



Nephrology Education Research and Development Consortium (NERDC)

Version: Final

Total Points: 58

1 May 2019

Dialysis Orders OSCE: 3 scenarios

Time: Up to 120 minutes

Scenarios may be given individually

This is a formative test. Please read the following cases carefully, write a set of dialysis orders (you should use the standard order sets available at your institution, if permitted by your Program Director), and answer content questions for each patient below. Normal laboratory values are given within each case.

Case 1. Acute CRRT for AKI (Total points: 20)

55-year-old anuric female in the ICU with septic shock. Pt has a past medical history significant for acute myelogenous leukemia, and prior to transfer was on the oncology ward. She is neutropenic, with an absolute neutrophil count of 200, and completed her initial induction cycle of cytarabine and daunorubicin 10 days ago. She complained of feeling feverish with body aches about midnight, but had no other specific complaints and general review of systems was negative. No other past medical history, no surgeries, medications as listed below, no known allergies, and no other pertinent history at this time. The ICU calls you for acute dialysis due to worsening acidemia, and have already placed a hemodialysis catheter.

Physical Examination: Wgt 80kg; O₂ saturation 92% on 70% FIO₂; RR 16-25

VS trend	6:00 am	7:00 am	8:00 am	9:00 am	10:00 am
HR (bpm)	145	140	120	125	120
BP (mmHg)	75/32	80/40	80/40	90/50	92/45
Temperature °F	103.5	103.5	102.7	102	102

Intubated, sedated female with no acute findings on exam except coarse breath sounds throughout and bilateral lower extremity petechia. No edema.

Tubes/Lines/Drains: Endotracheal tube, oral-gastric tube, Foley catheter, right IJ port, left IJ central line, 2-18 gauge IVs, and a **left femoral hemodialysis catheter**.

Vent setting: Intubated at 530 am. Assist Control; Tidal Volume 400ml; PEEP 8; FiO₂ 70%

Ins/Outs	6:00 am	7:00 am	8:00 am	9:00 am	10:00 am
Normal Saline	2000ml	0ml	1000ml	1000ml	250ml
Albumin 5%	0ml	250ml	0ml	0ml	250ml
Norepinephrine	Turned on	Titrated up	Titrated up	Stable high dose	Stable high dose
Vasopressin		Added	Stable dose	Stable dose	Stable dose
Blood products	1U PRBC	2U platelets			
Antibiotics/IV Medications	250 ml	50 ml	0 ml	100 ml	0 ml
Urine Output	15 ml	5 ml	0 ml	0 ml	5 ml

Labs

CBC	6:00 am	10:00 am
WBC (3.6-10.6K)	0.6	0.55
Hgb g/dL (12.8-17.7)	6	7.2
HCT (%) (37.5-50.9)	18	21.7
PLT (162-427K)	<10K	25K

Basic Metabolic Panel	6:00	8:00	10:00

Na (136-145 meq/L)	140	144	145
K+ (3.5-5.1 meq/L)	3.4	4.9	5.0
Cl- (98-107 meq/L)	103	110	112
HCO ₃ ⁻ (22-26 meq/L)	20	15	6
BUN (5-20 mg/dL)	9	8	15
Cr (0.7-1.2 mg/dL)	0.8	1.1	1.1
GLucose (74-104 mg/dl)	99	97	105
Lactate (< 2 mmol/L)	6	13	22
Serum Albumin (3.5-5.2 g/dL)	2.5	2.3	2.3
Serum Calcium (8.6-10.2 mg/dL)	8.0	8.1	8.0
Serum Phosphorus (2.5-4.5 md/dL)	4.5		
iCa (1.1-1.35 mmol/L)	1.0		

ABG:	6:00	8:00	9:00	10:00
pH (7.35-7.45)	7.35	7.32	7.22	7.12
pCO ₂ (35-45 mmHg)	36	30	25	19
PaO ₂ (75-100 mmHg)	125	90	62	65
HCO ₃ ⁻ (22-26 meq/L)	19	15	10	6
INR: (0.8-1.2 in patient not on warfarin)	1.9		2.0	

Radiology: CXR, portable film: diffuse interstitial infiltrates consistent with pulmonary edema

Medications: Piperacillin/Tazobactam 2.25gms IV every 6 hrs; Fluconazole 400 mg PO daily; Esomeprazole 40mg po daily, vasopression under titration IV; norepinephrine under titration IV; propofol IV and fentanyl IV titration for sedation

Answer the following questions:

1. Completely describe the acid-base abnormality in this patient, including compensatory responses at 10 am. (You may assume a normal anion gap of 12 meq/L.)
2. **(15 points)** You and your attending decide to perform CRRT. With the above information, please write an initial set of CRRT orders for this patient using the standard CRRT machine and filter set at your institution (e.g. NxStage, Prisma/Prismaflex, Fresenius in CRRT mode). **Do not use SLED or SHIFT. Include patient hemodynamic and therapy monitoring as part of your orders, as well as nursing interventions to be taken in response to monitoring thresholds.**
3. Please explain your choice of bicarbonate concentration in your dialysate and/or replacement fluid.
4. Your patient is stable after 6 hour of CRRT. The pressor requirement has decreased significantly, and the current average hourly volume input is 250 ml/hour. Urine output remains < 10 ml/hour. What modifications might you make to your prescription?
5.
 - a. Estimate the patient's urea clearance in ml/min. (Show your work.)
 - b. In general, discuss how will you adjust drug dosing while the patient is on CRRT. (You need not make calculations for specific drugs.)

Answers:

1.

2. Please attach your orders. Put your anonymous ID number on them.

3.

4.

5.

Case 2. Dialysis Initiation in ESRD (Total points: 21)

75-year-old female with CKD stage 5, presumed secondary to hypertensive nephrosclerosis, with eGFR of 10 ml/min/1.73m² at last visit, has been lost to follow-up due to many hospital admissions for exacerbations of congestive heart failure over the past 3 months. She has worsening metabolic acidosis and increasingly difficult-to-control volume status. Her diuretics have been titrated upwards, which improved her dyspnea on exertion and lower extremity edema, but have resulted in an increasing BUN/Cr, with increasing “soft” uremic signs and symptoms such as poor appetite, and increasing fatigue. She has a left upper extremity arteriovenous fistula with a good thrill and bruit that has been evaluated by the dialysis nurses and vascular surgeons and deemed ready to use. Today, she is complaining of decreased appetite with nausea and vomiting, a “funny taste in her mouth,” inability to sleep after 2 or 3 am, and significant fatigue.

Past Medical History: HTN since age 35, noted after developing pre-eclampsia with first pregnancy; Hyperlipidemia; CKD stage 5 as above with worsening metabolic acidosis; congestive heart failure with ejection fraction of 35-40% on last Echocardiogram one month ago, and history of diastolic dysfunction; secondary hyperparathyroidism; anemia of chronic kidney disease

Past Surgical History: Placement of left upper extremity arteriovenous fistula 9 months ago. No other.

Allergies: none known

Family History: non-contributory.

Social History: lives with husband in single family home and works part-time in a nail salon. No history of tobacco or alcohol use.

Medications: amlodipine 10mg daily, carvedilol IR 12.5mg twice daily, telmisartan 40mg daily, lasix 80mg twice daily, atorvastatin 40mg daily, aspirin 325mg daily, calcium carbonate 650mg, 2 tabs twice daily with meals, calcitriol 0.25mcg three times a week, sodium bicarbonate 650mg two tabs twice daily, darbapoeitin 25mcg subcutaneously once a month, ferrous sulfate 325mg two times daily

Physical Examination: HR 84 (regular rate and rhythm) ; BP 158/98; Ht: 5'0"; Wt: 135 lbs (126 lbs 3 months ago). RR 16. O₂ saturation on room air: 94%

Significant findings include soft bibasilar crackles, + S₄, no pericardial rub, and 2+ BLE pitting edema to knees. She has mild asterixis. Left upper arm fistula, well developed, with good thrill and bruit. Patient alert and oriented to person, place, time and situation.

Labs:

Na 144 meq/L (136-145); Cl 95 meq/L (98-107); K 4.5 meq/L (3.5-5.1); HCO₃ 25 meq/L (22-26); BUN 95 mg/dL (5-20); Cr 6.13 mg/dL (0.7-1.2); Glucose 84 mg/dL (74-104); Calcium 7.4 mg/dL (8.6-10.2);

Phosphorus 7.4 mg/dL (2.5-4.5). Albumin 3.2 g/dL (3.5-5.2).

eGFR 5 ml/min/1.73m².

WBC 8.5K (3.6-10.6); Hgb 8.0 g/dL (12.8-17.7); Hct 25% (37.5-50.9), Platelets 241K (162-427)

Answer the following questions:

- 1) Recognizing that there is no pH and pCO₂, describe as completely as possible the acid-base abnormality(s). (Assume a normal anion gap of 12 meq/L.)
- 2) **(11 points)** Please write a complete set of dialysis orders for this patient's first day of dialysis, and delineate your plan for hemodynamic and respiratory monitoring, nursing interventions to be taken

based on monitoring thresholds, choice of kidney, Qb/Qd, duration of first treatment, anticoagulation, and choice of dialysate composition.

- 3) In general (not necessarily present in this patient), name the two absolute indications for urgent chronic dialysis initiation in ESRD.
- 4) Name 4 other compelling indications for chronic dialysis initiation in ESRD.
- 5) a) What neurologic condition could this patient be at risk for during and post-dialysis initiation?
b) What is the pathophysiology?
c) What are the symptoms and signs (list mild and severe)?

Answers:

1.

2. Please attach your orders. Put the anonymous ID number on them.

3. a.

b.

4. a.

b.

c.

d.

5. a.

b.

c. Mild:

Severe:

Case 3. Acute Inpatient Dialysis in an ESRD patient (Total points: 17)

55 year old, anuric man with ESRD secondary to obstructive nephrolithiasis presents at midnight late on a Sunday to the emergency room with muscle weakness, increasing shortness of breath, and dyspnea on exertion over the last 8 hours. He is on a Monday, Wednesday, Friday hemodialysis schedule and his last dialysis was Friday, for 4 hours 15 minutes. He left at his dry weight of 102kg. Upon questioning, he reports going to a family reunion on Sunday at noon and enjoying a lunch of crabs, shrimp, carrot raisin salad and French fries with sweet tea.

Past Medical History: ESRD due to obstructive nephrolithiasis s/p cadaveric renal transplant in 1995 and returned to ESRD due to chronic rejection. Gout, HTN, hyperlipidemia, paroxysmal atrial fibrillation, renal osteodystrophy

Past Surgical History: Cadaveric renal transplant in 1995, peritoneal dialysis catheter placement in 2004 and removal in 2006. Left upper arm AV fistula placed in 2006—which is functioning well with venous pressures <80 mmHg at 200 ml/min blood flow rate.

Allergies: None known.

No contributory family history

Social History: lives with wife in a single family home and is retired

Medications: warfarin 5mg daily, Lopressor 100mg twice daily, telmisartan 80mg daily, nephrocap 1 daily, colchicine 0.6mg per day prn acute gout flare, allopurinol 100mg daily, calcium carbonate 500mg three tabs with each meal, sevelamer carbonate 800mg three tabs with each meal and 1 tab with snacks, erythropoietin 4500 units subcutaneously three times weekly, ergocalciferol 50,000IU weekly, calcitriol 1 mcg three times weekly, lovaza 2 grams twice daily

Chronic Dialysis Prescription: L upper arm AVF; Optiflux 200; Qb 400 ml/min; Qd 600 ml/min; Dialysate: 140 mEq/L Na, 2 mEq/L K; 30 mEq/L HCO₃; 2.5 mEq/L Ca. Heparin (usually receives no more than 1000 units at beginning of therapy, due to warfarin use). 4 hours 15 minutes, three times weekly. Dry Weight 102 kg.

Physical Examination: VS: HR: 94--irregular; BP 196/106; afebrile; 86% O₂ saturation on room air → increases to 92% on 6L O₂ by nasal cannula; Wt: 109kg

Significant findings include crackles ½ up bilateral lung fields with decreased breath sounds at the bases, 1+ BLE edema. His left upper arm AV fistula is well developed, and has a good thrill and bruit.

Labs:

Renal function panel: Na 138 meq/L (136-145), K 7.9 meq/L (3.5-5.1), Cl 100 meq/L (98-107), HCO₃ 24 meq/L (22-26), BUN 31 mg/dL (5-20), Cr 8.53 mg/dL (0.7-1.2), Ca 8.9 mg/dL (8.6-10.2), Phos 5.5 mg/dL (2.5-4.5)

INR: 3 (2-3 for patient on warfarin)

Chest X-ray: diffuse interstitial infiltrates, small bilateral pleural effusions

You are called at 1:00 am on Monday from the Emergency Room with the above information. The intern states that they have not initiated therapy for hyperkalemia because they think it is just a lab

error because the patient received his full hemodialysis treatment on Friday, and will be receiving dialysis tomorrow on Monday routinely in the morning. They are awaiting a repeat potassium level.

Please answer the following questions:

- 1) **(6 points)** Please write detailed orders for monitoring, testing, treatments (including doses, order, and frequency) , and/or disposition you want the intern to do at this point over the next 60-90 minutes, if any?
- 2) Is acute dialysis indicated? Why or why not?
- 3) Estimate the time it will take in this situation to begin dialysis.
- 4) **(4 points)** Please write a complete set of dialysis orders for this patient, including your patient and therapy monitoring plan during the treatment.
- 5) What are your criteria for stopping dialysis, and how long, at minimum, do you estimate that you will need to continue dialysis?
- 6) What is your monitoring plan (including follow-up labs) once the patient has completed your prescribed dialysis session?
- 7) Repeat potassium sent before the intern called you returned at 8.1 meq/L. In addition to dietary indiscretion, indicate at least 2 other potential contributors to his hyperkalemia.

Answers:

1.

2.

3.

4. Please attach your orders. Put the anonymous ID number on them.

5.

6.

7. a.
b.