ESR. The ESR is elevated in more than 90% of patients with giant cell arteritis. Forty percent of patients with giant cell arteritis present with atypical symptoms such as dry cough, painful shoulder paralysis (mononeuritis multiplex), or fever of unknown origin. Therefore, in elderly patients with an elevated ESR, FUO, and a normal WBC, the diagnosis should be considered even if they do not complain of typical symptoms such as jaw, scalp, or throat pain. The most sensitive test for the diagnosis is a temporal artery biopsy. When you suspect the diagnosis of giant cell arteritis, the next step is to give high dose steroids *immediately*. Polymyalgia rheumatica (PMR) usually presents with shoulder and hip pain without any evidence of temporal artery involvement (no headache, jaw claudication, blurry vision, throat pain, or scalp tenderness on history). Both PMR and giant cell arteritis are treated with steroids. PMR is treated with a lower dose of a systemic steroid. Any large-vessel vasculitis can be complicated by aortitis resulting in aortic regurgitation. Thoracic aneurysms of the aorta occur in 15% of patients with giant cell arteritis.

CASE 12

31-year-old man comes with fever and weight loss over last several months. He has difficulty walking, with frequent tripping and falling. Started gradually 4 months ago. Along with his fever and weight loss is right lower calf pain. He has abdominal pain that begins 40 minutes after a meal and is associated with nausea and vomiting. History for intravenous drug use (IDU). BP 176/102 mm Hg; a mottled, net-like rash located on the patient's lower extremities bilaterally, gangrene of the left big toe, and right foot drop with 3/5 strength on dorsiflexion of right foot.

1. Most likely diagnosis?
   - A. Alcoholic neuropathy
   - B. Guillain-Barré syndrome
   - C. Mononeuritis multiplex
   - D. Reflex sympathetic dystrophy

   Answer:

2. Best initial test?
   - A. Nerve conduction studies
   - B. P-ANCA
   - C. Renal biopsy
   - D. Sural nerve biopsy
   - E. Angiogram

   Answer:

3. If the blood tests are all negative, what test would you order next?

4. Can you differentiate between PAN and microscopic polyangiitis?

   A. GI involvement
   B. Skin lesion
   C. Arthralgia
   D. Lung involvement
   E. Uveitis

   Answer:

5. What is the significance of IDU in this case?

   A. HIV causes this presentation
   B. *Staphylococcus* toxin leads to this
   C. Focal segmental glomerulosclerosis is common here
   D. Hepatitis B or C is found in 15–30% of these patients

   Answer:

6. Best initial treatment?

Summary: Case 12

Foot drop, as a presentation of mononeuritis multiplex, and evidence of a systemic illness with fever and weight loss, suggest vasculitis as the diagnosis. The presence of a mottled, "net-like" rash, also known as livedo reticularis, suggests a vasculitis. The best initial test is a p-ANCA. It is sometimes helpful in making the diagnosis. In order to make the diagnosis of polyarteritis nodosa (PAN), either an angiogram demonstrating microaneurysms or a renal biopsy demonstrating vasculitis has to be obtained. Both are extremely sensitive and accurate in confirming the diagnosis. When a vasculitis involves medium-sized arteries, including the renal artery, hypertension will usually be a manifestation of the disease.

In PAN, which is a vasculitis of medium-sized arteries, manifestations include livedo reticularis, skin ulcers with gangrene, and hypertension. What is interesting about PAN is the absence of pulmonary involvement. Microscopic polyangiitis manifests with purpura, hematuria, and proteinuria, and does involve the lung. Abdominal pain can be seen in both PAN and microscopic polyangiitis. PAN is associated with hepatitis B and hepatitis C in 10–30% of all cases. The best initial therapy is high-dose corticosteroids.

Patients whose disease is refractory to steroid therapy or who have major organ involvement should have cyclophosphamide added to their treatment regimen.

CASE 13

34-year-old woman with rash and joint/abdominal pain that began 2 days ago. The rash is associated with abdominal pain and her urine "looked like tea." Also has muscle pain. She had just recovered from an upper respiratory tract infection 2 days prior to her first episode of hematuria. You note a nonblanching rash located over the lower extremities and the buttocks. Platelet count is normal and creatinine is 2.1 (elevated).

1. Next step in management?

   A. ANA
   B. Skin biopsy
   C. Urinalysis
   D. Protein:creatinine ratio in the urine
   E. Antistreptolysin O

   Answer:

2. Diagnosis?

   A. Cryoglobulinemia
   B. Henoch-Schonlein purpura
   C. Post-streptococcal glomerulonephritis
   D. Systemic lupus erythematosis
   E. IgA nephropathy

   Answer:

3. Most accurate test?

4. Treatment?

   A. ACE inhibitors
   B. Fish oil
   C. Angiotensin receptor blockers
   D. Cyclophosphamide
   E. None

   Answer:

5. The patient develops a urine protein-to-creatinine ratio of 7 to 1. Creatinine rises to 3.8 mg%. What would you do?

   A. Enalapril and prednisone
   B. Prednisone
   C. Cyclophosphamide
   D. Prednisone and cyclophosphamide
   E. Plasmapheresis

   Answer:

Summary: Case 13

In any patient who presents with hematuria and renal insufficiency the next step is to obtain a urinalysis. Urinalysis is to ascertain whether there are RBC casts. Casts suggest acute glomerulonephritis as the cause of the renal insufficiency. Unlike poststreptococcal glomerulonephritis, where there is a latent period before the onset of the hematuria, in IgA nephropathy the latent period is 1–2 days in length. Nonblanching rash can be secondary either to a vasculitis or to thrombocytopenia. A normal platelet count rules out idiopathic thrombocytopenic purpura (ITP). A normal platelet count points toward a vasculitis as the cause of the rash. IgA levels in the serum will be elevated in 50% of cases. The most accurate test is a renal biopsy where immunofluorescence shows IgA deposits in the mesangium. Patients with proteinuria >5 g/24 hours should be started on an ACE inhibitor. Steroids are used to treat the underlying disease only if there is no spontaneous resolution, severe proteinuria is present, or renal failure is progressing.

CASE 14

> 56-year-old man comes to ED complaining of right knee pain that began suddenly and awoke him from sleep. This is his first episode of arthritis. Temp 38.8°C (102°F). Right knee is warm, erythematous, swollen, and extremely tender to touch.

1. What is the next step?

   A. Antibiotics
   B. Joint aspiration
   C. Physical therapy
   D. Radiograph
   E. Steroid injection

   Answer:

2. What would an x-ray show?

Arthrocentesis shows negatively birefringent, needle-shaped crystals. White cell count returns as 23,000.

3. Diagnosis?

   A. Gout
   B. Osteoarthritis
   C. Osteochondritis dissecans
   D. Pseudogout
   E. Septic arthritis

   Answer:

4. Initial treatment?

   A. Allopurinol
   B. Oral steroids
   C. Colchicine
   D. Ibuprofen
   E. Intra-articular steroids
   F. Febuxostat

   Answer:

5. When is intra-articular steroids the answer?

6. When are oral steroids the answer?

7. When is colchicine the answer?

Note

Pegloticase and rasburicase are used if allopurinol or febuxostat do not control disease.

8. What nonpharmacologic measures are recommended to prevent further attacks?

9. What are the indications for using drugs that reduce uric acid levels? When would you use allopurinol? probenecid/sulfinpyrazone?

10. When is febuxostat the answer?

Summary: Case 14

In any acute monoarticular arthritis the next step in management is to aspirate the joint for analysis of the joint fluid. It is impossible to distinguish between a crystal-induced arthropathy and a septic arthritis on the basis of clinical criteria alone. Both will give a warm, inflamed joint on exam, associated fever, and an elevated WBC count. Analysis of the joint fluid will identify the presence of crystals, and a cell count of >50,000 white blood cells implies an infectious arthritis. Non-specific soft-tissue swelling is often found. Linear radiodense calcium deposits are seen in pseudogout along the menisci or articular cartilage. The presence of negatively birefringent, needle-shaped crystals on joint fluid analysis is extremely specific for the diagnosis of gout. In pseudogout, the joint fluid would show positively birefringent, rhomboid-shaped crystals.

The best initial therapy for the treatment of acute gouty arthritis is an NSAID. Any NSAID is equally effective for the treatment of gouty arthritis, but indomethacin is the traditional choice. Patients who have a history of PUD, use alcohol, and/or are currently taking steroids or warfarin have a higher risk of NSAID-associated GI bleeding. An alternate approach is to add a proton pump inhibitor to the NSAID therapy to prevent the development of a significant bleed. Misoprostol has been used in the past for this purpose, but because of its poor tolerability (diarrhea in 10–20% of patients) it is no longer considered first-line therapy for prophylaxis of NSAID-associated GI bleeding.

Note

Uric acid level can drop to normal during acute attacks.

Both standard NSAID therapy and COX-2 inhibitors can induce fluid retention and acute renal failure in all patients, but especially in patients with congestive heart failure. Use of these therapies is relatively contraindicated in the setting of renal insufficiency and/or congestive heart failure. Colchicine is rarely used for the treatment of acute gouty arthritis. Use is limited by its poor tolerability (abdominal cramping, nausea, vomiting, and diarrhea). In older patients or patients with renal insufficiency or liver disease, the dose of colchicine should be adjusted. Patients who cannot take an NSAID should receive steroids for treatment of acute gouty arthritis. One joint is injected; multiple joints get systemic steroids.

Nonpharmacologic measures that can reduce the number of gouty attacks include decreasing consumption of meat and alcohol, and losing weight. Low-dose aspirin, loop/thiazide diuretics, and niacin may exacerbate gouty arthritis. Indications for reducing uric acid levels in gouty arthritis include renal insufficiency, nephrolithiasis, tophaceous gout. and recurrent attacks. Patients who require diuretic therapy for other comorbid conditions should be considered for prophylactic therapy.

Use allopurinol or febuxostat for prophylaxis. Probenecid and sulfinpyrazone rarely, if ever, correct. There is no need to measure 24-hour urine for uric acid any longer. The concept of overproducer or underexcretor does not matter.

Pseudogout occurs when calcium-containing salts become present in articular cartilage. It is associated with hemochromatosis, hyperparathyroidism, diabetes mellitus, hypothyroidism, and Wilson disease. Pseudogout is treated acutely with NSAIDs and prophylactically with colchicine.

Note

CPPD caused by

- Hyperparathyroid
- Hemochromatosis
- Hypercalcemia
- Hypophosphatemia
- Wilson's disease

1. 56-year-old man with history of gout, PUD, and chronic renal insufficiency undergoes CABG and complains of right toe pain that began suddenly 2 days postoperatively. Physical exam reveals a red, swollen right big toe. What is the best initial therapy?

   A. Celecoxib
   B. Indomethacin
   C. Prednisone
   D. Arthrocentesis and intra-articular injection of triamcinolone

   Answer:

2. A man is found to have a markedly elevated uric acid level on a blood test by his urologist for a reason he can't remember. He feels well. What to do?

   A. Sulfinpyrazone
   B. Allopurinol
   C. Febuxostat
   D. 24-hour urine uric acid level
   E. Nothing

   Answer:

3. 43 year old man comes with pain in the knees and wrist. He is fatigued and has erectile dysfunction. Exam: Swelling of wrists and knees X-ray: Calcification of menisci AST/AST elevated HgA1c 8%. What is the diagnosis?

   A. Diabetic joint disease
   B. Hyperparathyroidism
   C. CPPD from hemochromatosis

   Answer:

Summary:

Patients with acute gout and a contraindication to NSAIDS such as ulcer disease and renal insufficiency should be treated with intra-articular or systemic steroids. There is no meaningful use for routine testing of urine uric acid excretion to guide therapy. You can have a high uric acid without gout and you can have a low uric acid level during an acute attack of gout.

Calcium pyrophosphate deposition disease (CPPD) or pseudogout is managed acutely in the same way at gout with NSAIDs and steroids. The cell count in the joint fluid is the same in range of 2,000 to 20,000 with some occasionally going up to 50,000 WBCs.

Synovial Fluid Cell Count

<200:	Normal
200–2,000:	Non-Inflammatory
2,000–50,000:	Inflammatory (gout, CPPD)
>50,000:	Infectious/Septic

CASE 15

58-year-old woman comes with joint stiffness that began slowly 1 year ago. Stiffness lasts less than 20 minutes and occurs in the morning. Her right DIPs and right knee are affected. Symptoms have gradually worsened. Now experiences pain when she crochets and when walking for longer than 20 minutes. Pain is relieved by rest. Exam is significant for crepitus on passive motion of right knee.

1. Diagnosis?

   A. Charcot joint
   B. Osteoarthritis
   C. Rheumatoid arthritis
   D. Psoriatic arthritis
   E. Septic arthritis

   Answer:

2. What would you expect on x-ray?

3. What are characteristic laboratory findings?

   A. Elevated C-reactive protein
   B. Elevated ESR
   C. Rheumatoid factor
   D. Ferritin level
   E. None

   Answer:

4. Are there any nonpharmacologic interventions?

5. Best initial treatment?

   A. Acetaminophen
   B. Celecoxib
   C. Colchicine
   D. Indomethacin
   E. Oxycodone

   Answer:

Summary: Case 15

Patients who present with an asymmetric, distal arthritis involving the DIP joints of the hands are very likely to have osteoarthritis (OA). The absence of significant morning stiffness helps to differentiate OA from the asymmetric distal arthritis of psoriatic arthritis. Radiographic findings on x-ray would show osteophytes and joint space narrowing. The ESR, ANA, and CRP are typically normal, as the arthritis is a noninflammatory one.

Nonpharmacologic treatment for OA consists of patient education, physical and occupational therapy, and weight loss. While most patients will ultimately require pharmacologic therapy, nonpharmacologic treatment reduces the intensity of pharmacologic intervention. After nonpharmacologic therapy, the best initial therapy for OA is acetaminophen. If patients fail therapy with acetaminophen, then a trial of NSAIDs/COX-2 inhibitors may be attempted. If patients have persistent pain despite all these interventions, the next step is intra-articular steroids.

CASE 16

Man in ED with right knee pain. Began suddenly and is dull in character. Patient denies weight loss, fever, or malaise over the last several months. Past medical history consists of asthma, for which he has been taking prednisone off and on for the last 6 years. Exam: no pain on passive movement of knee but significant pain on internal rotation of the hip.

1. Most likely diagnosis?
   A. Avascular necrosis of the hip
   B. Hip fracture
   C. Osteoporosis
   D. Ischial bursitis
   E. Trochanteric bursitis

   Answer:

2. Initial test?

3. Most sensitive test?

4. Best initial treatment?

5. Why is this patient's history of asthma important?

Summary: Case 16

This patient's most likely diagnosis is avascular necrosis of the hip. He complains of knee pain, but movement of the knee joint does not produce any pain. Rather, internal rotation of the hip is the maneuver that elicits symptoms. The best initial test for the diagnosis of avascular necrosis bone is radiographic evaluation of the joint in question. The most accurate test for the diagnosis is a CT or MRI scan. Nonoperative treatment usually results in a poor prognosis. Protected weight-bearing is associated with a greater than 85% rate of femoral head collapse. For this reason surgical decompression is indicated in most lesions. Severe joint dysfunction associated with cortical collapse is an indication for surgical intervention. Chronic steroid therapy is an important cause of avascular necrosis of bone. Other causes include SLE, alcoholism, gout, sickle-cell anemia, and Gaucher disease.

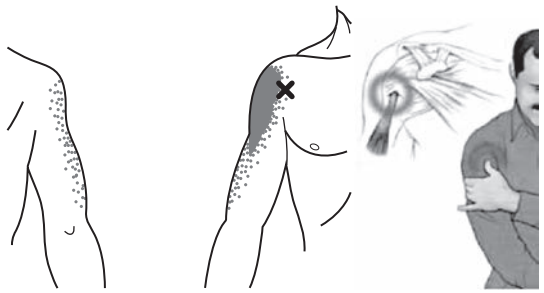
Tendon, Ligament, Cartilage and Bursa disorders

1. Patient with swelling of ears, hoarseness and nose. Laryngoscopy shows edema and inflammation. Earlobe is normal. Biopsy of cartilage is abnormal.

   What is it?

   Treatment?

2. What is it?



   Pain on abduction of shoulder mainly anterior tenderness over bicipital groove.

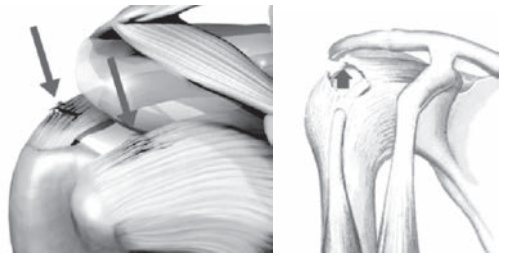
   What is it?

   Treatment

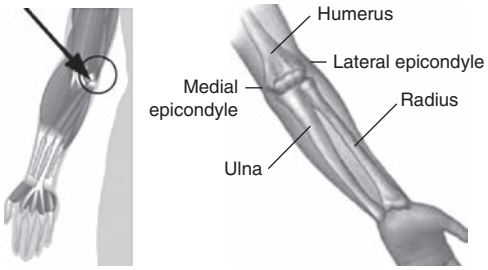
3. Patient in motor vehicle accident. Fell on outstretched hand. Couple of hours later with shoulder pain, swelling and unable to abduct, but he can shrug his shoulder

   What is it?

   Treatment



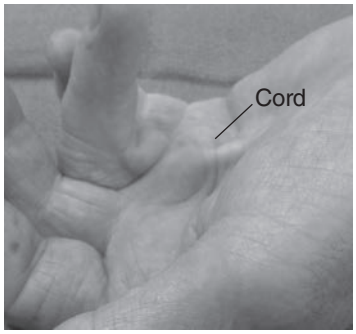
4. Pain the medial (inside) aspect of the elbow. It is tender as well



What is it?

Treatment

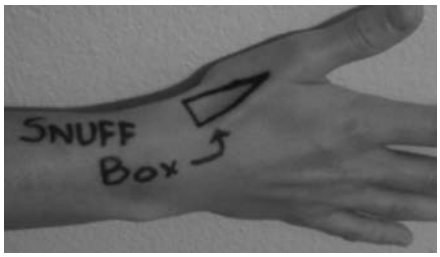
5. Stiffness of the ulnar aspect of the hand. Unable to extend 3rd and 4th fingers. Thickening and shortening of palmar fascia. Often with diabetes and alcoholism.



What is it?

Treatment

6. Patient falls on outstretched hand. Tender at anatomical snuff box.

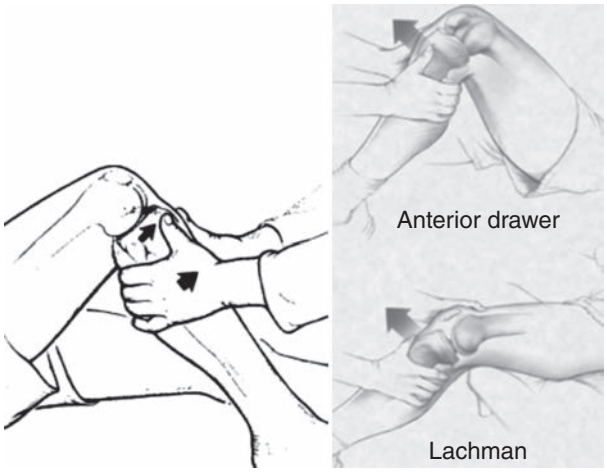


What is it?

Treatment

7. Football player. Knee pain. Heard "popping sound"

   Drawer sign and Lachman sign positive



   What is it?

   Treatment

Summary:

The ears are made of cartilage, but not the earlobe. Relapsing polychondritis will give hoarseness as well. Treat with steroids. When the anterior shoulder over the bicipital groove is painful and tender, bicipital tendonitis is treated with NSAIDs and a steroid injection

Rotator cuff tear makes it impossible for the patient to abduct the arm past 40 degrees or to comb hair. Look for phrase "unable to lift arms above head". Only surgery can ultimately fix the rotator cuff. Tennis elbow is the lateral epicondyle. Golfer's elbow is the medial epicondyle. Both are treated with NSAIDs and physical therapy.

Dupuytren's contracture is treated with collagenase to try to dissolve the contracture. If this does not work, surgical release is needed.

Tenderness at the anatomical snuff box after a fall/injury is a scaphoid fracture. Do an x-ray or MRI. Treat with splints and NSAIDs. Football injury of the knee with a "pop" and the laxity of increased mobility of the drawer and Lehman sign are from anterior cruciate ligament tear.

CASE 17

A 57-year-old, African-American woman presents to office with difficulty rising from a seated position. Denies double vision but chokes when eating. The patient explains that it is difficult for her to "start swallowing." Exam is noteworthy for scaly patches over the PIPs and MCPs bilaterally. You also note proximal muscle weakness of the lower extremities bilaterally.

1. Diagnosis?

   A. Dermatomyositis
   B. Eaten-Lambert syndrome
   C. Guillain-Barré syndrome
   D. Hypothyroidism
   E. Myasthenia gravis

   Answer:

2. Best initial test?

   A. Acetylcholinesterase antibodies
   B. Antinuclear antibodies
   C. Serum creatinine phosphokinase and aldolase
   D. TSH
   E. Tensilon (edrophonium) test

   Answer:

3. Most accurate test?

4. What other testing

5. Significance of anti-Jo-1 antibodies?

6. Initial treatment?

   A. Prednisone
   B. Azathioprine
   C. Cyclophosphamide
   D. Anti-TNF
   E. Colchicine

   Answer:

7. What would you give if this fails?

   A. Prednisone
   B. Azathioprine
   C. Cyclophosphamide
   D. Anti-TNF
   E. Colchicine

   Answer:

Summary: Case 17

In a patient who presents with proximal muscle weakness associated with scaly patches found symmetrically over her finger joints (Gottron papules), the most likely diagnosis is dermatomyositis. The best initial test for the diagnosis is to measure serum creatinine phosphokinase or aldolase. The most accurate test for the diagnosis is muscle biopsy that typically shows various stages of muscle fiber necrosis and regeneration. In any patient who presents with dermatomyositis, the presence of an underlying malignancy must be considered. The next step after the diagnosis is confirmed is to search for an occult malignancy. Anti-Jo-1 antibodies are associated with pulmonary fibrosis. The best initial therapy is steroids. Patients with dermatomyositis who fail to respond to steroids can be treated with methotrexate, azathioprine, or IV Ig.

CASE 18

A 25-year-old woman comes to your clinic with fatigue, headaches. Aching and pain in shoulder, neck, and both hips. Denies morning stiffness, low-grade fever, or weight loss over recent months. Exam is significant for tender points on the trapezius muscle but is otherwise normal.

1. What lab abnormalities would you expect?

   A. ESR
   B. C-reactive protein
   C. Aldolase
   D. CPK
   E. None

   Answer:

2. What diseases are associated with this disorder?

3. How are these patients managed?

Summary: Case 18

This patient has a history consistent with fibromyalgia. The presence of trigger points associated with diffuse muscle pain is consistent with the disorder. Chronic fatigue syndrome and fibromyalgia are different extremes along the same spectrum of disease. Essential to the diagnosis of fibromyalgia is the absence of any objective measures of inflammation. The ESR, CBC, and thyroid function are all expected to be normal. Sleep disorders, hypothyroidism, anxiety, and depression are associated with fibromyalgia.

Treatment for fibromyalgia is with antidepressant medications, such as amitriptyline or fluoxetine.

1. 37-year-old woman complaining of "aches and pains." Symptoms started several months ago and have been progressively worsening. She also complains of fatigue and frequent headaches. Pain produced upon palpation of medial fat pad of knee. CBC, ESR, and electrolytes are normal. Therapy?

   A. Ibuprofen
   B. Codeine
   C. Amitriptyline
   D. Prednisone

   Answer:

CASE 19

Receptionist with numbness and tingling in her right hand. Symptoms get worse after she spends the day typing. Pain worsens at night and radiates to her forearm and shoulder. Exam significant for positive Phalen and Tinel signs. No thenar muscle atrophy and no weakness in the right hand.

1. Diagnosis?

Note

Causes of Carpal Tunnel

- Rheumatoid Arthritis
- Diabetes
- Pregnancy
- Hypothyroidism
- Amyloid
- Acromegaly

2. Test?
   A. Cervical CT scan
   B. Nerve biopsy
   C. Nerve conduction study
   D. Radiograph of the hand
   E. Ultrasound

   Answer:

3. Therapy?

Note

Do **not** use MRI to assess carpal tunnel.

4. If initial therapy fails, what would you do next?

5. When would your answer be surgery?

6. What systemic disorders are associated with this disorder?

Summary: Case 19

In a patient with a history of repetitive hand motion who complains of numbness and tingling over the distribution of the median nerve, the most likely diagnosis is carpal tunnel syndrome. Atrophy of the thenar muscle also implies compression of the median nerve. The diagnostic test of choice is nerve conduction studies to assess the presence of conduction delay in the median nerve. The best initial therapy is hand splinting. In patients who fail physical therapy, the next step in management is to inject steroids into the carpal tunnel. Surgical decompression is the most effective therapy for the treatment of carpal tunnel syndrome. Patients with severe pain refractory to medical therapy or with significant thenar muscle atrophy should be treated with surgical decompression. Rheumatoid arthritis, myxedema, amyloidosis, sarcoidosis, leukemia, acromegaly, diabetes mellitus, and hyperparathyroidism are all associated with carpal tunnel syndrome.

CASE 20

20-year-old man with abdominal pain worse on eating. Better on empty stomach. Also with Joint pain in hands and feet. There is 20 pounds of weight loss. Leg ulcers for years. Exam: purpuric rash on lower extremities. ESR 100 mm/hour BUN and creatinine are elevated. Chest x-ray is normal.

1. What is the diagnosis?

   A. Churg-Strauss
   B. Polyarteritis nodosa
   C. SLE
   D. Microscopic polyangiitis

   Answer:

2. What test should you do first?

   A. C-reactive protein
   B. Rheumatoid factor
   C. CPK
   D. Abdominal Angiogram
   E. Colonoscopy

   Answer:

3. Which of the following is most likely to be associated with this?

   A. Mononeuritis multiplex
   B. MI
   C. Lung cancer

   Answer:

4. If angiography is not diagnostic, what test to do?

   A. Renal biopsy
   B. Skin biopsy
   C. Sural nerve biopsy

   Answer:

5. 28-year-old person of Middle Eastern origin with recurrent abdominal pain every two months lasting for 1-2 days. Attacks of periumbilical pain become generalized and are associated with fever and joint pain. Imaging studies normal. Father has the same. What is the diagnosis?

   Treatment?

   Complication?

6. Patient with asthma and allergic rhinitis comes with worsening shortness of breath as steroids are tapered. He takes zafirlukast for asthma. CBC shows eosinophils. Urinalysis shows red cells and red cell casts.

   What is the diagnosis?

   Treatment?

7. Chronic cough with abnormal x-ray. Shortness of breath. No upper respiratory problems. Hematuria and red cell casts.

   Eosinophils: Normal

   C-ANCA: Negative

   P-ANCA: Positive

   Biopsy shows vasculitis, but no granulomas.

   What is it?

   Treatment?

8. Swelling of skin of arms and legs after exercise with an orange peel type quality. Spares the hands and feet.

   CBC: increased eosinophils

   What is it?

   Treatment?

Summary: Case 20

Abdominal pain with joint pain, weight loss and renal insufficiency in the absence of lung findings is polyarteritis nodosa. Once the ESR is elevated, there is no added benefit of testing for CRP. Abdominal angiography spares the need for biopsy. If this is not clear, it is better to biopsy the sural nerve in the leg, rather than the more invasive renal biopsy. Treat with steroids and cyclophosphamide. Don't forget to test for chronic hepatitis B and C.

Recurrent attacks of fever and abdominal pain particularly with a family history in someone of Middle Eastern origin is familial Mediterranean fever. Treat with colchicine. They can develop amyloidosis.

Churg-Strauss syndrome is a vasculitis affecting the kidneys with asthma and eosinophilia. It is associated with the use of the leukotriene inhibitor zafirlukast. Treat with steroids and cyclophosphamide.

Microscopic polyangiitis is a lung and renal syndrome that can easily be confused with Wegener's but there are no upper respiratory issues (no otitis, no sinusitis) and no granulomas on biopsy. Treat with steroids and cyclophosphamide.

Eosinophilic fasciitis has orange skin, worse after exercise and is treated with steroids.

Infectious Diseases

11

CENTRAL NERVOUS SYSTEM INFECTIONS

Case 1

32-year-old, generally healthy woman comes to ED with 1 day of fever and a headache. She has photophobia. With her knees flexed against her abdomen, there is pain when you try to passively extend them. No focal deficits, and she is in pain but alert. When she is supine and you passively flex her neck, there is spontaneous flexion of her hips and knees.

1. When do you need to do a CT scan of the patient's head?

2. Most specific test on lumbar puncture?

   The culture

3. Most likely organism?

   Strep. pneumoniae

The CSF reveals 2,400 WBCs with 92% neutrophils. Gram stain is normal.

4. Best initial therapy?

5. When will your answer be to use steroids?

6. When do steroids lower mortality?

Summary: Case 1

All central nervous system infections will be characterized by a fever and a headache. There is an advantage to a Board question as compared with ordinary patient care, because if a Board question asks you for the most likely diagnosis, it must give you a definite clue as to the answer. If the patient has only a stiff neck, it must be meningitis. If the stiff neck is combined with confusion and a seizure, then you cannot tell if the diagnosis is encephalitis. Although a lumbar puncture (LP) is definitely the first test to perform, there are certain circumstances in which your answer must be a CT scan of the head as the best next step prior to an LP. CT scan is required before an LP if the patient has focal neurologic abnormalities, severe confusion that makes the neurologic examination inaccurate, papilledema, and/or a recent seizure. Immunocompromised patients, such as those with HIV and <200 CD4 cells, should also have a CT prior to an LP. When you are asked "What is the most accurate test?" on an infectious disease question, then the answer in general is a culture. You rarely, if ever, wait for the results of the culture before initiating therapy. In all age groups outside of the neonatal period, the most common cause of bacterial meningitis is *Streptococcus pneumoniae*. For immunocompetent patients, the best initial therapy for bacterial meningitis is ceftriaxone (or cefotaxime) and vancomycin. Steroids are most useful for tuberculous meningitis to decrease the risks of neurologic deficits, and they may decrease mortality in pneumococcal meningitis. Your answer will be to use steroids when bacteria are found on Gram stain and/or when the CSF white cell count is >1,000.

Case 2

48-year-old man with 3 days fever, headache, and stiff neck. Lumbar puncture shows 158 white cells, 95% lymphocytes. Gram stain negative, latex agglutination antigens for *Streptococcus Haemophilus*, and *Neisseria* are negative.

1. Diagnosis?

If THIS is in the history and physical…	…then THIS is the most likely diagnosis	Answer THIS as the best initial and most specific tests	Answer THIS as the best initial therapy
HIV with <100 CD4 cells; milder symptoms	Cryptococcus	India ink and cryptococcal antigen test	Amphotericin and 5-FC, followed by lifelong fluconazole
	Lyme	Specific IgM and IgG antibodies by ELISA and Western blot	Ceftriaxone or penicillin
	Rocky Mountain spotted fever		
Pulmonary TB; very high CSF protein	Tuberculosis	AFB stain and culture Specific PCR	INH, rifampin, PZA, ethambutol, steroids
	Viral meningitis		

Summary: Case 2

The point of the patient description here is to show that a mild meningitis with a moderate lymphocytic pleocytosis can be consistent with a number of etiologies and, in fact, excludes only bacterial causes. Viral meningitis can be confirmed with polymerase chain reaction (PCR) methods; however, it is generally a diagnosis of exclusion. Viral meningitis is the most common cause of this type of presentation and is the answer to the question "What is the most likely diagnosis?" in a case such as this one if there are no other points of history or physical attached to the case. If the history includes HIV with <100 CD4 cells, then the most likely diagnosis is cryptococcosis and the best initial test is an India ink. The India ink is like a Gram stain: it is extremely specific if it is positive, but it only has a 50–70% sensitivity. The most accurate test for cryptococcosis is an antigen test, and the best initial therapy is amphotericin followed by fluconazole.

Lyme is the "most likely diagnosis" when there is a history of a tick bite, target (erythema migrans) rash, joint pains, or facial palsy. Because *Borrelia* and *Rickettsia* cannot be seen on a Gram stain or grown in regular culture media, then the "most accurate diagnostic tests" for each of these is a specific serologic test such as PCR or IgM by enzyme-linked immunosorbent assay (ELISA) and Western blot. The "best initial therapy" for Lyme is ceftriaxone, and for Rocky Mountain spotted fever is doxycycline. TB meningitis is treated with the same four-drug regimen as pulmonary TB except that steroids are added. There is no therapy for viral meningitis.

Case 3

> 72-year-old man with fever, headache, photophobia, and stiff neck for last 24 hours. Past history is significant for AIDS, CD4 count 34. History of PCP and CMV retinitis. He is also pregnant. LP shows 3,800 WBCs, 92% neutrophils, elevated protein, and a normal Gram stain. Latex agglutination tests for bacteria are negative.

1. Most likely organism?

2. Best empiric therapy?

3. Best therapy if patient is penicillin-allergic?

Summary: Case 3

Immunocompromise is the most common risk for an increased incidence of *Listeria* monocytogenes. Although neutrophil defects do predispose to *Listeria*, it is more common with T-lymphocyte defects. Although *Listeria* is more common in these patients than in the general population, *Strep* pneumonia is still the most common. Therefore, although we have to start ampicillin for *Listeria*, we still have to cover for *Pneumococcus* with ceftriaxone and vancomycin. *Listeria* is resistant to all cephalosporins. When a diagnosis of *Listeria* is confirmed, gentamicin is added for synergy and to increase the rate of clearance of the bacteremia.

Case 4

17-year-old boy brought by girlfriend to emergency department because he had a seizure while they were kissing. His other friends arrive and state they are sure he was well yesterday because they were sharing cigarettes just yesterday. Patient complains of severe headache and is severely confused and febrile. Pulse 55. BP 145/95 with irregular respirations. Petechial rash on trunk.

1. Diagnosis?

2. What would you **do** first?

   A. CT
   B. Ceftriaxone and vancomycin
   C. C5-C9 levels
   D. Lumbar puncture

   Answer:

Eventually the boy's CSF cell count shows 2,500 neutrophils.

3. What additional measures are necessary in this case?

4. If patient has recurrent disease of this type, for what will you test?

   A. Neutrophil function
   B. HIV
   C. C5-C9 levels
   D. IgG levels
   E. Serum protein electrophoresis (SPEP)

   Answer:

Summary: Case 4

The most common cause of bacterial meningitis in an adolescent or college-age patient, especially with a rash, is *Neisseria* meningitis. Prophylaxis for meningococcus is indicated only for intimate contacts, such as household contacts or day care center or nursery school contacts, where there can be salivary contact. There must be a reason to suspect salivary contact. You do not routinely have to give prophylaxis to health care worker contacts. The method of transmission of meningococcus requires direct fluid contact between the patient's saliva and the contact's mucous membranes. Meningococcus is not spread via the airborne route, as would be considered for close contacts of patients with TB. The most common wrong

answer is to say that the doctors and nurses who attend patients with meningococcus need prophylaxis with rifampin or ciprofloxacin.

This patient has severe confusion and a recent seizure. This means he must have a CT scan prior to the LP. When a CT scan must be performed, then the first thing to do is to give a dose of empiric antibiotics; this is the answer to "What is the best next step in the management of this patient?" Whenever there is a delay to the LP, then your answer should be "Antibiotics next."

Patients with terminal complement deficiency are predisposed to recurrent *Neisseria* infections.

1. After bone-marrow transplantation, a 72-year-old patient comes with meningitis. CSF shows high protein and elevated white cell count. Stain shows gram-positive rods. Which is the most likely causative organism?

   A. *Strep. pneumoniae*
   B. *Listeria*
   C. Nocardia
   D. Anthrax
   E. *Bacillus* species

   Answer:

Case 5

42-year-old, HIV-positive man comes with fever and worsening headache for last 2 weeks. No photophobia. Minimal neck stiffness. CT head is normal. CSF shows an elevated protein, negative Gram stain. Cell count 4. All lymphocytes. Opening pressure 240 mm H_2O.

1. What is the single most important thing to know about this patient's history?

   A. Viral load
   B. Whether his CD4 count is <100
   C. History of pneumonia
   D. Current prophylactic medication use
   E. Current antiretroviral medication use

   Answer:

2. What would you **do** for him at this time (as in, *now*)?

   A. Intrathecal amphotericin
   B. Caspofungin
   C. Oral fluconazole
   D. Intravenous amphotericin and flucytosine
   E. Intravenous 5-flucytosine

   Answer:

3. Most accurate diagnostic tests?

4. Would you start this patient on HIV medications (anti-retrovirals)?

Summary: Case 5

In evaluating a patient with meningitis and HIV, the most important clue to the diagnosis is the patient's CD4 count. It is very rare with >100 CD4 cells and essentially impossible to have cryptococcal meningitis as an opportunistic infection if the CD4 is >200. India ink is like a Gram stain for bacterial meningitis in that it is a cheap, easy, immediately available test with results obtainable within an hour after the lumbar puncture. Like the Gram stain, the test lacks sensitivity and is positive in only 60–80% of cases at most. Cryptococcal antigen testing is extremely sensitive and specific at rates >95% for each.

A low CSF white cell count does not exclude cryptococcal meningitis. In fact, the worst prognostic factors for cryptococcal meningitis are a high opening pressure, a high cryptococcal antigen titer, and a low CSF white cell count. Amphotericin should be started first in all patients with acute CNS cryptococcosis. As the choice of "best initial therapy," amphotericin has a far greater mortality benefit compared with fluconazole.

Case 6

48-year-old man with a week of progressive confusion, disorientation, and fever. You can't find specific neck stiffness. Too confused to determine if he has focal neurologic deficits.

1. Diagnosis?

2. Initial test, and what might you find?
   A. MRI with contrast with cerebellar involvement
   B. CT with contrast
   C. CT without contrast with temporal lobe involvement
   D. Urethral swab with multinucleated giant cells

   Answer:

3. Most accurate diagnostic test?

   A. EEG
   B. CSF with increased white *and* red cells
   C. PCR for DNA
   D. Brain biopsy

   Answer:

4. Therapy?

   A. Acyclovir
   B. Ganciclovir
   C. Valganciclovir
   D. Interferon and steroids

   Answer:

Summary: Case 6

The most common cause of acute febrile confusion is herpes simplex. Although there are many viruses that can cause encephalitis, herpes is so much more overwhelmingly common that you should just answer herpes for any cause of encephalitis. Although a head CT may show some temporal lobe involvement, this is relatively nonspecific and insensitive. PCR is at least as accurate as a brain biopsy. Acyclovir is considered the drug of choice, mostly on the basis of administration issues. Famciclovir and valacyclovir are not available intravenously.

1. Man placed on acyclovir and develops high BUN and creatinine. What is most appropriate?

   A. Stop acyclovir
   B. Stop acyclovir and begin foscarnet
   C. Reduce the dose of acyclovir
   D. Reduce the dose of acyclovir and increase hydration and urine flow

   Answer:

2. Patient comes with fever, headache, stiff neck and photophobia. CSF shows elevated lymphocyte count. This is the fifth episode in six years. The last time he stayed home and it resolved spontaneously.

   What is the diagnosis?

   What treatment?

RESPIRATORY TRACT INFECTIONS

OTITIS MEDIA

Case 1

34-year-old man with pain in ear and decreased hearing over several days.

1. Most sensitive physical finding for otitis media?

   A. Redness
   B. Loss of light reflex
   C. Immobility of the tympanic membrane
   D. Bulging
   E. Dullness

   Answer:

2. Most accurate diagnostic test?

3. Initial therapy?

4. What will you treat with if this fails?

Summary: Case 1

Otitis media commonly presents with a bulging tympanic membrane, pain, decreased hearing, and loss of the light reflex; however, it can be present even in the absence of these findings. The most sensitive finding for the presence of otitis media is an immobile tympanic membrane on insufflation of the ear. Although it is rarely done, tympanocentesis is the most accurate diagnostic test for otitis media. Tympanic membrane puncture is the only way to identify a specific bacteriologic etiology. Tympanocentesis is your answer to "What is the next step in the management of this patient?" when the patient has been repeatedly treated and has shown either no response or frequent recurrences. Amoxicillin is your answer as the "best initial therapy." If there is no response to amoxicillin, then coverage is broadened with the addition of clavulanic acid or a switch to oral second- or third-generation cephalosporins, such as cefixime, ceftibuten, loracarbef, or cefdinir.

Case 2

34-year-old man with headache, fever, discolored nasal discharge, and a bad taste in his mouth. On exam he has tenderness over maxillary sinuses.

1. What would you do next?

2. Most accurate test?

   A. X-ray
   B. CT scan
   C. Biopsy
   D. MRI scan
   E. Culture of the discharge

   Answer:

3. What is the Best initial therapy?

   A. Amoxicillin/clavulanic acid and decongestants
   B. Erythromycin
   C. Nitrofurantoin
   D. Linezolid

   Answer:

Summary: Case 2

When your case gives such obvious findings as a discolored nasal discharge, facial pain and tenderness, and headache, then there is no point in answering a radiologic study as the "best next step in management." You should go straight to treatment. Although a CT scan is an accurate test for sinusitis, it still cannot give you a specific microbiologic diagnosis.

INFLUENZA

Case 3

A 46-year-old secretary comes to see you because of 1 day of fevers, myalgias, arthralgias, sore throat, headache, nasal stuffiness, and dry cough. Physical examination is normal except for fever.

1. What would you do next?
   A. Acetaminophen and fluids
   B. Oseltamivir
   C. Amantadine
   D. Nothing

   Answer:

2. Best initial diagnostic test?

3. Who should be vaccinated?
   A. > 50 yearly
   B. Chronic heart, lung, and liver diseases
   C. Everyone

   Answer:

Summary: Case 3

Patients with influenza can be treated with neuraminidase inhibitors, such as oseltamivir and zanamivir, if they present within the first 48 hours. Neuraminidase inhibitors are active against both influenzas, A and B. Older agents, such as amantadine and rimantadine, are effective only against influenza A and should never be used as empiric therapy. The influenza vaccine should be administered to all patients if they are generally healthy. In addition, the following groups derive the greatest benefit from vaccine: all health care workers, regardless of age, to prevent spread of the virus to patients; patients with chronic cardiopulmonary disorders, diabetes, and/or hemoglobinopathies; and pregnant women in their second and third trimesters.

HEAD AND NECK INFECTIONS

Case 5

Patient with low-grade fever, sore throat, fatigue, and posterior cervical adenopathy. (Question may be accompanied by a picture of red spots on the palate.)

1. With which complication would you use steroids?
   A. Tonsillar enlargement
   B. Guillain-Barré syndrome
   C. Airway obstruction
   D. Myocarditis

   Answer:

Case 6

17-year-old comes with abrupt onset of high fever, sore throat, and dysphagia. Also drooling and pooled saliva in the back of the throat.

1. Treatment?
   A. Albuterol
   B. Oral amoxicillin
   C. Ceftriaxone and clindamycin
   D. Erythromycin
   E. Vancomycin

   Answer:

Case 7

18-year-old high fever, extremely enlarged tonsils, dysphagia, neck pain, and drooling of saliva. He is speaking with a "hot potato" voice. There is swelling of the neck, and the uvula is deviated to one side.

1. Diagnosis?
   A. Epiglottitis
   B. Tonsillitis
   C. Mononucleosis
   D. Peritonsillar abscess

   Answer:

Case 8

40-year-old, healthy woman with pain in right ear with itching. She has tenderness on manipulation of the lobule. The tympanic membrane cannot be seen because of swelling of the canal. What do you recommend?

A. Otic steroids
B. Amoxicillin/clavulanic acid orally
C. Irrigation of the canal with saline
D. Otic solution of neomycin and topical steroids

Answer:

Case 9

25-year-old man comes with fever and worsening throat and neck pain of 2 days' duration. He has inflamed tonsils and exquisite tenderness and swelling along the left sternocleidomastoid muscle. WBC is 18,000; and the chest x-ray shows a pleural effusion. Diagnosis?

A. Diphtheria
B. Epiglottitis
C. Streptococcal pharyngitis
D. Septic thrombophlebitis of the internal jugular vein

Answer:

Case 10

A patient had nasal packing several days ago for severe epistaxis. You are called for:

- BP 84/50, Pulse 126, 102F
- Confusion
- Elevated Creatinine
- Low calcium, low sodium

There is a diffuse red rash "like a sunburn" and desquamation

What is the treatment?

A. Piperacillin/Tazobactam
B. Clindamycin and Vancomycin
C. Ampicillin and gentamicin
D. Oxacillin

Answer:

Which of the following is the LEAST common cause of toxic shock syndrome?

A. Tampons
B. Skilled nursing facility wearing diapers
C. Nasal packing
D. Sutures in wound

Answer:

Case 11

Which of the following is a first line indication for amphotericin?

A. Candidemia in neutropenic cancer patient
B. Pulmonary aspergillosis after bone marrow transplantation
C. Mucormycosis with black necrosis in an uncontrolled diabetic

Answer:

PNEUMONIA

Case 1

62-year-old man comes to the ED because of fever, cough, and sputum. Sputum is yellowish and thick. Uses no medications. His temperature is 38.8°C (102°F) and respiratory rate is 28. Lung exam reveals rales at the right base.

1. What would you do first?

   Obtain pulse oximetry and blood gas or give oxygen

2. What test first?

   Chest x-ray is always first to evaluate respiratory infections

3. Most accurate diagnostic test?

   Sputum Gram stain and culture

4. What criteria will you use to determine when your answer is admission to the hospital?

5. What is the most appropriate therapy?

   Empiric therapy of community-acquired pneumonia

Outpatient (Nonhospitalized)	Inpatient (Hospitalized)
First choice: All as a single agent. Macrolides: azithromycin, clarithromycin **Alternative:** Doxycycline	**First choice:** Second- or third-generation cephalosporins: ceftriaxone, cefotaxime, cefuroxime **Combined** with either: Doxycycline or a macrolide
Or, for patients with a history of cardiopulmonary disease: New fluoroquinolones, levofloxacin, gemifloxacin, moxifloxacin	**Alternative:** New fluoroquinolones alone, levofloxacin, gemifloxacin, moxifloxacin
	Or, for immunocompromised or critically ill patients: Beta-lactam/Beta-lactamase combination (ticarcillin/clavulanate; piperacillin/tazobactam); **Or:** Carbapenems **Or:** Ceftazidime, cefepime **Combined** with either: A macrolide or a fluoroquinolone

6. Who receives the pneumococcal vaccine?

   People over age 65; people with chronic disease such as diabetes, cirrhosis, COPD, or CHF; asplenic patients; people with hematologic malignancies; steroid users; people with renal failure; HIV-positive people; organ transplant recipients; and those on immunosuppressive medications

7. Who should be re-vaccinated after 5 years?

8. Who should receive more than one re-vaccination?

Summary: Case 1

Pneumonia is the most common infectious cause of death in the United States and therefore is guaranteed to be found on the Board exam. The first question is to determine which patients should be admitted to the hospital. The most important criteria are the presence of hypoxia, hypotension, tachycardia, tachypnea, altered mental status, hyponatremia, and an elevated BUN. The older and sicker a patient is, the more likely your answer should be to admit the patient. Underlying comorbid conditions are important criteria as well, such as cancer or heart, liver, or kidney disease. Although the best initial test for any respiratory infection is a chest x-ray, this is not actually one of the criteria for admission. Even if just one lobe is involved, a patient who is hypoxic and hypotensive should be admitted. Even if several lobes are involved, a patient who does not have the serious conditions described above does not need to be admitted.

Case 2

Man admitted for elective abdominal surgery and receives perioperative cefoxitin. He develops a severe pneumonia on the seventh hospital day, requiring intubation and mechanical ventilation.

1. Most likely organisms?
   A. Gram-negative rods
   B. Gram-positive cocci
   C. Mixed anaerobic flora
   D. *Candida*

   Answer:

Case 3

A patient is admitted with gram-negative sepsis and abdominal pain. He is placed on imipenem. Creatinine elevated at 2.5 mg/dL. He has his first seizure.

1. Most likely cause of his seizure?
   A. Hypocalcemia
   B. Hypomagnesemia
   C. Meningitis
   D. Imipenem toxicity
   E. Uremia

   Answer:

Summary: Case 3

Hospital-acquired pneumonia is most often from gram-negative bacilli. This is particularly true for those who develop their pneumonia while intubated and on mechanical ventilation in an intensive care unit. The best drugs for pneumonia that develops in this setting are carbapenems (imipenem, meropenem), piperacillin-tazobactam, and third- or fourth-generation cephalosporins such as ceftazidime or cefepime.

Case 4

47-year-old Australian farmer comes with several days of fever, cough, and chest soreness. Cough is dry, and his chest hurts worse with inspiration. He has been having some soft stools and headaches. He is healthy and on no medications. He is occasionally intimate with the animals. Besides fever and a respiratory rate of 20, his physical examination is normal. Chest x-ray shows bilateral interstitial infiltrates.

If THIS is in the history and physical . . .	**. . . Then THIS is the most likely diagnosis**	**Answer THIS as the best initial and most specific tests**	**Answer THIS as the best initial therapy**
HIV CD4 <200, no prophylaxis	Pneumocystis	LDH Bronchoscopy	TMP/SMZ,* pentamidine, steroids if pO_2 <70 or A-a gradient is >35
Young, healthy, anemia, hemolysis	Mycoplasma		
	Legionella		
	Coxiella burnetii (Q fever)		
Very little, hoarseness, laryngitis	*Chlamydia pneumoniae*	Specific serology	Macrolides, quinolones Alternative: Doxycycline

*Trimethoprim-sulfamethoxazole

Summary: Case 4

The point of this case is to show that the presentation of dry cough, nondiagnostic sputum Gram stain, fever, and shortness of breath alone is too nonspecific to allow for a specific diagnosis. You are dependent upon other words in the history, such as "HIV with <200 CD4 cells," to answer PCP as the most likely diagnosis. Although the LDH can be elevated in any cause of pneumonia, an elevated LDH is particularly associated with PCP on board questions. The same is true of hyponatremia and *Legionella* pneumonia. Although any form of pneumonia can give you syndrome of inappropriate antidiuretic hormone secretion (SIADH), hyponatremia is especially associated with *Legionella* in board questions. *Legionella* is most accurately diagnosed by sputum culture on specialized charcoal yeast extract agar. The best initial test for *Legionella* is a urinary antigen, which is 99% sensitive and specific for *Legionella*. Most of the "atypical" pneumonias, such as *Legionella*, *Mycoplasma*, and *Chlamydia*, are best treated with a macrolide or a new fluoroquinolone such as levofloxacin, gatifloxacin, and moxifloxacin. Although hoarseness is suggestive of *Chlamydia* pneumonia, there are very few specific associations with this organism to allow an answer to "the most likely diagnosis" question until the serologic test for *Chlamydia* is obtained. If you do not see animal exposure in the history, there is no reason to answer *Coxiella burnetii* as the most likely diagnosis. *Coxiella* can be effectively treated with doxycycline or a macrolide.

1. Aerosolized transmission is most common in which of the following?

   A. Rickettsia typhi
   B. Rickettsia prowazekii
   C. Coxiella burnetti
   D. Brucellosis

   Answer:

2. Veterinarian comes with a papule on his hand. He has muscle pains and conjunctival suffusion and his neck is stiff and he is confused. He has thrombocytopenia, and elevations of CPK, AST, ALT and his creatinine. Most likely diagnosis?

   A. Coxiella burnetti
   B. Tularemia
   C. Ehrlichia
   D. Leptospirosis
   E. Trichinosis

   Answer:

Case 5

Construction worker has recently returned to New York after a job in Arizona for the last month. Fever, dry cough, and joint pains, which have started to improve. Erythema nodosum lesions on legs. The chest x-ray shows scattered nodular infiltrates.

1. Diagnosis?

2. Diagnostic test?

   Serology with complement fixation titers

3. Therapy?

Summary: Case 5

"Desert rheumatism" is the term applied to Coccidioidomycosis. The organism starts as a nonspecific respiratory infection and is clinically indistinguishable from viral pneumonia. When you see the word "Arizona" in the history, you should suspect coccidioidomycosis. This organism is frequently associated with joint pain and erythema nodosum. Do not answer "fungal culture" as the best method of establishing a diagnosis. Serology with complement fixation titers is the answer to "most accurate diagnostic test." No treatment is necessary for mild respiratory symptoms. Disseminated disease is best treated with amphotericin.

1. Most common bacteria that causes lung infection in 75 year old patient after viral infection?

   A. Streptococcus pneumonia
   B. Pseudomonas
   C. Legionella
   D. Staphylococcus

   Answer:

TUBERCULOSIS

Case 1

42-year-old man emigrated from Russia and was recently released from prison has been experiencing cough, fever, and weight loss. He is an HIV-positive health care worker who used intravenous drugs and was homeless. Chest x-ray is abnormal for an apical infiltrate.

1. What would you do next?

   Sputum AFB stain and culture; respiratory isolation; never PPD first in acutely symptomatic patients

2. Initial therapy, and for how long?

3. What if the patient were a pregnant female?

4. What if he had a CD4 <500 and needed antiretroviral medications?

5. When do you treat for longer than 6 months?

6. When do you use steroids to treat tuberculosis?

   A. Pericardial and CNS
   B. Bone and CNS
   C. Pleural
   D. CNS
   E. Gastrointestinal

   Answer:

Summary: Case 1

Tuberculosis is best tested for initially with a sputum stain for acid-fast bacilli (AFB). Do not answer "a PPD" as the best initial test on any acutely symptomatic patient. Six months is the standard length of therapy. This is true if the patient has extrapulmonary TB as well, as long as the organism does not involve the bone (osteomyelitis) or brain (meningitis), occurs during pregnancy, or is military. Four drugs are used in the first 2 months, then isoniazid (INH)

and rifampin are used for another 4 months, making treatment a total of 6 months. In HIV-positive patients who must be treated immediately for their HIV, you cannot use rifampin. Instead, substitute rifabutin for rifampin and use either the protease inhibitors nelfinavir or indinavir or the non-nucleoside efavirenz.

1. Vietnamese man comes to the public health clinic for newly diagnosed tuberculosis (TB). He was started on 4 tuberculosis medications exactly 4 weeks ago. His organism is sensitive to all 4 TB medications. What do you recommend?

   A. Isoniazid and rifampin for a total of 6 months, pyrazinamide for another month, and stop the ethambutol now
   B. Isoniazid, rifampin, and pyrazinamide for 5 more months and stop the ethambutol now
   C. Continue all 4 drugs for 6 total months of therapy
   D. Isoniazid and rifampin for a total of 6 months and stop both the pyrazinamide and ethambutol now

   Answer:

Case 2

23-year-old medical student is admitted with a pleural effusion and a PPD that is positive at 14 mm.

1. What is the single most accurate test?

   A. Pleural biopsy
   B. Pleural fluid acid fast stain
   C. Sputum acid fast stain
   D. Adenosine deaminase level
   E. PCR of pleural fluid

   Answer:

Case 3

2% increase in the yearly rate of positive PPDs is noted at a place of employment. What is the reason?

A. New case of tuberculosis in the workplace.
B. Test has a booster effect.
C. Batch of PPD is defective.
D. Increased incidence of tuberculosis in the community.

Answer:

Case 4

1. *Mycobacterium marinum* is the answer for:

   A. Injury occurring in a pool
   B. After exposure to water in a fish tank
   C. Nosocomial sternal wound infection after coronary artery bypass
   D. All of the above

   Answer:

PPD TESTING

Case 1

1. Who should be tested, in general?

   A. Acute symptomatic patients
   B. General population
   C. High risk groups
   D. High risk groups if never vaccinated with BCG
   E. School children

   Answer:

2. What is a positive test?

   >5 mm
   >10 mm
   >15 mm

   Answer:

3. What is the "booster effect"?

4. What is treatment for a positive test?

   A. Isoniazid (INH) for 6 months
   B. INH for 9 months
   C. Rifampin for 6 months
   D. INH and rifampin for 6 months

   Answer:

5. What is the difference between interferon gamma release assays and the PPD?

6. What is the risk of developing TB with a positive test?

   A. 1% a year
   B. 10% a year
   C. 10% in a lifetime
   D. 90% in a lifetime

   Answer:

7. What is the effect of previous BCG vaccination on these recommendations?

8. Who should receive anergy testing?

   A. Steroid user
   B. AIDS patient
   C. Immigrant
   D. Bone marrow transplant recipient
   E. No one

   Answer:

All of the following patients are asymptomatic with NORMAL CHEST X-RAYS.

1. 27-year-old resident has 8 mm of induration. Last year's PPD was negative.

2. 34-year-old nurse, who has never been tested, has a PPD of 14 mm.

3. 20-year-old college student from Wyoming has a PPD of 14 mm.

4. 48-year-old, HIV-positive male inmate has 7 mm of induration.

5. 92-year-old nursing home resident had 3 mm of induration last year and has 14 mm this year.

6. You are a 24-year-old medical student who has 6 mm of induration. You have been taking care of a patient with active tuberculosis for the last 3 days.

7. An ancient Egyptian priest is 4,500-years-old and has recently been brought back to life in the Temple of Dendur at the Metropolitan Museum of Art. A BCG vaccine was given immediately before his mummification, and he was given a booster just before leaving Egypt last year. He has never been PPD tested before and now has 17 mm of induration.

Summary: Case 1

PPD testing is one of the most complex tests in all of medicine. The PPD is *not* a general screening test. PPDs should be performed only on populations at an increased risk of tuberculosis, such as immunocompromised patients (diabetes, chronic renal failure, silicosis, post-gastrectomy), recent immigrants, health care workers, close contacts of those with TB, and residents of homeless shelters, chronic care facilities, and prisons. If a patient with none of these risk factors is tested, then the test is not considered positive unless there is >15 mm of induration. The general cutoff for a positive test is 10 mm. Use a cutoff of 5 mm if the patient is a close contact of someone with TB, is on steroids, has an abnormal chest x-ray consistent with old TB, or is an organ transplant recipient. Anyone who has not been tested in the last 2 years should undergo two-stage testing to look for a "booster effect." This is to make sure that the first test is truly negative. There is no point in doing a second test if the first test is positive. Isoniazid for 9 months is the standard therapy for all PPD-positive patients. There is no effect to be taken into consideration if the patient has had previous BCG vaccination. There is no routine recommendation to perform anergy panel testing. If a patient has been exposed to drug-resistant TB, an attempt should be made to give a drug to which the patient's TB is not resistant. The interferon gamma release assay is more specific for TB than a PPD. It does not become falsely positive in those who have been vaccinated with BCG.

TROPICAL DISEASES AND ANIMAL-BOURNE ILLNESSES

Case 1

43-year-old Haitian woman has nonresolving pneumonia with cough. No improvement with azithromycin or moxifloxacin. CBC shows eosinophilia. What is the etiology?

A. *Chlamydia pneumoniae*
B. *Strongyloides*
C. *Paragonimus westermani*
D. *Cycloplasma*
E. Pneumocystis

Answer:

Case 2

50-year-old pig farmer from Arkansas has fever, muscle pain, and facial edema. He has hyperlipidemia and is on atorvastatin. He has periorbital edema, subconjunctival hemorrhages. CBC shows eosinophilia. He has high LDL and high CPK. Diagnosis?

A. Drug-induced
B. Polymyositis
C. Dermatomyositis
D. Trichinosis
E. Allergic reaction
F. Lymphoma

Answer:

Case 3

Rabbit hunter from Arkansas is admitted with conjunctivitis, adenopathy, myalgia, and arthralgia, and later develops pneumonia. Has an ulcer on his hand.

1. Diagnosis?

2. Diagnostic test?

Summary: Case 3

The rabbit hunter from Arkansas gives a classic presentation for tularemia. The organism passes through the skin in people who have contact with infected rodents and rabbits. The infected person will have conjunctivitis and an ulcer at the original site of the inoculation. In addition, later hematogenous spread brings the organism to the lungs. The test for the organism is serologic. This is because it is difficult to cultivate the organism in vitro as well as because it is a highly transmissible laboratory hazard.

Tropical Diseases and Animal-Bourne Illnesses Questions

1. After returning from a trip to Africa, a patient undergoes the development of abrupt fever, severe headache, chills, and severe pain in the back, legs, and bones. The white cell count and platelets drop with the development of a petechial rash. Most likely diagnosis?

   A. Dengue
   B. Malaria
   C. Lyme
   D. *Ehrlichia*

   Answer:

2. A patient without a spleen is bitten by an Ixodes tick and develops hemolysis. There is fever and shaking chills. The red cells show small ring forms. What is the most likely diagnosis?

   A. Malaria
   B. *Ehrlichia*
   C. *Babesia*
   D. Lyme
   E. *Coxiella burnetti*

   Answer:

   What is the treatment?

3. A man from Long Island, New York comes in with fever, chills, and headache. Platelet count and white count are low. Transaminases are high. He remembers being bitten by a tick. There are 'morulae' visible in the white cells. What is the most likely diagnosis?

   A. *Coxiella*
   B. *Babesia*
   C. Lyme
   D. *Ehrlichia/Anaplasma phagocytophila*

   Answer:

4. Mexican man on vacation from his job there as a butcher comes in with 2 weeks of chills, headache, enlarged lymph nodes, and tiredness. He has an enlarged spleen. What is the most likely diagnosis?

   A. Brucellosis
   B. Tularemia
   C. Plague
   D. Salmonella/typhoid
   E. Campylobacter

   Answer:

5. A young man is camping in Connecticut. He denies tick bite. He comes for facial palsy. He has clusters of vesicular eruptions over his external auditory canal. What is the diagnosis?

   A. Lyme
   B. Ehrlichia
   C. Babesia
   D. Varicella

   Answer:

6. Patient with splenectomy for ITP gets scratched/injured by a pet dog. The following day he is hypotensive. What is the organism?

   A. Streptococcus
   B. Eikenella
   C. Pasteurella
   D. Capnocytophagia

   Answer:

7. Cat bites give you:

8. HIV patient with increased AST/ALT.

   CT: liver with cystic spaces filled with blood (peliosis hepatis).

   Nodular lesions on extremities. Biopsy: silver stain/Warthin-Starry positive

   What is the diagnosis?

   What is the organism?

9. Homeless man, living in shelters and on street. Itching. Flea bitten. Has endocarditis What organism?

10. A man has been inhaling white spores derived from a dead deer found on a highway. He becomes short of breath. The chest x-ray shows a widened mediastinum. Skin shows ulceration with dark, black eschar. What is the diagnosis? What is the therapy?

    A. Cipro or Doxycycline
    B. Cefazolin
    C. Amphotericin
    D. Pentamidine

    Answer:

11. Itchy folliculitis in a person recently using hot tub/Jacuzzi ("Hot tub rash") What is the organism?

FOOD POISONING/INFECTIOUS DIARRHEA

Case 1

At 8:30 A.M. today 28-year-old medical resident had breakfast consisting of eggs, juice, and a chicken burrito. Last night she had hamburgers at Jack in the Box. At 12:10 P.M. today she begins to have explosive, bloody, diarrheal bowel movements. She has 3 watery stools before she is able to make it to the bathroom. She has a fever of 38.8°C (102°F) and crampy abdominal pain with flatus and bloating. She works in a daycare center at the Fulton Fish Market.

1. Most likely organism?

2. What test first?

   A. Stool culture
   B. Fecal leukocytes
   C. Gram stain
   D. Ova and parasite exam
   E. Sigmoidoscopy

   Answer:

3. Most accurate test?

   A. Stool culture
   B. Fecal leukocytes
   C. Gram stain
   D. Ova and parasite exam
   E. Sigmoidoscopy

   Answer:

4. Best therapy?

If THIS is in the history and physical …	… Then THIS is the most likely diagnosis	Answer THIS as the most specific test	Answer THIS as the best initial therapy
Chinese food, fried rice			
Campers, hikers			
Nursery schools			
HIV-positive with <50 CD4 cells			
Seafood, shellfish, clams, mussels			
Liver disease, hemoglobinopathy			

5. What cause of food poisoning gives symptoms fastest?

Summary: Case 1

The most important feature in diagnosing a patient with food poisoning or infectious diarrhea is whether or not there is blood in the stool. Blood in the stool tells you that the case described is secondary to an invasive organism such as *Salmonella*, *Shigellosis*, *Yersinia*, *E. coli*, or *Campylobacter*. No matter what exposure there may be in the history, *Bacillus cereus*, *Staphylococcus*, viruses, Giardiasis, and cryptosporidium do not give blood in the stool. Crypotsporidia is detected with a modified acid-fast stain. *B. cereus* and *Staphylococcus* should present predominantly with vomiting. If blood is not described in the history, you can use occult blood or the presence of white cells in the stool to give the same information. Viruses and the other noninvasive forms of diarrhea do not present with white cells in the stool.

When a patient has an invasive diarrhea severe enough to warrant antibiotic therapy, ciprofloxacin is the best empiric therapy until a specific microbiologic agent can be identified. Your answer should be ciprofloxacin when the disease is very severe and bacteremia is possible. Clues to the presence of very severe disease are hypotension, blood in the stool, tachycardia, abdominal pain, and tenesmus. The most accurate test for giardia is a stool ELISA antigen. This is more accurate than an ova and parasite examination. The treatment for cryptosporidia is nitazoxanide.

1. Which indicate, the highest risk of transmission?

   A. Hepatitis B surface antigen and e-antibody
   B. Hepatitis B core antigen
   C. Hepatitis B IgM core antibody
   D. Hepatitis B surface antigen and e-antigen

   Answer:

2. 56-year-old alcoholic man has been walking along the beach in New Orleans. He has a history of liver disease and he develops cellulitis of the leg. Which of the following is most likely to be associated with this patient's problem?

   A. *Naegleria*
   B. *Vibrio parahaemolyticus*
   C. *Vibrio vulnificus*
   D. *Strep agalactiae*

   Answer:

Summary: Case 1

All forms of acute hepatitis have the same initial presentation. You cannot tell which organism the patient has when there is jaundice, elevated ALT, elevated bilirubin, dark urine, and light stool. The only way to distinguish the organism is by serology. There is no therapy for any form of acute hepatitis. Hepatitis C is seen almost exclusively in patients with chronic hepatitis. Fewer than 20% of patients with hepatitis C ever remember having the acute syndrome, which includes jaundice and the other symptoms just described. Chronic hepatitis C cannot be diagnosed with just the hepatitis C antibody test. You need a hepatitis C viral load by PCR, and especially a liver biopsy to assess disease activity.

Chronic hepatitis C is treated with a combination of interferon, ribavirin and either telaprevir or boceprevir. Ribavirin increases the response to interferon alone from 15% to almost 50% when it is used in combination. Chronic hepatitis B is treated only when there is a positive hepatitis B e antigen. Chronic hepatitis B is treated with either interferon, lamivudine, or adefovir.

POSTEXPOSURE PROPHYLAXIS

Case 1

1. 28-year-old physician gets stuck by a needle of a hepatitis B surface antigen–positive patient. The idiot is a board-certified idiot and has never been vaccinated for hepatitis B. What is risk of transmission, and what do you do? How would this answer change if the person getting stuck were pregnant?

   A. Vaccine
   B. Immunoglobulin
   C. Interferon
   D. Immunoglobulin and vaccination
   E. No treatment

   A. 0.3%
   B. 3–6%
   C. 10–30%

   Answer:

2. Intern gets stuck on same day by the needle of a hepatitis C antibody–positive patient who has extremely active disease and is dying of cirrhosis from his chronic hepatitis C. Risk of transmission? What do you do?

   A. Vaccine
   B. Immunoglobulin
   C. Interferon
   D. Immunoglobulin and vaccination
   E. No treatment

   A. 0.3%
   B. 3–6%
   C. 10–30%

   Answer:

3. 31-year-old resident gets stuck by a needle used on an HIV-positive patient with a high viral load and low CD4 count. What is the risk of transmission, and what do you do?

   A. 0.3%
   B. 3–6%
   C. 10–30%

   Answer:

4. A 32-year-old pregnant nurse has just given a bed-bath to a patient with varicella zoster (shingles). Over 3–4 dermatome. The nurse has never been vaccinated for varicella zoster. What do you do?

   A. Vaccine
   B. Immunoglobulin
   C. Interferon
   D. Immunoglobulin and vaccination
   E. No treatment

   Answer:

5. What type of isolation should this patient have been on?

   A. Droplet
   B. Contact
   C. Contact and respiratory

   Answer:

6. A 40-year-old gastroenterology attending physician is having sex in the great outdoors when he is bitten on the buttocks by a bat, a raccoon, and a skunk. What do you do?

   A. Vaccine
   B. Immunoglobulin
   C. Interferon
   D. Immunoglobulin and vaccination
   E. No treatment

   Answer:

7. Can rats transmit rabies?

8. 72-year-old woman outside working in her garden when she steps on a dirty rake. What do you do?

Summary: Case 1

In general, postexposure prophylaxis consists of giving disease-specific immunoglobulin, followed by vaccination later. This is only for those who have never been vaccinated. Immune globulin does absolutely nothing for the acute therapy of a disease that has already established itself; it is only preventive. You are considered to be protected from tetanus for up to 10 years if the wound you obtain is relatively clean, such as that occurring in a kitchen. If the case describes a soil- or dirt-contaminated wound, there is a far greater volume of spore delivery and the injured person is considered protected for only 5 years from the time of the last vaccination. If previous vaccination with tetanus has occurred, then you give only a booster injection.

1. Pregnant phlebotomist sustains needle-stick with needle positive for hepatitis B surface antigen. She completed her third injection for hepatitis B vaccine series. Currently, her hepatitis B surface antibody is not detected. What do you do?

   A. Do nothing secondary to the pregnancy
   B. Do nothing. She has already received the three vaccine injections.
   C. Immune globulin and a vaccine
   D. Hepatitis B vaccine booster

   Answer:

2. 48-year-old man has undergone splenectomy for persistent severe thrombocytopenia. What immunizations would you recommend?

   A. *Varicella*
   B. *Pneumococcus*
   C. *Varicella*, *Pneumococcus*, hepatitis B
   D. *Pneumococcus*, *Meningococcus*, *Haemophilus influenzae*
   E. *Pneumococcus* and influenza

   Answer:

MALARIA

Case 1

1. 28-year-old resident is planning a trip to India. What do you recommend as prophylaxis for malaria?

2. He forgets to take the medication you prescribed, and has a fever with a blood smear positive for malaria. Most effective therapy for him?

3. What malaria drug is avoided in heart block?

Summary: Case 2

The majority of the world's malaria is now resistant to chloroquine. Hence, the standard of care for most travelers is mefloquine. This therapy should start the week before travel and continue for 4 weeks after leaving the endemic area. There is a small but significant risk of neuropsychiatric manifestations, and therefore this drug should be used with caution in those with a history of seizures or psychiatric disorders. The treatment for malaria is with oral quinine and doxycycline in the majority of cases.

SEXUALLY TRANSMITTED DISEASES

Case 1

42-year-old man comes to clinic with several days of urinary urgency, burning, and frequency. He has a urethral discharge.

1. Diagnosis?

2. Best initial and most accurate diagnostic tests?

   Urethral swab or voided urine for PCR DNA genetic (nucleic acid amplification) testing is the most accurate test for gonorrhea and chlamydia.

3. Best initial therapy?

   One drug for chlamydia (azithromycin or doxycycline) and one drug for gonorrhea (ceftriaxone). All of these are given as a single dose except for the doxycycline, which is taken twice a day for a week.

4. How would your answers differ if patient were pregnant?

5. What will you test for if the patient continues to have recurrent *Neisseria* infections, particularly bacteremia?

Summary: Case 1

Both cystitis and urethritis can present with symptoms of dysuria such as frequency, burning, and urgency. Urethritis gives a urethral discharge, and cystitis doesn't. In addition, cystitis can give suprapubic tenderness, and urethritis doesn't. It is impossible to distinguish chlamydia from *Neisseria* by symptoms alone. The urethral swab for a gonorrhea culture and DNA gene probe are the most accurate diagnostic tests. Treatment is with one agent for the gonorrhea and one agent for the chlamydia. Ligase chain reaction testing on the urine is extremely sensitive and specific for chlamydia infection. Single-dose therapy with ceftriaxone or cefixime is used for the gonorrhea. Single-dose oral fluoroquinolones such as ciprofloxacin are no longer recommended, secondary to the development of resistance. Single-dose therapy with azithromycin has the same efficacy as a week of doxycycline. Patients with a deficiency of terminal complement are at risk of recurrent *Neisseria* infections.

1. 16-year-old girl for treatment of combined gonococcal and chlamydial cervicitis. She is not accompanied by her parents. What should you do?

   A. Do not treat unless her parents are notified
   B. Make a "good faith" effort to contact the parents; if you cannot find them, treat her anyway.
   C. Refuse to administer therapy unless she is physically accompanied by her parents.
   D. Treat her without parental consent, as if she were an adult

   Answer:

2. Young man with yellowish urethral discharge is found to have a Gram stain positive for multiple neutrophils with intracellular gram-negative diplococci. He is treated with ceftriaxone. He returns in 7 days and has persistence of the urethral discharge. What is the most likely cause?

   A. Resistant gonorrhea
   B. Re-infection with gonorrhea
   C. *Chlamydia trachomatis*
   D. *Ureaplasma urealyticum*

   Answer:

3. Man comes for follow-up of chlamydia treatment. He took a gram of azithromycin in your office a week ago. He has no symptoms. PCR of the urethra done today on the return visit is positive for chlamydia. What do you tell him?

   A. He must be retreated with azithromycin.
   B. He must be treated for a longer period of time with doxycycline.
   C. His girlfriend re-infected him.
   D. "Don't worry. Do nothing. You shouldn't have done the repeat test."
   E. It is punishment for his sins.

   Answer:

4. Which of the following it NOT an accurate method of diagnosis?

   A. Urine nucleic acid amplification test (NAAT) for urethritis in men
   B. Self administered swab for cervicitis in women
   C. Gram stain of urethral discharge in men
   D. Blood Chlamydia testing for PID in women

   Answer:

BACTERIAL VAGINOSIS AND TRICHOMONIASIS

Case 2

32-year-old woman comes to see you because of an uncomfortable vaginal discharge.

1. Best initial test?

   Wet mount and KOH preparation

What is the best test for this disorder?	You should answer THIS diagnosis…	…And THIS is the treatment	How would the treatment differ in pregnancy?
Clue cells	Bacterial vaginosis	Metronidazole or clindamycin	
Motile forms on wet mount	Trichomoniasis	Metronidazole	
Fungal hyphae on KOH	Fungal vaginitis	Any topical antifungal or oral fluconazole	

Summary: Case 2

It is very difficult to determine a specific organism from signs and symptoms of vaginal discharge alone. Bacterial vaginosis with an overgrowth of *Gardnerella* is the most likely to have a fishy odor, but 30% of patients have two infections. Never culture the vagina. A wet mount can identify clue cells for bacterial vaginosis and motile ciliated forms for Trichomoniasis. Fungal hyphae become visible on a potassium hydroxide (KOH) test in fungal vaginitis. Bacterial vaginosis is treated with metronidazole in general, or clindamycin in pregnancy. Metronidazole is safe in the first trimester of pregnancy. Local antifungal agents such as clotrimazole, miconazole, nystatin, butoconazole, and terconazole can be used in fungal vaginitis, including during pregnancy. There is no good alternative to metronidazole for trichomoniasis. It is okay to use metronidazole for *trichomonas* in pregnancy.

1. Which is most likely to be associated with a low vaginal pH?

   A. Bacterial vaginosis
   B. Trichomoniasis
   C. Fungal vaginitis

   Answer:

2. 19-year-old sexually active woman comes to clinic with mild vaginal discharge. No pain or itching. KOH and wet mount are normal. pH is 4.0. What do you do?

   A. Colposcopy
   B. Vaginal culture
   C. Prescribe metronidazole
   D. Prescribe fluconazole
   E. Observation

   Answer:

Case 3

32-year-old woman comes to your clinic. She has recurrent vaginal yeast infections and has been given topical antifungal treatment five times over the past year.

1. Best method of preventing further recurrences?

Summary

In patients with four or more recurrences of fungal vaginitis per year, consideration should be given to administering chronic suppressive therapy. The best option is to use oral fluconazole on a weekly basis.

Case 4

27-year-old sexually active woman comes with bilateral lower abdominal pain. Temperature of 38.8°C (102°F) orally and a WBC count of 17,000. She has cervical motion tenderness and adnexal tenderness.

1. Diagnosis?

   Pelvic inflammatory disease

2. Most accurate diagnostic test?

   A. Ultrasound
   B. CT scan
   C. Cervical culture
   D. HCG
   E. Laparoscopy

   Answer:

3. Best initial diagnostic test?

   A. Ultrasound
   B. HCG
   C. Cervical culture

   Answer:

4. How will you determine whether she has to be admitted?

5. Best therapy?

Outpatient Therapy	Inpatient Therapy
Ceftriaxone and doxycycline	Cefoxitin (or cefotetan) and doxycycline
Ofloxacin (or levofloxacin) and metronidazole	Penicillin-allergic clindamycin and gentamicin

Summary: Case 4

Any woman with lower abdominal pain, particularly when combined with adnexal tenderness, should be considered to have an ectopic pregnancy until it is excluded. Cervical motion tenderness can also occur when there is an ectopic pregnancy. This is why a urine pregnancy test is considered the "best initial step" in the management of the patient described in this case. Laparoscopy is the most accurate diagnostic test for pelvic inflammatory disease (PID), even though it is rarely necessary. As a matter of test-taking strategy, a question asking "what is the most accurate test?" is not the same thing as asking "what will you DO next?" Laparoscopy is performed in those who have numerous recurrences of PID, or those in whom the diagnosis is indeterminate. The presence of lower abdominal pain, tenderness, and cervical motion tenderness virtually assures a diagnosis of PID. These findings are even more important than finding a fever. The treatment of PID is similar to the treatment of urethritis in that you want to give one drug for gonorrhea and one drug for chlamydia. Severely penicillin-allergic patients should be treated with clindamycin and gentamicin.

1. A woman comes to the clinic for advice. Her sexual partner has just been treated for gonorrhea. She has no symptoms. What will you recommend?

   A. Cervical DNA probe for gonorrhea, and treat only if it is positive
   B. Ceftriaxone and azithromycin
   C. Ceftriaxone
   D. Azithromycin
   E. Doxycycline

   Answer:

Case 5

37-year old man comes to clinic with several days of a genital ulcer and inguinal adenopathy.

If THIS is in the history and physical…	…Then THIS is the most likely diagnosis	Answer THIS as the best initial and most specific tests	Answer THIS as the best initial therapy
Vesicles	Herpes simplex		
Soft and pain**ful** chancre			
Prominent, huge, **tender** lymph nodes; pain**less** lesion			
Firm and painless chancre	Syphilis		
Terrible looking like cancer	Granuloma inguinale		

Summary: Case 5

A genital ulcer with adenopathy is a relatively nonspecific presentation and could occur with any STD except gonorrhea. In real patients you often cannot determine a specific diagnosis, but on the Boards, if they want you to answer "which of the following is the most likely diagnosis?" they have to give you a clue. Syphilis is more often nontender and firm (or indurated). The Venereal Disease Research Laboratory test/rapid plasma reagin (VDRL/RPR) has only a 65–75% sensitivity in primary syphilis. The darkfield exam is more sensitive in early-stage disease. Chancroid is soft and painful. It is diagnosed with a smear looking for pleomorphic gram-negative bacilli, and most specifically confirmed with culture on media specific for *Haemophilus ducreyi*. The Tzanck preparation is relatively nonspecific, and the presence of multinucleated giant cells can be found in any form of herpes family virus infection. Viral culture for herpes simplex will grow in as little as 2 days. Acyclovir, famciclovir, and valacyclovir are all equally effective for both herpes simplex and herpes zoster. Because lymphogranuloma venereum is caused by *Chlamydia trachomatis*, it is diagnosed by serologic tests on the blood or on aspiration of the buboes. As with many forms of chlamydial and rickettsial disease, it is treated with doxycycline.

Granuloma inguinale is caused by *Klebsiella granulomatis.* The lesions can look like cancer. Dark staining "Donovan bodies" are seen on biopsy or crush prep of tissue. These lesions are usually painless. Treat with doxycycline, Azithromycin or TMP/SMZ.

1. A 25-year-old sexually active woman comes to the clinic with second episode of cervicitis found to be from chlamydia. She had a similar episode 2 months ago that was definitively identified as being secondary to chlamydia. She received treatment with azithromycin and ceftriaxone at the time, and symptoms resolved for several weeks. She has a single sexual partner. What is the most likely reason for her problem?

   A. Inadequate dose of the azithromycin
   B. Inadequate duration of therapy
   C. Occult promiscuity
   D. Her partner was not treated, and he re-infected her.
   E. HIV infection in the patient

   Answer:

2. A 33-year-old man presents with genital lesions for one week following an episode of unprotected sex. You find two small **non-tender** ulcers of 1 cm diameter on the penile shaft. There is bilateral **tender inguinal adenopathy**. Organism?

   A. Herpes simplex
   B. *Treponema pallidum*
   C. Chlamydia
   D. *Hemophilus ducreyi*

   Answer:

SYPHILIS

Case 6

32-year-old man in clinic for rash consistent with secondary syphilis. He receives intramuscular injection of benzathine penicillin. Four hours later he returns with fever, myalgias, and a headache.

1. Diagnosis?

2. What will you do?
   A. Just reassurance
   B. Aspirin
   C. Recheck VDRL and RPR
   D. Switch to doxycycline

   Answer:

Stage	Clinical Manifestations	Tests	Treatment (and if penicillin-allergic)
Primary syphilis	Chancre	Darkfield, VDRL/RPR, FTA-ABS	
Secondary syphilis	Skin lesions, rash, condylomata lata, mucous patches, alopecia (rarely hepatitis, meningitis, nephrotic syndrome)	VDRL/RPR, FTA-ABS	
Tertiary syphilis	Neurologic, aortitis	VDRL/RPR, FTA	

Note

Syphilis can cause elevated LFTs.

Summary: Case 6

Primary syphilis is characterized by ulcerative genital lesions and is treated with a single intramuscular dose of penicillin. Penicillin-allergic patients are treated with doxycycline. Secondary syphilis is characterized by various forms of skin lesions such as a rash, condylomata lata, mucous patches, and alopecia. The treatment is the same as that for primary syphilis. Tertiary syphilis is essentially only a neurological disease in the United States. Gummas and aortitis are quite rare. The treatment is with intravenous penicillin. The Jarisch-Herxheimer reaction is not dangerous and is managed with just aspirin as a mild anti-inflammatory agent.

Case 7

Panicked couple comes because of a positive RPR at a titer of 1:4 found on testing by the state prior to marriage. MHA-TP is negative.

1. What is your response?

   A. Treat them for syphilis
   B. Tell them they may have been exposed
   C. Repeat the test
   D. Do nothing and tell them to get married
   E. It is tertiary syphilis.

   Answer:

Summary: Case 7

Routine syphilis testing prior to marriage has been discontinued in many states because of a markedly decreased incidence of syphilis. Hence, with a very low pre-test probability of disease, the majority of positive VDRL and RPR tests are false-positives. False-positive tests generally occur with titers that are <1:8. The specific treponemal tests such as the MHA-TP and FTA-ABS are negative in these cases, excluding the disease.

1. Man comes to clinic with painless penile ulcer with heaped-up, indurated edges. There is inguinal adenopathy, which is painless and nontender. Serum RPR is nonreactive. Most likely etiology?

   A. Herpes
   B. Syphilis
   C. Chancroid
   D. Chlamydia
   E. Behçet syndrome

   Answer:

2. A man presents to the emergency department with **painful**, necrotic penile ulcers with **tender** lymph nodes. On Gram stain, you see gram-negative bacilli with a "boxcar-like" or "school-of-fish" appearance. Which is the most likely organism?

   A. Anthrax
   B. *Chlamydia trachomatis*
   C. *Haemophilus ducreyi*
   D. *Calymmatobacterium granulomatis*

   Answer:

3. Which of the following is the most sensitive test of CSF for Neurosyphilis?

   A. Protein
   B. WBC count
   C. VDRL
   D. RPR
   E. FTA

   Answer:

WARTS

Case 8

35-year-old woman comes to see you with warts on her vulva. The lesions are firm, nonvesicular, non–fluid filled, not pustular, and not tender.

1. Diagnostic test?

2. Treatment?
   - *Removal*
   - *Freeze, burn, cut, laser, shave, and melt with podofilox or trichloroacetic acid*
   - *Gradually remove with imiquimod*

Summary: Case 8

There are several different types of warts that are managed in basically the same way. The diagnosis does not need stains, cultures, biopsies, serology, or smears. The management is the same for molluscum contagiosum, common verrucous warts, and condylomata acuminata. You remove the superficial accumulation of keratinized epithelium by various mechanical methods.

Case 9

A 17-year-old boy with itchy lesions at his elbows and his hands. Short, thin trails or burrows are visible in the skin folds.

1. Diagnosis?

2. Test?

3. Therapy?

Summary: Case 9

Both scabies and crabs, or pediculosis, are treated with permethrin or lindane. You do not need to do a scraping to diagnose crabs, however, because the bugs are larger and are on the surface.

URINARY INFECTIONS

Case 1

27-year-old woman with 2 days of urinary frequency, urgency, and burning. Dipstick in the office shows 3+ leukocytes and positive nitrites.

1. What to do next?
   A. Repeat urinalysis
   B. Wait for culture results
   C. Renal ultrasound
   D. Trimethoprim/sulfamethoxazole (TMP/SMX) for 3 days
   E. TMP/SMX for 7 days

   Answer:

2. What would you differently if she had a fever and flank tenderness?

   Extend the length of therapy to 10–14 days with the same drugs

3. When will you give 7 days of therapy?

4. How does prostatitis change your management?

   Extend the length of therapy to 2 weeks for acute prostatitis

5. Which of the following should be treated for asymptomatic bacteriuria?
   A. Catheterized patients
   B. Elderly patients
   C. Pregnant patients
   D. Diabetics
   E. Incontinent patients

   Answer:

Summary: Case 1

Patients with recurrent urinary tract infections or more than three episodes a year of cystitis should be considered for chronic suppressive therapy with TMP/SMZ. A single tablet of TMP/SMZ can also be tried postcoitally. If a patient has clear symptoms of dysuria and white cells in the urine, a urine culture is not necessary for an uncomplicated cystitis and you should answer TMP/SMZ or ciprofloxacin as the "best next step in management."

The presence of pyelonephritis is determined primarily by the presence of flank pain and tenderness. The same organisms that cause cystitis also cause pyelonephritis, so the therapy just has to be lengthened—although there are additional choices of medications for gram-negative bacilli that can easily be given intravenously, such as ampicillin/gentamicin, third-generation cephalosporins, or aztreonam. All beta-lactam antibiotics are safe in pregnancy. These are the penicillins, cephalosporins, carbapenems, and aztreonam. Erythromycin and azithromycin are also safe for use in pregnancy, as is nitrofurantoin. Drugs that are dangerous in pregnancy are quinolones, doxycycline, and metronidazole in the first trimester.

1. 34-week-pregnant woman is seen in the office with cystitis with a pan-sensitive *E. coli*. Most appropriate management for her?

   A. Ciprofloxacin
   B. TMP/SMX
   C. Amoxicillin
   D. No treatment is necessary

   Answer:

2. Which of following is most likely to have *Staphylococcus saprophyticus*?

   A. Catheterized patients
   B. Young healthy, sexually active women
   C. Diabetics

   Answer:

3. For Uncomplicated Cystitis, which of these is **NOT** a good choice?

   A. Nitrofurantoin
   B. TMP/SMZ
   C. Fosfomycin
   D. Erythromycin

   Answer:

Case 2

78-year-old woman admitted to intensive care unit. Urine culture shows vancomycin-resistant enterococcus.

1. Which is the most appropriate precaution to take?

   A. Hand-washing by personnel
   B. Private room with contact isolation
   C. Private room with airborne isolation
   D. Semiprivate room with negative pressure

   Answer:

Case 3

You are asked to evaluate a 63-year-old woman who is planned for elective cholecystectomy. Urine sample grows yeast. She has no symptoms. Most appropriate management?

Note

Treat asymptomatic bacteruria with urologic procedures (cystoscopy).

A. Amphotericin bladder wash
B. Fluconazole orally
C. Cancel the surgery
D. Proceed with the surgery

Answer:

FOURNIER GANGRENE

Case 4

60-year-old diabetic man has recently undergone a vasectomy. He develops pain in his groin, with a lesion at the base of the penis. Crepitus is present?

1. What the therapy?

   A. Zosyn (piperacillin/tazobactam)
   B. Clindamycin
   C. Gentamicin
   D. Metronidazole
   E. Cefazolin

   Answer:

2. Patient comes with Fournier gangrene and his surgeon is out of state. What would you do?

   A. Topical and oral antibiotics
   B. Hospitalize for IV antibiotics and consult with another surgeon
   C. Hospitalize for observation
   D. Prescribe antibiotics and refer the patient to his surgeon when he returns from vacation

   Answer:

Summary: Case 4

Fournier gangrene is a mixed infection of the perineum that happens more often in diabetic men. It is a mix of streptococci, anaerobes, and gram-negative bacilli. Urgent surgical debridement is essential in addition to the use of antibiotics. Clindamycin does not cover aerobic gram-negative rods. Gentamicin will not cover streptococci or anaerobes. Metronidazole is predominantly for anaerobic gram-negative bacilli. Cefazolin will not cover anaerobes.

1. 24-year-old college student comes with acute right testicular pain. While on vacation in San Francisco, he had numerous sexual contacts. Right testicle is enlarged and very tender. Most likely organism involved?

   A. Enterobacter
   B. *Chlamydia*
   C. Ureaplasma urealyticum
   D. Mycoplasma hominis
   E. *E. coli*

   Answer:

Epididymitis: You will recognize the diagnosis of epididymitis when the case gives a chief complaint of "testicular pain." There will also be swelling and tenderness. There are two basic questions generally found on the Board exam: they ask for the causative organism and/or the treatment. In patients younger than 35 years of age the answers are, respectively, *Chlamydia*, and to give the same treatment that you would for urethritis—i.e., either ceftriaxone combined with either azithromycin, or doxycycline. Ofloxacin alone is an alternative to the combination. In patients over 35 the answers are *E. coli* as the most common organism, and either TMP/SMZ or ciprofloxacin as the treatment. If the question asks for the diagnosis, remember that testicular torsion does not give fever, and is very sudden. The pain of epididymitis is relieved by slightly elevating the testicle, however the testicle is riding high all the time with a torsion. In addition, the cremasteric reflex is always absent with torsion.

Case 5

You are treating Fournier gangrene and blood cultures grow enterococci. Which of these will NOT cover enterococci?

A. Ampicillin and Gentamicin
B. Vancomycin
C. Piperacillin/Tazobactam
D. Linezolid
E. Ceftriaxone

Answer:

Case 6

What it the BK virus most often associated with?

A. Pneumonia
B. Encephalitis
C. Overwhelming urge to eat hamburgers
D. Renal transplant rejection

Answer:

BONE AND JOINT INFECTIONS

Case 1

70-year-old man with a history of peripheral arterial disease and diabetes is admitted to the hospital with an ulceration on the distal tibia for last 5 days. He has pain and swelling of the lower extremity around the area of the ulcer. Afebrile. There is a small amount of necrotic material in the ulcer and a draining sinus tract with a small amount of purulent material coming out of the draining sinus. Tibia is red and tender.

1. What test(s) would you do first?

   A. X-ray
   B. CT scan
   C. MRI
   D. Swab the draining sinus tract for culture
   E. ESR
   F. Nuclear bone scan
   G. Biopsy

   Answer:

2. Most accurate test?

   A. Biopsy
   B. CT scan
   C. MRI
   D. Swab the draining sinus tract
   E. ESR
   F. Nuclear bone scan

   Answer:

3. Therapy?

4. When will your answer be ESR?

5. When will your answer be to culture the draining sinus tract?

Summary: Case 1

The majority of cases of osteomyelitis in adults spread from a contiguous infection of the skin, such as an ulceration in diabetic patients and in people with peripheral vascular disease. Culturing the ulcer is never sufficiently accurate to allow prolonged therapy to be guided by the results. The ulcers are often colonized, as are draining sinus tracts. Therapy should always be guided by a bone biopsy. Although *Staphylococcus aureus* is still the most common organism, you cannot tell if it is sensitive to oxacillin or nafcillin, or whether the patient needs therapy with vancomycin or linezolid for methicillin-resistant *Staphylococcus aureus* (MRSA). In addition, diabetics are predisposed to gram-negative bacilli such as *E. coli*. Gram-negative osteomyelitis can also be treated with oral ciprofloxacin, and you cannot tell what the patient has for sure until you have bone culture results.

Case 2

59-year-old Catholic nun is admitted to the hospital with swelling of her right knee for the last week. She has a temperature of 38.8°C (102°F). The knee is red, swollen, and tender, with decreased mobility.

1. What test(s) first?

   A. X-ray of joint
   B. Arthrocentesis
   C. MRI of joint
   D. Arthroscopy

   Answer:

2. Most accurate diagnostic test?

   A. Gram stain
   B. Crystal analysis
   C. Protein level
   D. Cell count
   E. Culture of synovial fluid
   F. Blood cultures

   Answer:

3. Best therapy?

4. How do you know when to culture multiple sites, such as the cervix, urethra, rectum, and throat, looking for disseminated gonorrhea?

   A. Sexual history
   B. HIV testing
   C. History of syphilis in the past
   D. Polyarticular involvement, rash, and tenosynovitis

   Answer:

Summary: Case 2

Septic arthritis from any cause presents with a swollen, tender, immobile, and warm joint with the presence of an effusion. In all cases, the arthrocentesis is the single most accurate test. The difficulty is in the diagnosis of disseminated gonorrhea. Although the arthrocentesis is still the single most accurate test, an elevated white cell count above 30,000 to 50,000 can be found in all causes of septic arthritis. When you combine culture of the throat, urethra, rectum, blood, and cervix for gonorrhea, you actually get a greater yield than for culture of the joint alone. The key is how to recognize the person with suspected disseminated gonorrhea who needs all of these cultures. Disseminated gonorrhea is more often associated with migratory polyarthralgias, a petechial rash, and inflammation of the tendon sheaths of the hands and feet (known as tenosynovitis). The treatment of disseminated gonorrhea is with ceftriaxone, which does not reliably cover staphylococcus. The most common organism in septic arthritis, when gonorrhea is not the causative organism, is *Staphylococcus.*

1. A landscaper, who is a part-time rose gardener, comes for evaluation of a skin lesion. She has a painless nodule on the wrist with an enlarged lymph node in her axilla. Most appropriate therapy?

   A. Saturated solution of potassium iodide
   B. Itraconazole
   C. Amphotericin
   D. Fluconazole
   E. Surgery

   Answer:

2. Your own cat at home has scratched you on the hand. Today you are developing swelling of the hand. What is the most likely organism?

   A. *Pasturella multocida*
   B. *Capnocytophagia canimorsus (DF2)*
   C. *Bartonella henselae*
   D. *Bartonella quintana*
   E. *Eikenella corrodens*

   Answer:

3. A 42-year-old man gets involved in a fistfight at a bar. He strikes several people in the mouth and sustains several lacerations to his hand. Which is the most appropriate antibiotic choice?

   A. Trimethoprim–sulfamethoxazole
   B. Amoxicillin
   C. Ciprofloxacin
   D. Doxycycline
   E. Cefadroxyl
   F. Amoxicillin/clavulanic acid

   Answer:

LYME DISEASE

Case 1

48-year-old man has recently been camping in woods of New England. Now comes to see you because of a 5-cm rash on his back. Lesion is oval in shape, with an erythematous border and a pale center. He denies a tick bite.

1. What would you do next?
   A. Reassurance
   B. Serology (Western blot and ELISA)
   C. PCR for *Borrelia burgdorferi*
   D. Oral doxycycline

   Answer:

Case 2

Man comes to visit his friends in Connecticut and finds a tick attached to his ankles. No symptoms. He just got off a plane from Los Angeles 2 hours before coming to see you.

1. What will you do?
   A. Reassurance
   B. Serology (Western blot and ELISA)
   C. PCR for *Borrelia burgdorferi*
   D. Oral doxycycline

   Answer:

2. How do you remove the tick, and should you send it for analysis?

Summary: Cases 1–2

The diagnosis of Lyme disease is based on the presence of clinical manifestations and is supported by a positive serologic test. When there is a characteristic erythema migrans rash—which should be at least 5 cm in diameter, red on the outside, and pale on the inside—then the diagnosis is sufficiently confirmed in order for you to answer doxycycline or amoxicillin as the best next step in management. In other words, a classic target rash is more important than a positive ELISA or Western blot. There is still no conclusive proof that there is efficacy in treating patients who have sustained an asymptomatic tick bite. No further therapy is required in the case of an asymptomatic tick bite. In addition, the tick must be attached for at least 24 hours in order to

transmit the disease Because the diagnosis of Lyme is based more on clinical manifestations than on a positive serologic test, there is no point in doing serology on an asymptomatic tick bite. Serology is useful when there are manifestations such as a seventh cranial-nerve palsy, meningitis, or joint pains that could have other etiologies. The rash, seventh cranial-nerve palsy, and joint pains are best treated with oral doxycycline or amoxicillin. More serious manifestations, such as meningitis, pericarditis, and heart block, should be treated with intravenous ceftriaxone.

Case 3

68-year-old man has a bilateral seventh cranial-nerve palsy. He denies a tick bite but does spend every weekend at a country house in Connecticut.

1. What will you do first?

2. With what will you treat the patient?

3. What treatment will be your answer if there is joint involvement as well?

Summary: Case 3

Tick-borne illnesses: The other tick-borne illnesses that are possible but less likely as a source of questions are Rocky Mountain spotted fever, Babesiosis, and Ehrlichia. Rocky Mountain spotted fever presents with fever, headache, and myalgias for 3–4 days before the onset of a petechial rash on the wrists and ankles that moves toward the trunk. It is diagnosed with serology and treated with doxycycline. Babesiosis and Ehrlichia are carried by the same *Ixodes* tick that carries Lyme disease and therefore have the same geographic distribution. Babesiosis occurs more frequently in the patient described as having had a splenectomy in the past. There is hemolysis like that in a patient with malaria, but milder, and the patient will be described as having been camping near Long Island or Massachusetts with no travel outside the United States. The diagnosis is made by finding characteristic ring forms in the red cell. Babesiosis is treated with quinine plus clindamycin or atovaquone plus azithromycin. Ehrlichia rarely causes a rash and does not produce hemolysis. Answer Ehrlichia if the question gives you a Long Island camper with low platelets and a low white count with elevated transaminases. Ehrlichia is diagnosed by seeing inclusions in white cells on a smear, and is confirmed by serology. Ehrlichia is treated with doxycycline.

Case 4

A 24-year-old medical student is walking the halls with an IV in her arm. "What's it for?" you ask. "Six weeks of IV ceftriaxone. I finished four weeks already. I took three months of Doxycycline earlier this year for chronic lyme disease but I still have joint pain"

1. What do you tell her?

   A. Continue ceftriaxone
   B. Go back to oral doxycycline
   C. Stop antibiotics

   Answer:

FEVER AND NEUTROPENIA

Case 1

47-year-old woman is admitted to the hospital after having recently undergone combination chemotherapy for lymphoma. Her temperature is 38°C (100.3°F) repeatedly, and the absolute neutrophil count is <500.

1. Which of the following is **NOT** appropriate for initial therapy for this patient?

   A. Ceftriaxone
   B. Cefepime
   C. Imipenem
   D. Piperacillin/tazobactam and gentamicin
   E. Meropenem

   Answer:

2. What do you do if she is still febrile after 3 days?

3. 55-year-old man is admitted for fever and chills after chemotherapy for lymphoma. He was placed on cefepime and had vancomycin added after three days of persistent fever. Now, several days later, he is still febrile. What should you change in therapy?

   A. Add gentamicin
   B. Switch both antibiotics to meropenem
   C. Add caspofungin
   D. Add metronidazole
   E. Add amphotericin

   Answer:

Case 2

A 58-year-old man with neutropenia and persistent fever despite the use of cefepime has been started on vancomycin. He develops flushing and generalized pruritus.

1. What is your next step in management?

   A. Stop the vancomycin
   B. Switch the vancomycin to nafcillin
   C. Add hydrocortisone
   D. Measure urine for 24-hour 5-HIAA
   E. Slow the rate of infusion of vancomycin

   Answer:

2. A 50-year-old man is transferred to the intensive care unit for fever and hypotension. He has new infiltrates on chest x-ray. His central line is changed over a guidewire. He markedly improves on ceftriaxone and azithromycin; and the sputum grows pneumococcus. Blood culture shows no growth. The catheter tip culture grows coagulase negative staphylococcus. What is the best management?

   A. Continue the same antibiotics and retain the catheter
   B. Same antibiotics but place a new central line at a new site
   C. Add vancomycin
   D. Add vancomycin and place a new central line.

   Answer:

3. A patient had chemotherapy leading to profound neutropenia. **As the cell count rises** and recovers, he develops new fevers. Abdominal CT shows **new nodules in the liver.** Chest x-ray is normal. What is the diagnosis?

   A. Nocardia
   B. Aspergillus
   C. Hepatosplenic candidiasis

   Answer:

4. Which of the following is the best therapy for pulmonary aspergillus with a Halo sign?

   A. Amphotericin
   B. Itraconazole
   C. Voriconazoles
   C. Fluconazole

   Answer:

Summary: Cases 1–2

Any patient with an absolute neutrophil count <500 and a temperature above 100.3°F (38°C) should have blood cultures drawn and be started on antibiotics. Appropriate choices include cefepime, ceftazidime, imipenem, or meropenem as single agents, or a combination of ticarcillin/clavulanate and an aminoglycoside in combination. Vancomycin does not need to be automatically included with the initial therapy unless there is mucositis, hypotension, a definite catheter-related infection, or a clear infection with methicillin-resistant *Staphylococcus aureus*. The simple presence of an intravenous central line is not the same thing as saying there is a definite catheter infection. If the patient is still febrile after 3 days, you should then add vancomycin. If vancomycin was already part of the original treatment and the fever persists, then you should start antifungal coverage with amphotericin. Voriconazole can be used as an alternative to amphotericin, but amphotericin still has the best evidence for mortality benefit. The only reason to use a liposomal formulation of amphotericin is if renal insufficiency is present.

Chronic granulomatous disease (CGD): CGD is a hereditary disorder of a defect in the ability to fight off catalase-positive organisms. You will recognize the case because a patient with a normal white cell count will have recurrent infections with *Staphylococcus*, *Pseudomonas*, and *Aspergillus*. The case will show extensive inflammation of the lymph nodes, to the point of suppuration.

Look for recurrent lymphadenitis. It is like a patient who has neutropenia and fever, but the white count is normal and there are big lymph nodes. The granulomas can even obstruct the gastrointestinal tract or urinary system. The diagnostic test is the nitroblue tetrazolium dye test. In addition to treating acute infections, chronic therapy is with chronic TMP/SMZ and interferon. Steroids are sometimes used for gastrointestinal or urinary tract obstruction.

Case 3

18-year-old man comes with recurrent episodes of fever and multiple skin abscesses requiring antibiotics. He has a history of episodes of cervical lymph node enlargement that has worsened to the point of suppuration and drainage since childhood. They have grown staphylococcus and pseudomonas. Normal white cell count. Brother has a similar problem. Most appropriate test for this patient?

A. Serum protein electrophoresis
B. Complement levels
C. HIV testing
D. Skin testing for T cell function
E. Nitroblue tetrazolium testing

Answer:

Summary: Case 3

Toxic shock syndrome (TSS): Originally, most TSS cases were associated with the use of superabsorbent menstrual tampons, which subsequently have been removed from the market. Currently, the most common causes are from infection of surgically placed material, such as sutures, breast implants, or surgical mesh, or from nasal packing. There is no specific diagnostic test for TSS. You must recognize the clinical presentation and the potential for colonized or infected foreign material. Patients present with hypotension, tachycardia, fever, confusion, and a diffuse rash described as a "sunburn." The rash occurs from the staphylococcal- or streptococcal-mediated toxin and is followed by sloughing of the skin. In addition, the toxin affects most organs in the body diffusely and there is elevation of the BUN, creatinine, and transaminases. Treatment consists of fluid resuscitation; antistaphylococcal and antistreptococcal antibiotics such as oxacillin, nafcillin, or cefazolin; and removal of the infected material that is producing the toxin.

Case 4

Which of the following is **NOT** true about pseudomonas?

A. Causes malignant otitis externa
B. Endocarditis in injection drug users
C. Sepsis in neutropenia
D. Treated with ertapenem or ampicillin/sulbactam
E. Hot tub folliculitis
F. Causes ecthyma gangrenosum

Answer:

CATHETER INFECTIONS, BACTEREMIA AND INFECTION CONTROL

Case 1

You have a patient with ESRD transferred from the dialysis center because of a temperature of 103F. There is no clear source. The patient is being dialysed through a temporary large lumen catheter that is tunneled. The tunnel is not red, warm or tender. Chest x-ray and urinalysis are normal.

What is the next step?

A. Obtain blood culture and treat based on result
B. Draw cultures through catheter and peripherally and start Vancomycin and gentamicin
C. Echocardiogram
D. Oxacillin

Answer:

What is the route of antibiotics in a patient such as this?

A. Peripheral line
B. Current central line
C. Both peripheral and central line

Answer:

Two days later the cultures are confirmed as growing MRSA. Gentamicin is stopped. This is the third episode this year. After five days of therapy, MRSA is still growing. The MIC to Vancomycin is >4.

What to do?

A. Increase dose of Vancomycin
B. Switch to linezolid
C. Add gentamicin back
D. Switch to tigecycline

Answer:

Case 2

What is the best way to prevent hospital infection?

A. Handwashing
B. Respiratory isolation
C. Reverse Isolation

Answer:

What is the best way to prevent hospital acquired pneumonia?

A. Rotate antibiotics
B. Stop proton pump inhibitors
C. Elevate head of bed 45 degrees

Answer:

What is the best therapy for *Stenotrophomonas maltophilia?*

A. TMP/SMZ
B. Cefazolin
C. Vancomycin
D. Voriconazole

Answer:

1. 34-year-old man was admitted for *Pneumocystis* pneumonia 4 days ago and was placed on TMP/SMZ, prednisone, efavirenz, lamivudine, and didanosine. He develops a rapidly dropping white cell count. What is the most appropriate management?

   A. Switch the TMP/SMZ to pentamidine
   B. Bone marrow biopsy
   C. Increase the prednisone dose
   D. Stop the efavirenz
   E. Stop the didanosine

   Answer:

2. A 47-year-old man is admitted for PCP and is placed on TMP/SMZ. He develops a high BUN and hyperkalemia. What is your next step?

   A. Change to pentamidine
   B. Decrease the dose of TMP/SMZ and give saline
   C. Stop the TMP/SMZ
   D. Stop the TMP/SMZ and hydrate with saline

   Answer:

3. Which of these is most likely a true pathogen on Bronchoalveolar lavage in HIV?

   A. Candida
   B. Herpes
   C. CMV
   D. Nocardia

   Answer:

4. What is the treatment?

5. Besides the lung, what other organ is most likely to be involved?

   A. CNS
   B. Skin
   C. Kidney

   Answer:

Any patient with HIV and <200 CD4 cells should be on prophylaxis for *Pneumocystis* pneumonia (PCP) with TMP/SMZ. If the patient is allergic to TMP/SMZ, then oral dapsone or atovaquone should be used. Aerosolized pentamidine has the worst efficacy with the greatest number of adverse effects. For active therapy in a sulfa-allergic person, intravenous pentamidine should be used. If the patient is severely hypoxic (pO_2 <70, or A–a gradient >35), then oral prednisone should be given for 3 weeks in addition to the TMP/SMZ. Prednisone will reduce mortality with severe PCP.

Case 1

48-year-old woman with AIDS seen because of blurry vision. She had 35 CD4 cells and a viral load of 418,000 several months ago and was prescribed zidovudine, didanosine, and indinavir 3 times a day. Whenever you ask, she always says she is taking her medications.

1. Diagnosis?

2. What would you do next?
   A. Dilated ophthalmologic exam
   B. Head CT
   C. Serum CMV antibody test
   D. Serum PCR for CMV

   Answer:

3. Therapy?

4. Most likely complications of therapy?

5. Is there routine prophylaxis? If so, what?

Summary: Case 1

Abnormal vision of any kind in an HIV-positive person with <50 CD4 cells should raise the suspicion of cytomegalovirus (CMV) retinitis. The diagnosis is confirmed with a dilated ophthalmologic examination. Serology is useless because 50% of the general population is always seropositive for CMV. Treatment for CMV is with intravenous ganciclovir or foscarnet. This is followed later with an intravitreal implant of ganciclovir and oral valganciclovir. There is no recommendation for routine primary prophylaxis for CMV.

Case 2

Man who is HIV-positive several weeks of fevers to 39.4–40.0ºC (103.0–104.0ºF), fatigue, weight loss, and wasting. He has 23 CD4 cells. On no HIV medications since diagnosis was made several years ago. Liver and spleen are normal. Chest x-ray is normal. Hematocrit 30, MCV (mean corpuscular volume) of 85.

1. What is the diagnosis?

2. What would you expect to find on liver function tests?

   Elevated alkaline phosphatase and gamma glutamyl transpeptidase (GGTP) with a normal bilirubin

3. What is the best therapy?

4. Is there routine prophylaxis? If so, what?

Summary: Case 2

Disseminated *Mycobacterium avium intracellulare* (MAI) presents as a cause of fever and wasting syndrome in HIV-positive persons with low CD4 cell counts. The least sensitive test, but the one that is easiest to obtain, is a blood culture for mycobacteria. The liver biopsy is the most accurate diagnostic test. Treatment for acute MAI is with clarithromycin and ethambutol.

1. A man with HIV has *Mycobacterium avium* complex (MAC/MAI) growing from his sputum. The chest x-ray is normal. What is the management?

   A. Rifabutin/ethambutol/clarithromycin
   B. Clarithromycin/ethambutol
   C. Azithromycin
   D. None of the above

   Answer:

Case 3

52-year-old man is brought to the emergency department because of a seizure. CT scan of the head reveals a 3-cm, contrast-enhancing lesion of the parietal area. There is minimal edema and no midline shift. He is HIV-positive but was refusing all HIV medications prior to the event.

1. Diagnosis?

2. Next step in management of this patient?

3. Most specific test?

4. Duration of therapy?

Summary: Case 3

Contrast, or "ring"-enhancing, lesions in the brain found with a CT scan are secondary to two main groups of diseases: cancers and infections. In patients with HIV and a CD4 count <50, contrast-enhancing lesions of the brain have a much more limited differential. As much as 90% of the time, it will be from either lymphoma or toxoplasmosis. The best way to confirm the diagnosis at first is to treat empirically with pyrimethamine and sulfadiazine and repeat the head CT in 2 weeks. If there is no change in the lesion, then you should perform a brain biopsy to confirm the diagnosis. In HIV-negative persons you are much more likely to do a brain biopsy at the beginning to guide therapy.

1. An HIV positive patient is asymptomatic with a CD4 count of 600. What infection is he at risk for?

   A. Pneumocystis pneumonia
   B. Cytomegalovirus
   C. Toxoplasmosis
   D. Tuberculosis
   E. Mycobacterium avium

   Answer:

Case 4

Nucleoside Reverse Transcriptase Inhibitors	**Adverse Effects**	**Non-Nucleoside Reverse Transcriptase Inhibitors**	**Adverse Effects**	**Protease Inhibitors**	**Adverse Effects**
Zidovudine		Efavirenz		Nelfinavir	
Lamivudine				Atazanavir	
Stavudine				Ritonavir	
Didanosine				Indinavir	
Abacavir				Saquinavir	
Tenofovir				Darunavir	
Emtricitabine				Amprenavir	
				Tipranavir	

1. When should antiretroviral medication be started?

2. What should be started?

Additional Cases

1. A 37-year-old woman comes to your office having recently been diagnosed as HIV-positive. She has been healthy, with no opportunistic infections. Her CD4 count is 395 and her viral load is 7,000 by PCR-RNA measurement. What is appropriate in her management?

2. A 23-year-old woman has been HIV-positive for several years and is asymptomatic. She is maintained on zidovudine, lamivudine, and darunavir. Her last CD4 was 385 and her last viral load was <20 (undetectable) 3 months ago. The total cholesterol was 295 and triglycerides were 425 at that time. A repeat measurement in your clinic now reveals a CD4 count of 392 and a viral load that is still undetectable. The lipid levels are essentially the same. What would you do for her?

3. During routine testing in her second month of pregnancy, a 19-year-old woman finds that she is HIV-positive. Her CD4 count is 42 and her PCR-RNA viral load is 271,000. What would you do for her?

OR

A 24-year-old, HIV-positive female has been on zidovudine, lamivudine, and nelfinavir for the last 6 months. Her CD4 has risen from 270 to 450, and the viral load has become undetectable. She has just learned that she is pregnant. Which of the following is the most appropriate management?

A. Stop the HIV medications until after the delivery
B. Stop the HIV medications except for zidovudine (AZT)
C. Stop all the medications except the protease inhibitors
D. Continue the same medications

Answer:

4. A 38-year-old woman who knew she was HIV-positive becomes pregnant and comes to see you for advice in her third month of pregnancy. She has never used antiretroviral medications before. Her CD4 is 859 and her viral load is 570. What is appropriate for her?

5. A 34-year-old man comes to see you for management of his antiretroviral medications. He was started on zidovudine, lamivudine, and efavirenz 4 months ago. There was initially a decrease in the viral load from 140,000 to 50,000, but now it has risen back to 120,000. How would you best manage this patient?

6. A 29-year-old medical resident gets stuck in the thumb with the needle he just used to test for a blood gas in an HIV-positive patient. What should you do next?

   A. Observe until the results of the resident's HIV test come back
   B. Zidovudine alone
   C. Immunoglobulin
   D. Zidovudine, lamivudine, nelfinavir

   Answer:

Summary: Case 5

The indication to start antiretroviral medications is a CD4 count <500. The primary reason to start therapy is not based on the viral load. The main idea is to keep the person's CD4 count above 200 cells so he will not be at risk of developing an opportunistic infection. The best initial combination is two nucleoside reverse transcriptase inhibitors and a protease inhibitor or efavirenz. The most common adverse effects of zidovudine (AZT) are bone marrow suppression and anemia. You cannot use rifampin in combination with protease inhibitors. If a patient who has tuberculosis requires medications to treat the HIV disease, then use rifabutin instead of rifampin. You should use either efavirenz or nelfinavir in combination with antituberculosis medications such as rifabutin. The most common adverse effects of the protease inhibitors are hyperglycemia and hyperlipidemia. Pregnant women who need the HIV medications for their own health should be continued or started on therapy as needed. The only one of the HIV medications that may be teratogenic is efavirenz. All patients with significant HIV needle-sticks should be given a combination of three antiretrovirals for a month without waiting for the results of the stuck person's HIV test.

Pregnant patients with viral load >1,000 on the day of delivery need a C-section.

1. In a patient who has just been started on antiretrovirals for HIV, which of the following is the first indication of treatment failure?

   A. Cough, fever, adenopathy
   B. Weight loss
   C. CD4 count
   D. HIV by PCR viral load

   Answer:

2. A 37-year-old woman with HIV and 395 CD4 cells comes in for routine evaluation. Which of the following cannot be given to this person?

   A. DPT vaccine
   B. MMR
   C. Hepatitis B
   D. Varicella
   E. Oral polio

   Answer:

3. A man with HIV and 20 CD4 cells has been started on TMP/SMZ, azithromycin, zidovudine, stavudine, and ritonavir/lopinavir. He is admitted for weakness and is found to have a serum bicarbonate of 12 and an elevated lactic acid level. Which of the following should you discontinue?

   A. Ritonavir
   B. Stavudine and zidovudine
   C. TMP/SMZ
   D. Azithromycin

   Answer:

4. 24-year-old, HIV-positive patient has a CD4 count of 25 with a negative VDRL and a 6mm positive PPD. What is the most appropriate therapy for him?

   A. Antiretroviral therapy and isoniazid
   B. Antiretroviral therapy and TMP-SMZ and azithromycin and isoniazid
   C. Antiretroviral therapy and TMP-SMZ
   D. Antiretroviral therapy and azithromycin

   Answer:

Statistics/ Preventive Medicine/Ethics

12

Test Discrimination

	Diseased	Disease-Free
Test Positive	A = TP	B = FP
Test Negative	C = FN	D = TN

TP = True Positive, FP = False Positive, FN = False Negative, TN = True Negative

UNDERSTANDING 2 × 2 THEORY

Boxes

A: Individuals who are diseased and positive

B: Individuals who are disease-free and positive

C: Individuals who are diseased and negative

D: Individuals who are disease-free and negative

A + C = Total number of diseased individuals

B + D = Total number of disease-free individuals

Sensitivity and Specificity

Sensitivity = A/(A + C) = proportion of diseased individuals labeled as positive by test (ability to detect when disease present) = true positive rate.

Specificity = D/(B + D) = proportion of the disease-free individuals labeled as negative by the test (ability to detect when disease not present) = true negative rate.

Positive Predictive Value (PPV): proportion of individuals with a positive test who have the disease = A/(A + B).

Negative Predictive Value (NPV): proportion of individuals with a negative test who do not have the disease = D/(C + D).

Case 1: Application of a New Test

Assume that a new test is applied to a population of 1,000 persons, 500 with and 500 without the disease . . . 50% prevalence! The results of the studies are that 400 patients with the disease were correctly identified as having the disease. Unfortunately, 50 healthy persons were inappropriately identified as having the disease when no disease was present.

What are the sensitivity, specificity, PPV, and NPV?

	Diseased	Disease-Free
Test Positive	400	50
Test Negative	100	450

Sensitivity = A/(A + C)
= 400/(400 + 100) = 400/500 = 80%

Specificity = D/(B + D)
= 450/(50 + 450) = 450/500 = 90%

PPV = A/(A + B)
= 400/(400 + 50) = 400/450 = 89%

NPV = D/(C + D)
= 450/(450 + 100) = 450/550 = 82%

Case 2: What If the Prevalence of Disease Is 10%?

Make the 2 × 2

Sensitivity = A/(A + C) = 80/(80 + 20) = 80/100 = 80%

Specificity = D/(B + D) = 810/(90 + 810) = 810/900 = 90%

PPV = A/(A + B) = 80/80 + 90 = 80/170 = 47%

NPV = D/(C + D) = 810/20 + 810 = 810/830 = 97%

Why are the sensitivity and specificity the same? Why did the PPV decrease?

Sensitivity and specificity are not affected by prevalence. However, the prevalence of disease affects the number of individuals who are falsely labeled as positive and falsely labeled as negative.

Note: The lower the prevalence of disease, the lower the positive predictive value (PPV).

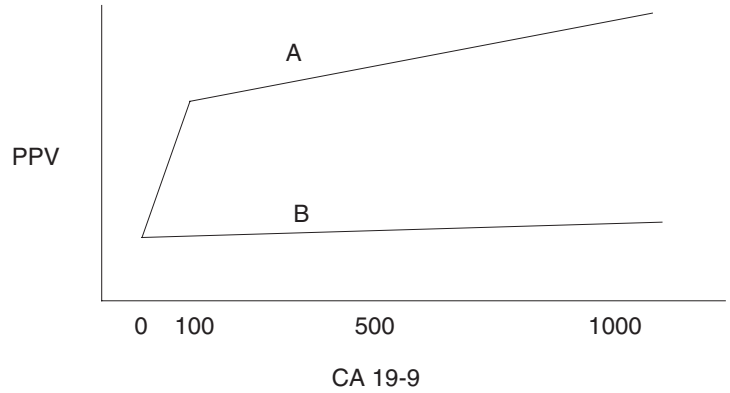
SCREENING TESTS AND BIAS

Case 3

A healthy, 22-year-old woman undergoes numerous laboratory tests for a physical exam. Accidentally, the nurse orders a CA 19-9. The level is over 700 (normal less than 50). The test is repeated and the level is confirmed. A CT is performed with fine cuts through the pancreas. The CT is normal.

Knowing the sensitivity and specificity for pancreatic cancer of this test to be over 80%, what is the best next step?

A. The test should be repeated annually
B. Reassure the patient that the test is not accurate in patients such as her
C. Submit a CEA level
D. MRI/MRCP



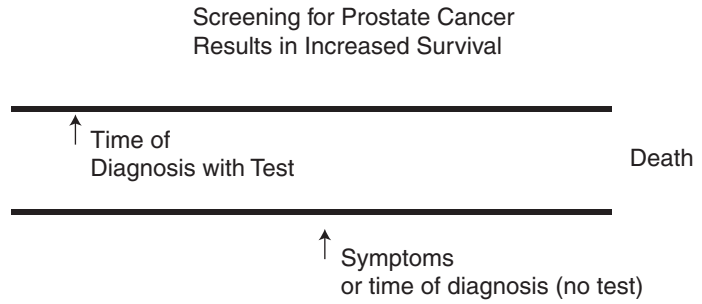
PPV CA19-9 Pancreatic Cancer

Case 4

The University Study Group performed a long-term study on the effect of prostate-specific antigen (PSA) in decreasing mortality from prostate cancer. Patients were randomized to two groups. The first group underwent PSA testing annually. The second group had no PSA screening. After 10 years, more people in the PSA screening group were found to have survived prostate cancer. The authors of the study concluded that PSA screening prolongs life due to early detection of prostate cancer.

The study's conclusions may be affected by

A. lead-time bias.
B. confounding variable.
C. length bias.
D. reporting error.
E. beta-error.



Lead Time Bias

Case 5

An Italian investigator shows that people who drink coffee are more likely to develop pancreatic cancer. He concludes that coffee consumption is associated with pancreatic cancer. Reviewing the manuscript, you notice that patients who consumed coffee also smoked more cigarettes.

The conclusion of the investigator may thus have been affected by

A. lead-time bias.
B. confounding variable.
C. length bias.
D. reporting error.
E. beta-error.

Case 6

An investigator claims that his study of 32 patients failed to show any benefit of using thrombolytics in treating patients with myocardial infarction ($p = 0.22$). The investigator submits his paper to an academic journal.

The journal editor refuses to accept the paper on the basis of which of the following?

A. Type I error
B. Type II error (beta-error)
C. Confounding variable
D. Lack of significance

Case 7

Which of the following is a true statement?

A. Type I error occurs when an investigator declares a benefit but there is none
B. In an intention-to-treat analysis, the investigators ignore noncompliance and use all patients in the final analysis
C. A study that uses statistics to combine many randomized trials is referred to as a meta-analysis
D. All of the above are true

Case 8

In a study to evaluate a drug, 200 patients are randomized equally to two arms; one receives the drug, the other a placebo. The mortality in the placebo group is 80%. Mortality is 60% in the drug treatment group.

How many patients need to be treated with the new drug to save one life (i.e., what is the number needed to treat)?

A. 10
B. 7
C. 5
D. Cannot be calculated

Case 9

What is the most accurate method of determining the prevalence of a disease in a geographic area?

A. Physicians' office records
B. Local incidence over the past month
C. Random selection of persons within a defined population
D. Hospital records

Explanation: Case 9

Sensitivity and specificity are defined by a specific test and refer to accuracy in relationship to a gold standard. The most important factor in interpreting an abnormal test result in a patient is the prevalence of the disease in the population being tested. Prevalence is the proportion of persons in the population who are affected by the disease. Thus, a positive test is more likely to be true if the disease is widespread than if the disease is rare. The positive and negative predictive values are thus a more important parameter for clinicians. The *p* value is a way of expressing the significance of a study. It measures the probability of the test result being due to chance. The null hypothesis implies that the results are by chance. The smaller the *p* value, the greater the likelihood that the results occurred as a "surprise"—not by chance. Confidence intervals are another method of determining whether the results occurred by chance. The numbers in the confidence interval represent the range that results could fall within to be by chance. A meta-analysis is defined as the quantitative analysis of two or more independent studies to integrate the findings and describe features of the studies that contribute to variation in their results. Odds ratios compare the affected population with the unaffected population; this comparison is expressed as a ratio. The odds ratio gives the odds of having a risk factor if the condition is present as compared with having a risk factor if the condition is not present.

ETHICS

Case 1

Colonoscopy reveals that a 78-year-old man is found to have colon cancer. His children insist that he will "die of a heart attack" if you tell him the diagnosis. They request that you tell their father nothing. They will arrange surgery.

You should:

Case 2

The HMO that you work for insists that only flexible sigmoidoscopy be recommended for colon-cancer screening. They insist that you not discuss other options with patients.

You should:

Case 3

A 44-year-old woman is in a car accident with her 9-year-old child. The family members are devout Jehovah's Witnesses. The woman and her child both need blood due to splenic ruptures, HCT 20 preoperatively. The mother and father refuse blood for both the mother and child.

You should:

Case 4

A 55-year-old man developed severe confusion while being treated for AML. His care decisions have been given to his wife via a "living will" document signed by the patient, his lawyer, and witnesses. Now, the patient is no longer confused. Due to excess blasts in the smear, a relapse is suspected. You want to give the man a trial of chemotherapy with a research protocol. His wife says no. She instructs you not to discuss the matter with her husband and claims that as his designated health care proxy, she has the authority to make that decision.

You should:

Questions

1. Which of the following has the highest priority in a patient's health care management?

   A. Physician of record
   B. Patient's spouse
   C. Durable power of attorney
   D. The hospital's Ethics Committee

2. A 94-year-old man, who is clearly alert and oriented, presents with lung cancer. The patient is realistic about his expectations of treatment. He has been living alone at home, caring for himself. His daughter comes to the hospital and has her father's health care proxy. The patient refuses to have chemotherapy and requests comfort care only. His daughter demands that he receive treatment. You should

   A. comply with the patient's requests without reservation.
   B. order a mental health evaluation for the patient.
   C. present the case to the hospital's Ethics Committee.
   D. review the proxy document.

3. A 71-year-old patient presents to the ER with respiratory failure. He is intubated and put on the respirator. He is unconscious and likely to die without mechanical ventilation. Later that evening, his family brings to you his advance directive, which clearly states that he never wanted to have life-sustaining interventions. What is the most appropriate next step?

   A. Take him off the ventilator
   B. Tell the family that it is too late for the living will
   C. Obtain an Ethics Committee consult
   D. Ask to speak to the lawyer who constructed the document

4. A 66-year-old man with small cell carcinoma of the lungs and severe COPD refuses intubation. He is dyspneic, and oxygen/nebulizers are unable to raise his saturation above 88%. What is the best course of action?

   A. Administer morphine
   B. Administer meperidine
   C. Ask family members for permission to use mechanical ventilation
   D. Pressure the patient for a trial of mechanical ventilation

5. A confused patient with severe spinal stenosis that requires surgery is brought to you by family members for evaluation. The patient's son has durable power of attorney. The son and other family members demand that the father be referred to a chiropractor. What should you do?

   A. Comply without reservation
   B. Refuse, because such a referral is futile
   C. Present the case to the hospital's Ethics Committee
   D. Review the proxy document

6. A 16-year-old girl comes to the office with a thick vaginal discharge. She admits to having unprotected sex. What is your next step?

   A. Contact her parents
   B. Examine and treat the patient without parental consent
   C. First establish the diagnosis, then discuss it with the parents
   D. Ask to speak to the family lawyer

7. A 72-year-old man has had two traffic accidents in the past month because he failed to stop at a red light and at a stop sign. He denies that the accidents were his fault. He has a mildly impaired mental status and a slow, broad-based gait. What is your next step?

   A. Refer him to an ophthalmologist for possible diagnosis
   B. Report the findings to the state's Department of Motor Vehicles
   C. Tell the patient to be more careful
   D. Neurology consult

8. A 94-year-old man has colon cancer. He requests that he receive no treatment. How will you know if he is capable of making that decision?

   A. If he can tell you what condition he has and the risks of not treating the tumor
   B. If he can recognize family members
   C. If he is alert and oriented to place and time
   D. If he has a living will

Summary: Case Studies 1–4

Autonomy requires that you, the physician, discuss all issues with the patient regardless of family wishes. A competent patient may tell you that she/he does not want that information; however, the decision belongs to the patient. Informed consent requires complete disclosure for the benefit of the patient (beneficence). Case 1 clearly requires discussion with the patient regardless of the family's concerns. Comforting the family about the extremely low risk of MI is recommended. Case 2 requires disclosure of all important information, including the best test available. Case 3 allows the mother to maintain her autonomy, but she does not control that of the child, who should receive blood. The child's fate should not be decided on the basis of a mother's religious beliefs when life-saving care is needed. Lastly, in Case 4, legal documents do not supersede informed consent and a patient's autonomy. The patient must be allowed to hear the options.

PREVENTATIVE MEDICINE

1. A 48-year-old woman with diabetes should be seen by an ophthalmologist

   A. at the time of diagnosis.
   B. 1 year after the diagnosis.
   C. 5 years after the diagnosis.
   D. when symptoms develop.
   E. when the primary care physician identifies retinal abnormalities.

2. A 58-year-old man after myocardial infarction with a history of diabetes mellitus, hypertension, hyperlipidemia, and a history of peptic ulcer disease complicated by a massive upper GI bleed should

   A. take aspirin daily.
   B. take only enteric coated aspirin.
   C. take only buffered aspirin.
   D. take aspirin with lansoprazole.
   E. never take aspirin, clopidogrel, or warfarin.

3. A 50-year-old woman presents with concerns of developing ovarian cancer. She wants to be screened. Although a friend recently developed the disease (Stage III), no family members have ever had ovarian cancer. You should

   A. order a CA 125.
   B. order a CA 125 and pelvic ultrasound.
   C. instruct the woman to have a CA 125 and pelvic ultrasound annually.
   D. instruct the woman to have a CA 125 and pelvic ultrasound at 2-year intervals.
   E. explain that there are no accurate screening tests available.

4. A 61-year-old man with a 40-pack-year history of smoking presents to you for a routine evaluation. He denies cough, wheezing, and shortness of breath. His lungs are clear. Aside from explaining to him the importance of discontinuing tobacco use, you should

   A. obtain a chest radiograph, PA only.
   B. obtain a chest radiograph, PA and lateral.
   C. schedule a non-contrast CT of the chest.
   D. perform pulmonary function testing.
   E. refuse to perform a screening chest radiograph if requested for screening.

5. A 44-year-old man presents for evaluation. He has hepatitis C, and he failed treatment with pegylated interferon and ribavirin. His spleen is enlarged, and his platelet count is 77,000. He is currently on no medications. An upper endoscopy report from his gastroenterologist reveals Grade II esophageal varices. He has no prior GI bleeding. For primary prophylaxis, you should

   A. inform him that if bleeding occurs, a beta blocker such as metoprolol should be given.
   B. if no contraindications, begin nadolol.
   C. if no contraindications, begin metoprolol.
   D. refer him for liver transplantation evaluation.
   E. start him on omeprazole immediately.

6. A 54-year-old woman with mitral valve prolapse presents for discussion regarding the need for a colonoscopy. On physical examination, there is a Grade II systolic murmur radiating to the left axilla. You should

   A. start her on oral amoxicillin prior to the colonoscopy.
   B. give a dose of cefazolin intravenously prior to the colonoscopy.
   C. give a dose of vancomycin and gentamicin intravenously prior to the colonoscopy.
   D. inform her that only patients with a history of rheumatic heart disease need antibiotics for colonoscopy.
   E. comfort the patient. Antibiotics are not necessary.

7. The only oral substance shown to prevent breast cancer in persons at increased risk is

   A. vitamin E (alpha tocopherol).
   B. folic acid.
   C. tamoxifen.
   D. calcium.
   E. aspirin.

8. The most important risk factor for the development of colon cancer and breast cancer is

   A. family history.
   B. age.
   C. diet.
   D. history of radiation exposure.

9. A 55-year-old man presents for discussion of the need for an exercise treadmill test. He has not seen a physician in 5 years. At work, many of his colleagues have had this test performed to rule out coronary artery disease. After your evaluation, you find no risk factors for heart disease and no symptoms. You should

   A. perform an exercise treadmill test.
   B. obtain an electrocardiogram and serum cholesterol panel.
   C. obtain a serum cholesterol panel only.
   D. schedule an electron beam CT.
   E. schedule a stress thallium.

10. A 50-year-old woman presents for an annual routine evaluation. You should

   A. obtain a screening TSH.
   B. schedule a mammogram and a screening TSH.
   C. schedule a mammogram, and order a TSH only if multiple symptoms develop.
   D. schedule a mammogram, and order a TSH if one or more symptoms exist.
   E. schedule a mammogram, and order a thyroid panel.

11. Which of the following statements is true regarding vitamins?

   A. Vitamin E helps to prevent colon cancer
   B. Vitamin A helps to prevent leukemia
   C. Calcium helps to prevent lung cancer
   D. Folic acid helps to prevent certain birth defects
   E. Vitamin C helps to prevent the common cold

12. A 45-year-old man with no significant past medical history presents for a routine evaluation. He has no complaints. There were no prior hospitalizations or surgeries. He takes no medications, no drug allergies. His family history is remarkable for a father and mother who had myocardial infarctions before the age of 50. A grandfather had colon cancer. An uncle had prostate cancer. The patient smokes 1 pack of cigarettes per day and does not exercise. In addition to a lipid panel, he should be screened for which of the following diseases?

   A. Diabetes
   B. Prostate cancer
   C. Colon cancer
   D. Thyroid disease
   E. None

13. A 45-year-old woman presents for discussion regarding the need for a screening mammogram. Which of the following is true?

    A. The palpation of the breast is more important than the mammogram itself
    B. Palpation of the breast has no role in the setting of the mammogram (the mammogram includes all pathology that would be found on palpation)
    C. Self-palpation is more important than physician palpation for screening
    D. There is clear evidence that a baseline mammogram should be performed between ages 35 and 40
    E. Women should have mammograms every 1–2 years after the age of 50

14. Which of the following is a risk factor for the development of pancreatic cancer?

    A. Alcohol abuse
    B. Smoking
    C. History of acute pancreatitis
    D. Family history of pancreatic cancer
    E. History of Hodgkin disease treated with mantle irradiation

15. A 35-year-old woman is found to have hepatitis C, genotype 1B, with elevated transaminases. She should receive which of the following vaccines?

    A. Hepatitis B
    B. Hepatitis A
    C. Pneumococcal
    D. Influenza
    E. All of the above

16. Cervical cancer screening with a PAP smear is best considered

    A. primary prevention.
    B. secondary prevention.
    C. tertiary prevention.
    D. just good medical care.

17. Which of the following statements concerning practice guidelines is correct?

    A. Guidelines should be used only for managed care
    B. Guidelines protect patients from substandard care
    C. Following guidelines decreases malpractice cases
    D. Guidelines are based on cost-cutting

18. A 29-year-old woman with HIV calls you regarding her recent Pap smear, which was normal. She has had an annual Pap smear for the last three consecutive years. She should have her next Pap

    A. in 1 year.
    B. in 2 years.
    C. in 3 years.
    D. in 4 years.
    E. only if she has symptoms.

19. A 55-year-old woman who had right knee replacement one year ago calls you the night before her colonoscopy. She inquires about the need for antibiotics during the procedure. What do you tell her?

    A. The colonoscopy scheduled for the next day should be canceled because the artificial knee requires 3 days of antibiotics prior to the procedure
    B. Vancomycin and gentamicin should be given as single doses during the procedure
    C. Cephalexin will be given during the procedure
    D. Oral amoxicillin will be given before and after the procedure
    E. No antibiotics are needed

20. A 32-year-old obese woman presents to you for advice regarding weight loss. She has no significant medical problems at this time. She requests a pill to help her lose weight. You should do which of the following?

    A. Tell her that exercise and a low-calorie diet are the best ways to lose weight
    B. Prescribe phentermine
    C. Prescribe fenfluramine
    D. Prescribe L-thyroxine
    E. Refer her for gastric bypass surgery

21. Which of the following should be done?

    A. DEXA bone scan for anyone above age 65
    B. Varicella zoster vaccine above age 65 and aortic ultrasound in men who were ever smokers
    C. Pneumococcal vaccines in everyone above age 50
    D. Offer mastectomy if BRCA is positive above age 50.

22. A 45-year-old woman presents with anemia. She has celiac disease. On physical examination, what finding would be characteristic?

    A. Seborrheic dermatitis
    B. Atrophic tongue
    C. Glossitis
    D. Corneal abrasions

23. In a patient who is on long-term TPN, which micronutrient deficiency is associated with diabetes (glucose intolerance)?

    A. Selenium
    B. Copper
    C. Chromium
    D. Zinc

24. A 72-year-old man is admitted to the hospital with a complicated gangrenous cholecystitis. After cholecystectomy, he is kept NPO and placed on antibiotics for an extended period of time. Twelve days later, he develops ecchymosis and mild anemia. Hgb is 10, PT 16 sec, and PTT 40 sec. What is the most common cause of these findings?

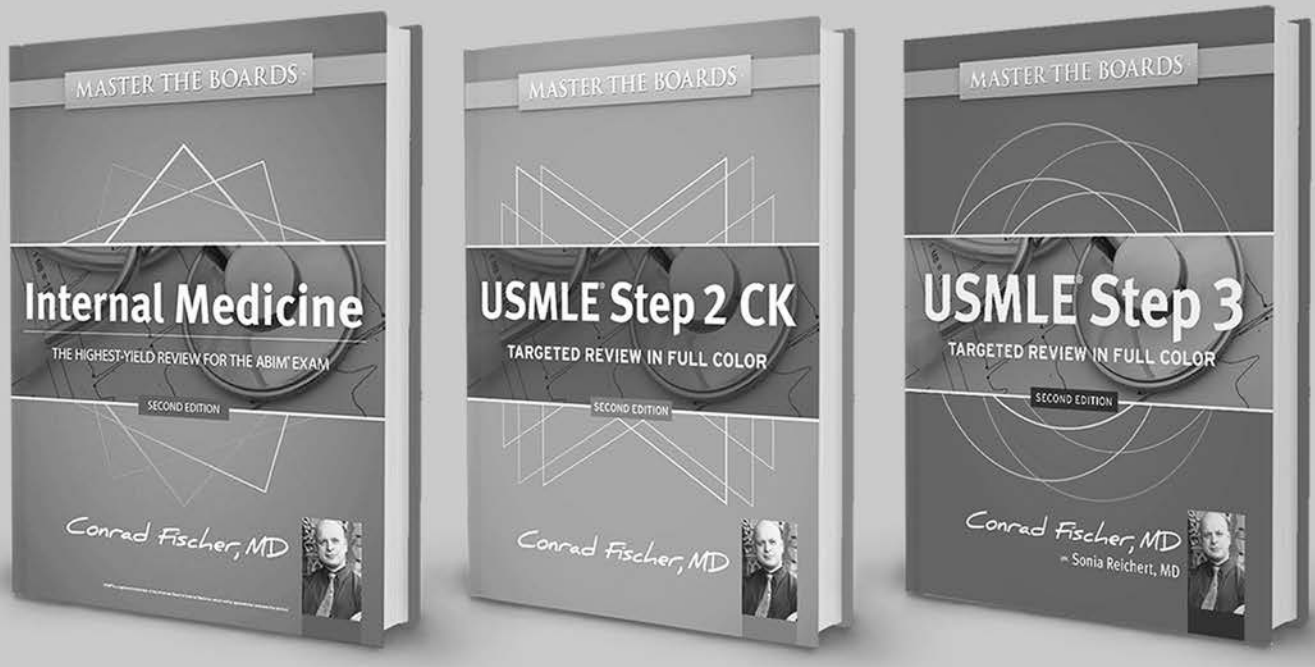
    A. Vitamin C deficiency
    B. Vitamin K deficiency
    C. Factor X deficiency
    D. Antiphospholipid syndrome

25. Endocarditis prophylaxis is indicated for a patient in which of the following circumstances?

    A. Bicuspid valve, undergoing dental cleaning
    B. Ostium secundum defect, undergoing vaginal hysterectomy
    C. Bioprosthetic valve, undergoing dental extraction
    D. Mitral valve prolapse with murmur, undergoing colonoscopy
    E. Metal valve with transesophageal echo

From

Dr. Conrad Fischer



Concise Guides with Must-Know and Highly Tested Concepts for the Boards

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