

Sample Nephrology Questions & Critiques

The sample NCCPA items and item critiques are provided to help PAs better understand how exam questions are developed and should be answered for NCCPA's Nephrology CAQ Exam.

Question #1

A 56-year-old man with a long history of significant alcohol use is admitted to the hospital after he had a seizure that was witnessed by his wife. Temperature is 36.8°C (98.3°F), heart rate is 104/min and regular, respirations are 18/min, and blood pressure is 104/62 mmHg. The patient is obtunded, swollen, and jaundiced. On physical examination, auscultation of the chest shows diminished breath sounds. Examination of the abdomen shows firmness of the right upper quadrant, palpable hepatomegaly, and protuberance of the umbilicus. Results of laboratory studies of serum include the following:

Creatinine	0.8 mg/dL
Potassium	3.5 mEq/L
Sodium	108 mEq/L
Blood urea nitrogen	4 mg/dL

Which of the following is the most appropriate initial management?

- A. Emergent hemodialysis
- B. Fluid restriction
- C. Intravenous administration of 3% saline**
- D. Intravenous administration of 5% dextrose in water
- E. Intravenous administration of diltiazem

Content Area: Renal Pathophysiology (14%)

Critique

This question tests the examinee's ability to determine the most appropriate initial management on the basis of symptoms, history, and laboratory findings. The correct answer is Option (C), intravenous administration of 3% saline. The presenting symptom of mental status changes along with the physical examination and laboratory findings indicate that the seizure was most likely secondary to hyponatremia. Rapid increase in serum sodium level is indicated in patients with hyponatremia when neurologic manifestations are present. Therefore, the most appropriate initial

management of the patient's condition is an intervention that will elevate sodium levels – intravenous administration of 3% saline.

Option (A), emergent hemodialysis, is incorrect because no indicators for this therapy are present. Option (B), fluid restriction, is incorrect because although this intervention will ultimately cause a proportional increase in the serum sodium level, the patient's mental status changes and seizure activity warrant more rapid increase than fluid restriction alone could provide. Option (D), intravenous administration of 5% dextrose in water, is incorrect because this therapy will decrease the serum sodium level. Also, the patient's seizure was not secondary to hypoglycemia. Option (E), intravenous administration of diltiazem, is incorrect because this therapy will not increase the serum sodium level and because it is indicated for arrhythmia, which is not present.

Question #2

A 73-year-old man with stage 2 chronic kidney disease comes to the clinic for follow-up examination. Medical history includes coronary artery disease, hyperlipidemia, and type 2 diabetes mellitus. Current medications include metformin, simvastatin, and low-dose aspirin. In this patient, discontinuation of metformin is appropriate when the estimated glomerular filtration rate (eGFR), calculated using the Modification of Diet in Renal Disease (MDRD) Study equation, decreases to less than which of the following values?

- A. 10 mL/min/1.73 m²
- B. 15 mL/min/1.73 m²
- C. 30 mL/min/1.73 m²**
- D. 45 mL/min/1.73 m²
- E. 60 mL/min/1.73 m²

Content Area: Chronic Kidney Disease (20%)

Critique

This item tests the examinee's ability to identify the contraindications and adverse effects of medications. Metformin must be discontinued immediately when the patient's eGFR falls to 30 mL/min/1.73 m² because of the increased risk of lactic acidosis.

Options (A) and (B) are incorrect because metformin must be discontinued immediately when the patient's GFR reaches 30 mL/min/1.73 m². Options (D) and (E) are incorrect because metformin may be continued when GFR is 60 mL/min/1.73 m² or 45 mL/min/1.73 m². Research found that use of metformin does not increase a patient's risk of lactic acidosis until GFR of 30 mL/min is reached.

Question #3

A 54-year-old woman with diabetic nephropathy comes to the office because she has had vomiting, anorexia, fatigue, itching, and a metallic taste in her mouth for the past two weeks. Respirations are 32/min. Physical examination shows urine-like odor of the breath and 2+ pitting edema. Estimated glomerular filtration rate, calculated using the Modification of Diet in Renal Disease (MDRD) Study equation, is 14 mL/min/1.73 m². Additional studies in this patient are most likely to show presence of which of the following conditions?

- A. Hypokalemia
- B. Primary metabolic acidosis**
- C. Primary metabolic alkalosis
- D. Primary respiratory acidosis
- E. Primary respiratory alkalosis

Content Area: Renal Pathophysiology (14%)

Critique

This question tests the ability of the examinee to associate acid-base abnormalities with specific medical conditions. The correct answer is Option (B), primary metabolic acidosis. The patient's history includes several risk factors for an acid-base abnormality. Chronic kidney disease, diabetes mellitus, and vomiting all are associated with an increased risk of primary metabolic acidosis.

Option (A), hypokalemia, is incorrect because as chronic kidney disease progresses, the distal nephron loses the ability to secrete potassium ions, most often leading to hyperkalemia. Option (C), primary metabolic alkalosis, is incorrect because the progression of chronic kidney disease leads to distal renal tubular acidosis – marked by low blood pH, not elevated pH as seen in alkalosis. Option (D), primary respiratory acidosis, is incorrect because this condition is caused by elevated pCO₂, not buildup of hydrogen and chloride ions in the blood. Option (E), primary respiratory alkalosis, is incorrect because although a degree of respiratory alkalosis may develop in patients with chronic kidney disease, it is compensatory in nature and is not the primary disorder.

Question #4

A 36-year-old man comes to the office for consultation regarding results of recent laboratory studies. Medical history includes stage 3b chronic kidney disease and hypertension, which is currently well controlled with lisinopril and furosemide. The patient has a 20-pack-year history of cigarette smoking. Results of laboratory studies of serum include the following:

Alanine aminotransferase	23 U/L
Aspartate aminotransferase	24 U/L
Total cholesterol	236 mg/dL
Low-density lipoprotein cholesterol	128 mg/dL
High-density lipoprotein cholesterol	39 mg/dL
Triglycerides	110 mg/dL

Initiation of therapy with which of the following agents is most appropriate for management of hyperlipidemia in this patient?

- A. Ezetimibe
- B. Fenofibrate
- C. Fish oil
- D. Niacin
- E. Simvastatin**

Content Area: Chronic Kidney Disease (20%)

Critique

This question assesses the examinee's knowledge of recommended guidelines for management of patients with stage 3 chronic kidney disease and comorbid hyperlipidemia. The correct answer is Option (E), simvastatin. Statin therapy to decrease the serum low-density lipoprotein cholesterol level to the goal of less than 100 mg/dL has been shown to delay the progression of chronic kidney disease.

Option (A), ezetimibe, is incorrect because this medication has not been proven to delay the progression of chronic kidney disease in patients with hyperlipidemia. Option (B), fenofibrate, Option (C), fish oil, and Option (D), niacin, are incorrect because these medications are not first-

line therapies for hyperlipidemia and have not been shown to delay the progression of chronic kidney disease.

Question #5

A 62-year-old man comes to the office for routine follow-up. The patient has retired from civil service with full medical benefits. Medical history includes hypertension, hyperlipidemia, coronary artery disease, stage 3b chronic kidney disease, and type 2 diabetes mellitus. Current medications include carvedilol, amlodipine, furosemide, lisinopril, nitroglycerin transdermal patch, insulin, simvastatin, aspirin, and gabapentin. Weight is 80.7 kg (178 lb), and body mass index is 27.9 kg/m². Heart rate is 88/min, and blood pressure is 172/88 mmHg in the left arm and 170/78 mmHg in the right arm. The patient appears well developed and well nourished, and he is not in acute distress. Which of the following findings in this patient is the most likely cause of continued uncontrolled hypertension?

- A. Body mass index
- B. History of hyperlipidemia
- C. Noncompliance with the drug regimen**
- D. Patient age
- E. Polypharmacy

Content Area: Chronic Kidney Disease (20%)

Critique

This question tests the examinee's ability to assess factors in the patient's presentation and history. The correct answer is Option (C), noncompliance with the drug regimen. In a patient with hypertension, hyperlipidemia, coronary artery disease, and type 2 diabetes mellitus, for which appropriate drug therapies have been prescribed, the most appropriate initial suspected cause of increased blood pressure (confirmed with bilateral measurements) is noncompliance with the drug regimen.

Option (A), body mass index, and Option (D), patient age, are incorrect because these factors are not extreme enough to cause increased blood pressure. Option (B), history of hyperlipidemia, is incorrect because hyperlipidemia does not cause uncontrolled hypertension. Option (E), polypharmacy, is incorrect because the combination of medications prescribed to this patient would not cause hypertension.

Question #6

A 56-year-old woman comes to the emergency department because she has had increasing swelling of the right ankle over the past two days, since she sustained an injury while playing outdoors with her grandchildren. She says she has been taking over-the-counter ibuprofen 400 to 800 mg every four to six hours to relieve the pain. Medical history includes mild hypertension, which is currently controlled with lisinopril. Results of laboratory studies show elevated levels of serum creatinine and blood urea nitrogen. Acute renal failure induced by use of nonsteroidal anti-inflammatory drugs is suspected. On the basis of the suspected diagnosis, which of the following additional abnormal laboratory results is most likely?

- A. Decreased serum chloride level
- B. Decreased serum potassium level
- C. Elevated serum chloride level
- D. Elevated serum potassium level**
- E. Elevated serum sodium level

Content Area: Acute Kidney Injury/ICU Nephrology (11%)

Critique

This question tests the examinee's ability to recognize the adverse effects of medications and the associated laboratory findings. The correct answer is Option (D), elevated serum potassium level. The suspected diagnosis is acute renal failure induced by use of nonsteroidal anti-inflammatory drugs (NSAIDs), which are associated with nephrotoxicity. Because hyperkalemia is the most common manifestation of acute renal failure secondary to use of NSAIDs, the laboratory result that is most likely to be abnormal in the patient described is elevated serum potassium level.

Option (A), decreased serum chloride level, is incorrect because chloride ions are not lost excessively in acute renal failure induced by nonsteroidal anti-inflammatory drug (NSAID) therapy. Option (B), decreased serum potassium level, is incorrect because this finding represents hypokalemia, which is the opposite of what would be noted in a patient with acute renal failure secondary to use of NSAIDs. Option (C), decreased serum sodium level, is incorrect because the patient does not have signs of significant volume overload and because sodium abnormalities are not the most common manifestation of acute renal failure. Option (E), elevated serum sodium level, is incorrect because serum sodium level is rarely elevated above the normal range unless significant dehydration is present.

Question #7

A 65-year-old woman with stage 4 chronic kidney disease secondary to hypertension comes to the office because she has had dysuria and increased urinary frequency during the past two days. She has not had fever or hematuria. Temperature is 37.3°C (99.1°F), heart rate is 90/min, and blood pressure is 142/85 mmHg. On physical examination, no flank tenderness is noted. Urinalysis shows cloudy urine that is positive for leukocyte esterase, nitrites, and protein. Results of urine culture are pending. Which of the following medications is the most appropriate therapy for this patient's condition?

- A. Intramuscular administration of ceftriaxone
- B. Intravenous administration of gentamicin
- C. Intravenous administration of vancomycin
- D. Oral administration of ciprofloxacin**
- E. Oral administration of nitrofurantoin

Content Area: Chronic Kidney Disease (20%)

Critique

This question tests the examinee's ability to identify the disorder, consider the most likely cause, and then determine the most appropriate therapy considering the underlying condition of stage 4 chronic kidney disease. The correct answer is Option (D), oral administration of ciprofloxacin. The patient's symptoms, physical examination findings, and results of urinalysis are consistent with urinary tract infection, and Escherichia coli is the most likely pathogen. On the basis of the causative organism and the options presented, oral administration of ciprofloxacin is the most appropriate management of urinary tract infection in the patient described.

Option (A), intramuscular administration of ceftriaxone, and Option (C), intravenous administration of vancomycin, are incorrect because these are not appropriate first-line therapies for uncomplicated urinary tract infection. Option (B), intravenous administration of gentamicin, is incorrect because this therapy is not appropriate initial management of uncomplicated urinary tract infection. In addition, because gentamicin is nephrotoxic, it should not be used in patients with chronic kidney disease. Option (E), oral administration of nitrofurantoin, is incorrect because it is contraindicated and is ineffective therapy for urinary tract infection in patients with stage 4 chronic kidney disease.

Question #8

A 67-year-old man with mild dementia, in whom peritoneal dialysis was recently initiated because of end-stage renal disease, is brought to the office by his wife because he has had abdominal pain for the past 48 hours. The patient's wife says he has been reusing one cap to close off his peritoneal dialysis catheter. On analysis, a sample of fluid from the catheter is cloudy and grows gram-positive cocci. Which of the following is the most appropriate next step?

- A. Intraperitoneal administration of antibiotics**
- B. Intravenous administration of antibiotics
- C. Retraining of the patient regarding catheter procedures
- D. Retraining of the patient's wife regarding catheter procedures
- E. Transfer of the patient to a hemodialysis clinic

Content Area: End-Stage Renal Disease/Dialysis (17%)

Critique

This question tests the examinee's ability to identify behavior that places a patient at risk and to select the most appropriate intervention. The correct answer is Option (A), intraperitoneal administration of antibiotics. In a patient who is being treated with peritoneal dialysis, reusing one cap to close off the dialysis catheter increases the risk of infection. In the patient described, infection is confirmed by analysis of a sample of fluid from the catheter, which is cloudy and positive for gram-positive cocci. Therefore, the patient's symptom of abdominal pain is a sign of peritonitis and initiation of antibiotic therapy is the most appropriate next step. The intraperitoneal route is most appropriate for delivery of this therapy because it goes straight to the source of the infection and minimizes the risk of systemic side effects and interactions.

Option (B), intravenous administration of antibiotics, is plausible but incorrect because the intraperitoneal route is preferred. Option (C), retraining of the patient regarding catheter procedures, and Option (D), retraining of the patient's wife regarding catheter procedures, are incorrect because although these are important interventions, antibiotic therapy must be initiated first. Peritonitis must be managed before the patient and/or his primary caregiver can be educated regarding methods of preventing recurrence of infection. Option (E), transfer of the patient to a hemodialysis clinic, is incorrect because there is no indication for a change to the present dialysis modality. The most appropriate next step is management of peritonitis with intraperitoneal antibiotics, which are administered during peritoneal dialysis exchanges and not during hemodialysis.

Question #9

A 67-year-old man with stage 4 chronic kidney disease, hypertension, type 2 diabetes mellitus, and anemia of chronic kidney disease comes to the office for routine follow-up. Laboratory findings include the following:

Serum	
Bicarbonate	19 mEq/L
Calcium	9.4 mg/dL
Creatinine	3.24 mg/dL
Fasting glucose	63 mg/dL
Phosphate	4.2 mg/dL
Potassium	3.8 mEq/L
Albumin	4.0 g/dL
Blood urea nitrogen	36 mg/dL
Hematocrit	33.1%
Hemoglobin	11.1 g/dL
Mean corpuscular volume	94 μm^3

Estimation of glomerular filtration rate, calculated using the Modification of Diet in Renal Disease (MDRD) Study equation, is 19 mL/min/1.73 m². Measurement of which of the following additional laboratory values is most appropriate to screen for renal osteodystrophy in this patient?

- A. Erythrocyte sedimentation rate
- B. Serum C-reactive protein level
- C. Serum intact parathyroid hormone level**
- D. Serum thyroid-stimulating hormone level
- E. Serum vitamin B₁₂ level

Content Area: Chronic Kidney Disease (20%)

Critique

This question tests the examinee's ability to determine the cause of a condition on the basis of history and laboratory findings, as well as knowledge of guidelines and appropriate testing for mineral bone disease in patients with chronic kidney disease. The correct answer is Option (C), serum intact parathyroid hormone level. In the patient with stage 4 chronic kidney disease and corresponding abnormal laboratory values, the pathophysiologic response represents mineral bone disease and depletion of serum calcium. The National Kidney Foundation (NKF) Kidney Disease Outcomes Quality Initiative (KDOQI) recommends measurement of serum parathyroid hormone level and therapy for abnormal values to prevent and manage mineral bone disease.

Option (A), erythrocyte sedimentation rate, and Option (B), serum C-reactive protein level, are incorrect because these are markers of inflammation and are not useful in diagnosing mineral bone disease. Option (D), serum thyroid-stimulating hormone level, is incorrect because this test is used for diagnosing primary and secondary hyperthyroidism and hypothyroidism, not mineral bone disease. Option (E), serum vitamin B₁₂ level, is incorrect because this test would be appropriate if anemia secondary to vitamin B₁₂ deficiency were suspected.

Question #10

A 60-year-old woman with end-stage renal disease secondary to diabetic nephropathy comes to the clinic for routine hemodialysis. The patient says she has cramping during hemodialysis as well as weakness after each treatment. Post-treatment, heart rate is 95/min and blood pressure is 90/60 mmHg. On physical examination, auscultation of the chest shows normal breath sounds. Examination of the extremities shows no edema. Which of the following is the most appropriate next step?

- A. Add sodium modeling
- B. Continue monitoring blood pressure
- C. Decrease the dialysate temperature
- D. Decrease the dialysis time
- E. Increase the dry weight**

Content Area: End-Stage Renal Disease/Dialysis (17%)

Critique

This question assesses the examinee's ability to identify common complications of hemodialysis and determine the appropriate next step in management. The correct answer is Option (E), increase the dry weight. Development of cramps during hemodialysis and hypotension after hemodialysis are characteristic of excessive volume removal during the treatment. Increasing the dry weight will prevent excess volume removal and alleviate the associated symptoms.

Option (A), add sodium modeling, is plausible but incorrect because this therapy is most useful when an increased amount of volume removal is required during a hemodialysis treatment, which is not consistent with the patient's clear lung sounds, hypotension, and lack of edema. Option (B), continue monitoring blood pressure, is incorrect because this monitoring does not address the patient's symptoms. Option (C), decrease the dialysate temperature, is incorrect because although this intervention might improve the ability to ultrafiltrate fluid in patients with hypotension who are being treated with hemodialysis, ultrafiltration is not required in the patient described because her lungs are clear and no edema is noted. Option (D), decrease the dialysis time, is incorrect because even if the dialysis time is decreased, the same amount of fluid will be removed and the patient will continue to have cramping and hypotension.