

The following training problems are taken from the CDIM National Objectives:

Acid-Base Disorders, Training Problem #11

Students should be able to define, describe and discuss:

1. The pathophysiology of:
 - Hypo- and hypervolemia. *(MK)*
 - Hypo- and hypernatremia. *(MK)*
 - Hypo- and hyperkalemia. *(MK)*
 - Hypo- and hypercalcemia. *(MK)*
 - Simple and mixed acid-base disorders. *(MK)*
 - Hypo- and hyperphosphatemia. *(MK)*
 - Hypo- and hypermagnesemia. *(MK)*
 - Respiratory acidosis and alkalosis. *(MK)*
 - Metabolic acidosis and alkalosis. *(MK)*
2. Presenting symptoms and signs of the above disorders. *(MK)*
3. The importance of total body water and its distribution. *(MK)*
4. The differential diagnosis of hypo- and hypernatremia in the setting of volume depletion, euvoolemia, and hypervolemia. *(MK)*
5. How to distinguish hyponatremia from pseudohyponatremia. *(MK)*
6. How to identify spurious hyperkalemia or acidosis-related hyperkalemia. *(MK)*
7. Risks of too rapid or delayed therapy for hyponatremia. *(MK)*
8. The most common causes of respiratory acidosis, respiratory alkalosis, metabolic acidosis and metabolic alkalosis. *(MK)*
9. How to calculate the anion gap and explain its relevance to determining the cause of a metabolic acidosis. *(MK)*
10. Changes in total body water distribution that occur with aging. *(MK)*
11. How altered mental status can contribute to electrolyte disorders. *(MK)*
12. Tests to use in the evaluation of fluid, electrolyte, and acid-base disorders. *(MK)*
13. Indications for obtaining an ABG. *(MK)*
14. The types of fluid preparations to use in the treatment of fluid and electrolyte disorders. *(MK)*

Anemia, Training Problem #4

Students should be able to define, describe, and discuss:

1. Classification of anemia based on red cell size:
 - Microcytic:
 - Iron deficiency. *(MK)*
 - Thalassemic disorders. *(MK)*
 - Sideroblastic anemia. *(MK)*
 - Normocytic:
 - Acute blood loss. *(MK)*
 - Hemolysis. *(MK)*
 - Anemia of chronic disease (e.g. infection, inflammation, malignancy). *(MK)*
 - Chronic renal insufficiency/erythropoietin deficiency. *(MK)*
 - Bone marrow suppression (e.g. bone marrow invasion, aplastic anemia).
 - Hypothyroidism. *(MK)*
 - Testosterone deficiency. *(MK)*

- Early presentation of microcytic or macrocytic anemia (e.g. early iron deficiency anemia). *(MK)*
 - Combined presentation of microcytic and macrocytic anemias. *(MK)*
 - Macrocytic:
 - Ethanol abuse. *(MK)*
 - B12 deficiency. *(MK)*
 - Folate deficiency. *(MK)*
 - Drug-induced. *(MK)*
 - Reticulocytosis. *(MK)*
 - Liver disease. *(MK)*
 - Myelodysplastic syndromes. *(MK)*
 - Hypothyroidism. *(MK)*
2. Morphological characteristics, pathophysiology, and relative prevalence of each of the causes of anemia. *(MK)*
 3. The meaning and utility of various components of the hemogram (e.g. hemoglobin, hematocrit, mean corpuscular volume, and random distribution width). *(MK)*
 4. The classification of anemia into hypoproliferative and hyperproliferative categories and the utility of the reticulocyte count/index. *(MK)*
 5. The potential usefulness of the white blood cell count and red blood cell count when attempting to determine the cause of anemia. *(MK)*
 6. The diagnostic utility of the various tests for iron deficiency (e.g. serum iron, total iron binding capacity, transferrin saturation, ferritin). *(MK)*
 7. The genetic basis of some forms of anemia. *(MK)*
 8. Indications, contraindications, and complications of blood transfusion. *(MK)*

Hyponatremia, Training Problem #11

Students should be able to define, describe and discuss:

1. The pathophysiology of:
 - Hypo- and hypervolemia. *(MK)*
 - Hypo- and hypernatremia. *(MK)*
 - Hypo- and hyperkalemia. *(MK)*
 - Hypo- and hypercalcemia. *(MK)*
 - Simple and mixed acid-base disorders. *(MK)*
 - Hypo- and hyperphosphatemia. *(MK)*
 - Hypo- and hypermagnesemia. *(MK)*
 - Respiratory acidosis and alkalosis. *(MK)*
 - Metabolic acidosis and alkalosis. *(MK)*
2. Presenting symptoms and signs of the above disorders. *(MK)*
3. The importance of total body water and its distribution. *(MK)*
4. The differential diagnosis of hypo- and hypernatremia in the setting of volume depletion, euvoolemia, and hypervolemia. *(MK)*
5. How to distinguish hyponatremia from pseudo hyponatremia. *(MK)*
6. How to identify spurious hyperkalemia or acidosis-related hyperkalemia. *(MK)*
7. Risks of too rapid or delayed therapy for hyponatremia. *(MK)*
8. The most common causes of respiratory acidosis, respiratory alkalosis, metabolic acidosis and metabolic alkalosis. *(MK)*
9. How to calculate the anion gap and explain its relevance to determining the cause of a metabolic acidosis. *(MK)*
10. Changes in total body water distribution that occur with aging. *(MK)*
11. How altered mental status can contribute to electrolyte disorders. *(MK)*
12. Tests to use in the evaluation of fluid, electrolyte, and acid-base disorders. *(MK)*

13. Indications for obtaining an ABG. (MK)
14. The types of fluid preparations to use in the treatment of fluid and electrolyte disorders. (MK)

ID 101, Training Problem #27

Students should be able to define, describe, and discuss:

1. The epidemiology and significance of nosocomial infections in the United States. (MK)
2. The general clinical risk factors for nosocomial infection, including:
 - Immunocompromise. (MK)
 - Immunosuppressive drugs. (MK)
 - Extremes of age. (MK)
 - Compromise of the skin and mucosal surfaces secondary to:
 - Drugs. (MK)
 - Irradiation. (MK)
 - Trauma. (MK)
 - Invasive diagnostic and therapeutic procedures. (MK)
 - Invasive indwelling devices (e.g. intravenous catheter, bladder catheter, endotracheal tube, etc.). (MK)
3. The major routes of nosocomial infection transmission, including:
 - Contact. (MK)
 - Droplet. (MK)
 - Airborne. (MK)
 - Common vehicle. (MK)
4. The epidemiology, pathophysiology, microbiology, symptoms, signs, typical clinical course, and preventive strategies for the most common nosocomial infections, including:
 - Urinary tract infection. (MK)
 - Pneumonia. (MK)
 - Surgical site infection. (MK)
 - Intravascular device-related bloodstream infections. (MK)
 - Skin infections. (MK)
 - Health care associated diarrhea. (MK)
5. Empiric antibiotic therapy for the most common nosocomial infections. (MK)
6. The epidemiology, pathophysiology, microbiology, symptoms, signs, typical clinical course, and preventive strategies for colonization or infection with the following organisms:
 - Vancomycin-resistant enterococci. (MK)
 - *Clostridium difficile*. (MK)
 - Methicillin-resistant *Staphylococcus aureus*. (MRSA) (MK)
 - Multidrug-resistant Gram-negative bacteria. (MK)
7. The crucial importance of judicious antibiotic use. (MK)
8. The effect of widespread use of broad spectrum anti-microbial agents on endogenous body flora and the hospital microbial flora. (MK)
9. The types of isolation procedures and their indications:
 - Standard. (MK)
 - Airborne. (MK)
 - Contact. (MK)
 - Droplet. (MK)
10. The Centers for Disease Control and Prevention (CDC) guidelines for hand hygiene. (MK)
11. Preventive strategies for needlestick and sharps injuries intended to reduce the transmission of bloodborne pathogens (hepatitis B, hepatitis C, and HIV). (MK)
12. Local hospital post-exposure (i.e. after an eye/mucous membrane splash, needlestick or other sharps injury) protocols for prompt reporting, evaluation, counseling, treatment, and follow-up. (MK, SBP)

13. The indications, efficacy, and side effects of post-exposure prophylaxis for hepatitis B and HIV/AIDS. (MK)
14. negative-pressure ventilation isolation for known or suspected tuberculosis patients (MK)
15. National Institute for Occupational Safety and Health (NIOSH) approved personal respiratory protective equipment (i.e. N95 respirator) use for the prevention of transmission of *Mycobacterium tuberculosis* to health care workers. (MK)

Interpretation of LFT, Training Problem #25

Students should be able to define, describe, and discuss:

1. The biochemical/physiologic/mechanistic approach to hyperbilirubinemia, including:
 - Increased production. (MK)
 - Decreased hepatocyte uptake. (MK)
 - Decreased conjugation. (MK)
 - Decreased excretion from the hepatocyte. (MK)
 - Decreased small duct transport (intrahepatic cholestasis). (MK)
 - Decreased large duct transport (extrahepatic cholestasis, obstructive jaundice). (MK)
2. The biochemistry and common causes of unconjugated and conjugated hyperbilirubinemia. (MK)
3. The use of serum markers of liver injury (e.g. AST, ALT, GGT, Alk Phos) and function (e.g. bilirubin, ALB, PT/INR) in the diagnostic evaluation of hepatobiliary disease. (MK)
4. The clinical significance of asymptomatic, isolated elevation of AST, ALT, GGT, and/or Alk Phos. (MK)
5. The common pathologic patterns of liver disease and their common causes, including:
 - Steatosis (fatty liver). (MK)
 - Hepatitis. (MK)
 - Cirrhosis. (MK)
 - Infiltrative. (MK)
 - Intrahepatic cholestasis. (MK)
 - Extrahepatic cholestasis (obstructive jaundice). (MK)
6. The epidemiology, symptoms, signs, typical clinical course, and prevention of viral hepatitis. (MK)
7. The distinctions between acute and chronic hepatitis. (MK)
8. The indications for and efficacy of hepatitis A and B vaccinations. (MK)
9. The common causes and clinical significance of hepatic steatosis and steatohepatitis. (MK)
10. The epidemiology, symptoms, signs, and typical clinical course of autoimmune liver diseases such as autoimmune hepatitis, primary biliary cirrhosis, and primary sclerosing cholangitis. (MK)
11. The epidemiology, symptoms, signs, and typical clinical course of cirrhosis. (MK)
12. The pathophysiologic manifestations, symptoms, signs, and complications of alcohol-induced liver disease. (MK)
13. The symptoms, signs, and complications of portal hypertension. (MK)
14. The pathophysiology and common causes of ascites. (MK)
15. The pathophysiologic manifestations, symptoms, and signs of spontaneous bacterial peritonitis. (MK)
16. The basic pathophysiology, symptoms, signs, typical clinical course, and precipitants of hepatic encephalopathy. (MK)
17. The basic pathophysiology, symptoms, signs, and typical clinical course of the hepatorenal syndrome. (MK)
18. The analysis of ascitic fluid and its use in the diagnostic evaluation of liver disease. (MK)
19. Common causes of drug-induced liver injury. (MK)
20. Genetic considerations in liver disease (i.e. hemochromatosis, Wilson's disease, alpha-1 antitrypsin deficiency, Gilbert's syndrome). (MK)
21. The epidemiology, pathophysiology, symptoms, signs, and typical clinical course of cholelithiasis and cholecystitis. (MK)
22. The clinical syndrome of "ascending cholangitis" including its common causes and typical clinical course. (MK)
23. The indications for and risks of paracentesis and liver biopsy. (MK)

24. The indications for and utility of hepatobiliary imaging studies, including:

- Ultrasound. (MK)
- Nuclear medicine studies. (MK)
- CT. (MK)
- MRI. (MK)
- Magnetic resonance cholangiopancreatography (MRCP). (MK)
- Endoscopic retrograde cholangiopancreatography (ERCP). (MK)

Immuno Tests, Training Problem #30

Students should be able to define, describe, and discuss:

1. A systematic approach to joint pain based on an understanding of pathophysiology to classify potential causes. (MK)
2. The effect of the time course of symptoms on the potential causes of joint pain (acute vs. subacute vs. chronic). (MK)
3. The difference between and pathophysiology of arthralgia vs. arthritis and mechanical vs. inflammatory joint pain. (MK)
4. The distinguishing features of intra-articular and periarticular complaints (joint pain vs. bursitis and tendonitis). (MK)
5. The effect of the features of joint involvement on the potential causes of joint pain (monoarticular vs. oligoarticular vs. polyarticular, symmetric vs. asymmetric, axial and/or appendicular, small vs. large joints, additive vs. migratory vs. intermittent). (MK)
6. Indications for performing an arthrocentesis and the results of synovial fluid analysis. (MK)
7. The pathophysiology and common signs and symptoms of:
 - Osteoarthritis. (MK)
 - Crystalline arthropathies. (MK)
 - Septic arthritis. (MK)
8. Indications for and effectiveness of intra-articular steroid injections. (MK)
9. Treatment options for gout (e.g. colchicine, NSAIDs, steroids, uricosurics, xanthine oxidase inhibitors). (MK)
10. The pathophysiology and common signs and symptoms of common periarticular disorders:
 - Sprain/stain. (MK)
 - Tendonitis. (MK)
 - Bursitis. (MK)
11. The basic pathophysiology of autoimmunity and autoimmune diseases. (MK)
12. The basic role of genetics in autoimmune disorders. (MK)
13. Typical clinical scenarios when systemic rheumatologic disorders should be considered:
 - Diffuse aches and pains. (MK)
 - Generalized weakness/fatigue. (MK)
 - Myalgias with or without weakness. (MK)
 - Arthritis with systemic signs (e.g. fever, weight loss). (MK)
 - Arthritis with disorders of other systems (e.g. rash, cardiopulmonary symptoms, gastrointestinal symptoms, eye disease, renal disease, neurologic symptoms). (MK)
13. the common signs and symptoms of and diagnostic approach to:
 - Rheumatoid arthritis. (MK)
 - Spondyloarthropathies (reactive arthritis/Reiter's syndrome, ankylosing spondylitis, psoriatic arthritis). (MK)
 - Systemic lupus erythematosus. (MK)
 - Systemic sclerosis. (MK)
 - Raynaud's syndrome/phenomenon. (MK)
 - Sjögren's syndrome. (MK)
 - Temporal arteritis and polymyalgia rheumatica. (MK)

- Other systemic vasculitides. *(MK)*
- Polymyositis and dermatomyositis. *(MK)*
- Fibromyalgia. *(MK)*

Laboratory interpretation:

Students should be able to recommend when to order diagnostic and laboratory tests and be able to interpret them, both prior to and after initiating treatment based on the differential diagnosis, including consideration of test cost and performance characteristics as well as patient preferences.

Laboratory and diagnostic tests should include, when appropriate:

- CBC with differential. *(PC, MK)*
- Synovial fluid analysis (Gram stain, culture, crystal exam, cell count with differential, and glucose). *(PC, MK)*
- Uric acid. *(PC, MK)*
- ESR. *(PC, MK)*
- Rheumatoid factor (RF). *(PC, MK)*
- Antinuclear antibody test (ANA) and anti-DNA test. *(PC, MK)*

Students should be able to define the indications for and interpret (**with consultation**) the results of:

- Plain radiographs of the shoulder, elbow, wrist, hand, hip, knee, ankle, and foot. *(PC, MK)*

Renal Tests, Training Problem #17

Students should be able to define, describe and discuss:

1. The distinction between the three major pathophysiologic etiologies for acute renal failure (ARF):
 - Decreased renal perfusion (prerenal). *(MK)*
 - Intrinsic renal disease (renal). *(MK)*
 - Acute renal obstruction (postrenal). *(MK)*
2. The pathophysiology of the major etiologies of “prerenal” ARF, including:
 - Hypovolemia. *(MK)*
 - Decreased cardiac output. *(MK)*
 - Systemic vasodilation. *(MK)*
 - Renal vasoconstriction. *(MK)*
3. The pathophysiology of the major etiologies of intrinsic “renal” ARF, including:
 - Vascular lesions. *(MK)*
 - Glomerular lesions. *(MK)*
 - interstitial nephritis. *(MK)*
 - Intra-tubule deposition/obstruction. *(MK)*
 - Acute tubular necrosis (ATN). *(MK)*
4. The pathophysiology of the major etiologies of “postrenal” ARF, including:
 - Urethral (e.g. tumors, calculi, clot, sloughed papillae, retroperitoneal fibrosis, lymphadenopathy). *(MK)*
 - Bladder neck (e.g. tumors, calculi, prostatic hypertrophy or carcinoma, neurogenic). *(MK)*
 - Urethral (e.g. stricture, tumors, obstructed indwelling catheters). *(MK)*
5. The pathophysiology and clinical findings of uremia. *(MK)*
6. The natural history, initial evaluation and treatment, and complications of ARF. *(MK)*
7. The most common etiologies of chronic kidney disease (CKD):
 - DM. *(MK)*
 - Hypertension. *(MK)*
 - Glomerulonephritis. *(MK)*
 - Polycystic kidney disease. *(MK)*

- Autoimmune diseases (e.g. systemic lupus erythematosus). (MK)
 - The staging scheme for CKD. (MK)
8. The significance for proteinuria in CKD. (MK)
 9. The use of ACE-Is and ARBs in the management of CKD. (MK)
 10. The importance of secondary hyperparathyroidism in CKD. (MK)
 11. The pathophysiology of anemia in CKD. (MK)
 12. The value of glycemic and hypertension control in limiting the progression of CKD. (MK)
 13. The value of CAD risk factor modification in patients with CKD, particularly those treated with dialysis. (MK)
 14. The basic principles of renal replacement therapy (e.g., hemodialysis and peritoneal dialysis) as well as the complications. (MK)

Laboratory interpretation:

Students should be able to recommend when to order diagnostic and laboratory tests and be able to interpret them, both prior to and after initiating treatment based on the differential diagnosis, including consideration of test cost and performance characteristics as well as patient preferences. Laboratory and diagnostic tests should include, when appropriate:

- Serum electrolytes, BUN/Cr, calcium, phosphorus. (PC, MK)
- Urine sodium. (PC, MK)
- Serum and urine osmolality. (PC, MK)
- Anion gap. (PC, MK)
- ABG (PC, MK)
- Serum BUN to Cr ratio. (PC, MK)
- CBC, ferritin. (PC, MK)
- Performing and interpreting a urinalysis, including microscopic examination for casts, red blood cells, white blood cells, and crystals. (PC, MK)
- Calculating fractional excretion of sodium and appreciate its usefulness in distinguishing between pre-renal and intrinsic renal disease. (PC, MK)
- Calculating creatinine clearance using the Cockcroft-Gault or MDRD (“modification of diet in renal disease study”) equations. (PC, MK)
- Serum parathyroid hormone level. (PC, MK)
- ECG findings in hyperkalemia. (PC, MK)

Students should be able to define the indications for and interpret (**with consultation**) results of:

- Renal ultrasonography. (PC, MK)

Rheumatological Diseases, Training Problem #30

Students should be able to define, describe, and discuss:

1. A systematic approach to joint pain based on an understanding of pathophysiology to classify potential causes. (MK)
2. The effect of the time course of symptoms on the potential causes of joint pain (acute vs. subacute vs. chronic). (MK)
3. The difference between and pathophysiology of arthralgia vs. arthritis and mechanical vs. inflammatory joint pain. (MK)
4. The distinguishing features of intra-articular and periarticular complaints (joint pain vs. bursitis and tendonitis). (MK)
5. The effect of the features of joint involvement on the potential causes of joint pain (monoarticular vs. oligoarticular vs. polyarticular, symmetric vs. asymmetric, axial and/or appendicular, small vs. large joints, additive vs. migratory vs. intermittent). (MK)

6. Indications for performing an arthrocentesis and the results of synovial fluid analysis. *(MK)*
7. The pathophysiology and common signs and symptoms of:
 - Osteoarthritis. *(MK)*
 - Crystalline arthropathies. *(MK)*
 - Septic arthritis. *(MK)*
8. Indications for and effectiveness of intra-articular steroid injections. *(MK)*
9. Treatment options for gout (e.g. colchicine, NSAIDs, steroids, uricosurics, xanthine oxidase inhibitors). *(MK)*
10. The pathophysiology and common signs and symptoms of common periarticular disorders:
 - Sprain/stain. *(MK)*
 - Tendonitis. *(MK)*
 - Bursitis. *(MK)*
11. The basic pathophysiology of autoimmunity and autoimmune diseases. *(MK)*
12. The basic role of genetics in autoimmune disorders. *(MK)*
13. Typical clinical scenarios when systemic rheumatologic disorders should be considered:
 - Diffuse aches and pains. *(MK)*
 - Generalized weakness/fatigue. *(MK)*
 - Myalgias with or without weakness. *(MK)*
 - Arthritis with systemic signs (e.g. fever, weight loss). *(MK)*
 - Arthritis with disorders of other systems (e.g. rash, cardiopulmonary symptoms, gastrointestinal symptoms, eye disease, renal disease, neurologic symptoms). *(MK)*
13. the common signs and symptoms of and diagnostic approach to:
 - Rheumatoid arthritis. *(MK)*
 - Spondyloarthropathies (reactive arthritis/Reiter's syndrome, ankylosing spondylitis, psoriatic arthritis). *(MK)*
 - Systemic lupus erythematosus. *(MK)*
 - Systemic sclerosis. *(MK)*
 - Raynaud's syndrome/phenomenon. *(MK)*
 - Sjögren's syndrome. *(MK)*
 - Temporal arteritis and polymyalgia rheumatica. *(MK)*
 - Other systemic vasculitides. *(MK)*
 - Polymyositis and dermatomyositis. *(MK)*
 - Fibromyalgia. *(MK)*

Laboratory interpretation:

Students should be able to recommend when to order diagnostic and laboratory tests and be able to interpret them, both prior to and after initiating treatment based on the differential diagnosis, including consideration of test cost and performance characteristics as well as patient preferences.

Laboratory and diagnostic tests should include, when appropriate:

- CBC with differential. *(PC, MK)*
- Synovial fluid analysis (Gram stain, culture, crystal exam, cell count with differential, and glucose). *(PC, MK)*
- Uric acid. *(PC, MK)*
- ESR. *(PC, MK)*
- Rheumatoid factor (RF). *(PC, MK)*
- Antinuclear antibody test (ANA) and anti-DNA test. *(PC, MK)*

Students should be able to define the indications for and interpret (**with consultation**) the results of:

- Plain radiographs of the shoulder, elbow, wrist, hand, hip, knee, ankle and foot. *(PC, MK)*

Cardiac Clinical Correlation

Students should be able to define, describe and discuss:

1. The student will describe the mechanism of generation, clinical significance and best listening areas on the chest of the following sounds:
 - a. S1 & S2—including etiologies for increased and decreased intensities
 - b. S2 splitting patterns-including normal, wide, fixed, paradoxical
 - c. S3 & S4
 - d. Ejection clicks-early and mid (including MVP)
 - e. Opening snap
2. The student will describe the grading system for heart murmurs (I-VI/VI).
3. The student will compare and contrast the location, pattern of radiation, timing, pitch, shape, quality and response to common physiologic maneuvers and any associated change in carotid waveform with the following murmurs:
 - a. Aortic stenosis
 - b. Mitral stenosis
 - c. Aortic regurgitation
 - d. Mitral regurgitation
 - e. Hypertrophic cardiomyopathy
 - f. Ventricular septal defect
 - g. Atrial septal defect
 - h. Mitral valve prolapse
 - i. Pericardial rub

ACGME Competencies:

PC = Patient Care
MK = Medical Knowledge
PLI = Practice-Based Learning and Improvement

CS = Communication Skills
P = Professionalism
SBP = Systems-Based Practice