

Nephrology Board Review Practice 2

Q & A

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Clinical Interests: ICU Nephrology, Lupus Nephritis

Academic Interests:

Lupus Nephritis

Post-graduate Education



Disclosures

- Alexion Pharmaceuticals – Research Support
- Allena Pharmaceuticals – Advisor
- Advanced Instruments - Consultant



Question 1

A 82-year-old female with type 2 diabetes mellitus, hypertension, hyperlipidemia, and CKD (serum creatinine, 2.3 mg/dL) has exertional chest pain consistent with myocardial ischemia. A stress test is positive. Prior to cardiac catheterization, she is given intravenous fluids and n-acetylcysteine to prevent contrast nephropathy. The left anterior descending artery is stented, and she is started on clopidogrel. Approximately 4 days later, she develops oliguria, azotemia (creatinine 2.8 mg/dL), abdominal pain and has evidence of GI bleeding. Which of the following is the most likely cause of AKI?

- A) Cholesterol embolization to the renal arteries
- B) Pre-renal azotemia
- C) Ischemic acute tubular necrosis caused by hypotension during catheterization
- D) Radiocontrast-induced nephrotoxicity

Question 1

A 82-year-old female with type 2 diabetes mellitus, hypertension, hyperlipidemia, and CKD (serum creatinine, 2.3 mg/dL) has exertional chest pain consistent with myocardial ischemia. A stress test is positive. Prior to cardiac catheterization, she is given intravenous fluids and N-acetylcysteine to prevent contrast nephropathy. The left anterior descending artery is stented, and she is started on clopidogrel. Approximately 4 days post-procedure, she develops oliguria, azotemia (creatinine 2.8 mg/dL), abdominal pain, fever and tarry stools. Which of the following is the most likely cause of AKI?

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- AKI occurred at 4 days post-catheterization
- Typical time course for contrast nephropathy 24-48 hours
- Abdominal pain, fever and GI bleeding suggestive of cholesterol embolization
 - Other signs/symptoms may include peripheral eosinophilia, depressed complement levels, blue toes
 - Sediment may be active
 - Can be diagnosed on renal biopsy (cholesterol cleft)

Question 2

A 25-year-old female with no significant history, is referred by her PCP for new onset hypertension. On exam she is a thin female with normal heart and lung exam. There is no edema and exam is otherwise normal. Blood pressure is 190/95 and equal in both arms. Urinalysis is normal and labs are notable for a creatinine of 1.2, potassium of 4.0 and bicarbonate of 24. She denies intake of over the counter or prescription medications, and family history is unremarkable. What is the most appropriate next step in the work-up of the hypertension?

- A) No additional testing—secondary hypertension is unlikely.
- B) 24 hour collection for catecholamine
- C) Renal artery imaging
- D) Genetic testing for Gordon's syndrome

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Question 3

Renal MRI/MRA is ordered and shows the following. What is the most appropriate next step in the treatment of this patient's hypertension?

- A) Renal artery bypass.
- B) Renal artery stenting
- C) Renal artery angioplasty
- D) ACE-inhibition



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- Secondary hypertension suggested by young age and apparently abrupt onset of hypertension
- Gordon's syndrome (activating mutation in thiazide channel/wnk-kinases) unlikely to have onset in 20s. Also not suggested by absence of familial history or hyperkalemia
- Renal artery stenosis is most common cause of secondary hypertension and may be present in >40% of patients with malignant hypertension

- Most common cause of renal artery stenosis in young female is fibromuscular dysplasia
- Typical imaging appearance is “string of beads”
- Responds well to native angioplasty with low risk of recurrence
- Consider imaging carotids to rule out stenosis in other large arteries, as can be systemic condition

Question 4

A 43-year-old male construction worker presents after being found at home lethargic and confused. He was last seen in good health approximately 12 hours earlier. He is afebrile with a BP of 102/55 and tachycardia. He is arousable but lethargic and confused. Respirations are shallow. Lungs are clear and abdomen is benign. Neurologic exam is non-focal and physical exam is otherwise unremarkable. Labs and studies are notable for the following: WBC 9.5 Na 141 K 4.2 Cl 102 Bicarbonate 12 Bun 44 Creat 1.5 Glucose 122. Laboratory urinalysis has a pH of 5.5, negative ketones, trace protein and rare RBC and WBC. Head CT and CXR are normal

What is the best combination of tests to determine the etiology of this patient's syndrome?

- A) Lumbar puncture, blood and urine cultures
- B) Blood gas and urine toxicology
- C) Blood gas, lactate levels and serum osmolality
- D) Methanol and ethanol levels

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Question 5

1 hour later the patient's wife is reached. She states that the patient has been depressed lately and that she found an empty bottle of antifreeze in the kitchen.

What is the appropriate treatment for this patient

- A) Ethanol
- B) CVVH
- C) Dialysis
- D) Dialysis and fomepizole

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- Dominant features in presentation are mental status changes and possible anion gap acidosis without obvious infection—findings should raise red flag to possibility of ingestion
- Blood gas is needed to confirm presence of acidosis
- Lactate level will rule out lactic acidosis as cause of acidosis
- Measuring serum osmolality allows rapid calculation of serum osmolar gap. Gap > 20 is suggestive of methanol, ethylene glycol or isopropyl alcohol ingestion. However, only methanol, and ethylene glycol are likely to cause this degree of AG acidosis in the absence of ketones or lactate-
ISOPROPYL ALCOHOL NOT ASSOCIATED WITH AG ACIDOSIS.
- Methanol level and ethylene glycol often not measured locally. Turn-around time may be too slow for use in rapid decision making
- Where suspicion of ingestion is moderate dialysis/fomepizole may be initiated on the basis of elevated Osm gap and unexplained anion gap acidosis while awaiting methanol or ethylene glycol levels

- Acids
 - Ethylene glycol-glycolic acid
 - Methanol—formic acid
- Osm gap is produced by ethylene glycol not by glycolic acid.
 - acidosis may not be present until ethylene glycol is metabolized to glycolic acid
 - Osm gap may no longer be present once acidosis is present
- CVVH will remove toxic alcohols but more slowly than HD. Thus prolonged HD therapy is treatment of choice for rapid reduction in levels
- Indications for dialysis/fomepizole
 - Acidosis ($\text{pH} < 7.3$)
 - Renal failure
 - Ethylene glycol level $> 50 \text{ mg/dL}$
 - Methanol level $> 50 \text{ mg/dL}$

Question 6

A 68 year old female with ESRD secondary to diabetes and hypertension is on maintenance HD. Current medications include aspirin, atorvastatin, insulin, lisinopril (held pre-HD), erythropoietin, calcitriol, calcium acetate, and weekly iron sucrose. On pre-dialysis exam she generally has basilar rales, 2+ peripheral edema and BP \geq 150/80. Intradialytic weight gains average 2.5 kg and dry weight is listed as 72 kg. The nephrologist asks the nurses to change the dry weight to 70 kg in an attempt to remove edema and achieve clear lungs. Over the course of several weeks the patient has repeated cramping and intra-dialytic hypotension and is unable to achieve a weight of below 72 kg. The patient currently receives 4 hours of dialysis with sodium modeling (145/140/135). Qb is 400 and QD is 800. What is the most appropriate next step with this patient?

- A) Change dry weight back to 72 kg
- B) Give albumin infusions during dialysis
- C) Change dialysis orders to 1 hour of ultrafiltration followed by 3 hours of dialysis
- D) Cool dialysate to 35 degrees

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- Intradialytic hypotension (IDH) is common complication of dialysis that occurs in 20-30% of treatments and is a repeated issue in a subset of patients
- Frequent IDH is associated with high risk of long-term morbidity and mortality
- Etiology
 - Impaired catecholamine release in ESRD
 - Autonomic neuropathy/impaired vascular tone
 - Increased adenosine levels
 - Reduce myocardial contractility

- Treatments for IDH
 - Cool dialysate (35 or 36 degrees)
 - Sodium modeling
 - Ultrafiltration profiling
 - Albumin/hypertonic saline infusion
 - Blood volume monitoring
 - High calcium dialysate
 - Isolated ultrafiltration
 - Abdominal band/raising legs (increases venous return)
 - Adenosine antagonists (not available in U.S.)
 - Midodrine/vasopressin

- Clinical trials support efficacy of cool dialysate, sodium modeling, abdominal band, adenosine antagonists, midodrine and vasopressin
- Isolated ultrafiltration and albumin infusion appear to be poorly effective
- Cool dialysate
 - well tolerated by most patients (step down to 35°C)
 - may improve myocardial perfusion/contractility
- Na modelling may result in relative hypernatremia-leading to increase intradialytic weight gains

Question 7

A 77 year old male is admitted with 2-3 days of nausea, vomiting and constipation. On admission he is noted to be confused and lethargic. PMH is notable for Crohn's disease, hypertension, congestive heart failure, coronary bypass surgery and chronic kidney disease with a baseline creatinine of 1.6. On admission he is noted to be hypotensive and bradycardic with abdominal tenderness, marked abdominal distension and absent bowel sounds. Neurologic exam is notable for absent deep tendon reflexes and dilated pupils. Which of the following best explains his presentation?

- A) Hypokalemia
- B) Hyperkalemia
- C) Hypercalcemia
- D) Hypermagnesemia

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Question 8

Over the course of 4 hours blood pressure declines, bradycardia worsens, multiple pressors are required and the patient becomes oliguric. The patient requires intubation. Imaging is notable for marked ileus and slight pulmonary congestion. Laboratory data reveals the following:

Na 143 K 4.3 Cl 111 CO2 21 BUN 50 Creatinine 2.1 Glucose 150, Calcium 10.0 Phos 3.1, Magnesium 8.9 WBC 8.9, Hemoglobin 11.3

Treatment for this patient should include

- A) Dialysis
- B) Calcium infusion followed by dialysis
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- Patient has hypermagnesemia
- Symptoms
 - Nausea/vomiting
 - Ileus
 - Depressed reflexes
 - Decreased parasympathetic tone (dilated pupils)
 - Paralysis/apnea/respiratory depression
 - Bradycardia
 - PR and QT prolongation
 - Hypotension
 - Ventricular fibrillation/bradycardic arrest

- Most filtered magnesium is reabsorbed therefore toxicity rarely occurs except when Mg administration is combined with renal failure
- Mild Toxicity < 6 mg/dL
- Moderate 6-10 mg/dL
- Severe >10 mg/dL
- Toxicity more common with oral than intravenous magnesium
- Severe symptoms have been described with levels between 6-10 and bradycardia/hypotension not unusual at this level mg/dL

- Mild toxicity can be treated with fluid and diuretics to promote excretion (if renal function adequate)
- Dialysis is indicated in severe cases, moderate cases with evidence of significant complications, or when renal failure is present
- CVVH may clear Mg too slowly to be useful in moderate to severe cases
- Calcium administration indicated when cardiac toxicity present
 - Mg blocks Ca receptors

Question 9

A 72 year-old hemodialysis patient presents with fever, chills and positive blood cultures for staph aureus. He dialyzes via a right internal jugular tunneled line. Medical history is notable for defunct right and left upper arm fistulas and stenosis of the left internal jugular and subclavian veins. Temperature is 38°C, HR 100 and BP 140/90. The patient looks uncomfortable but not toxic. What is the appropriate management?

- A) Immediate line removal and vancomycin for 3 weeks
- B) Vancomycin for 3 weeks without line removal
- C) Vancomycin for 3 weeks with exchange of line over wire in 2-3 days
- D) Gentamycin lock and intravenous vancomycin for 3 weeks

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Question 10

Over 48 hours the patient develops a pressor requirement and continues to spike high-grade temperatures. What is the most appropriate step?

- A) Echocardiogram to rule out endocarditis
- B) Pull the catheter and dialyze via temporary catheter until clinically stable
- C) Add gram negative and fungal coverage
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- Patient with line infection but clinically stable
- Extended antibiotic course is appropriate
- Treating through lines is associated with high recurrence and incidence of complications (endocarditis, osteo).
- Immediate removal is safe but requires temporary access and may “burn” through access sites more quickly than catheter lock or guidewire exchange
- Guidewire exchange in stable patients preserves access sites, avoids need for temporary lines and is associated with high cure rates and low recurrent rates in non randomized series (recurrence <10%)
 - Not appropriate for unstable patients
- Gentamycin/antibiotic locks highly effective in gram negative infections but may be less effective in gram positive infections

Question 11

An 35-year-old man presents with acute flank pain and is noted to have a non-obstructing 6 mm calculus in the right uretero-pelvic junction and several smaller stones. He is sent home from the emergency room with a narcotic prescription and told to follow-up with a nephrologist. In addition to analgesia, appropriate steps at this point include.

- A) Urology referral for lithotripsy
- B) 24 hour urine collection and metabolic work-up
- C) Straining the urine and analysis of any retrieved stones
- D) No work-up is necessary in a first stone episode
- E) B & C

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Question 12

The patient's medical history is remarkable for hypertension. Family history is negative for stones. Dietary history is unremarkable. His only medication is atenolol. Urinalysis and serum chemistries are unremarkable. PTH is within normal limits. A 24 hour urinary collection shows the following: Volume 1.7 liters, Calcium 400 mg/day, Oxalate 45, Citrate 150 mg/day, urate 145 mg/day, sodium 190 mg/day pH 6.0

What interventions should you recommend?

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- B) Potassium citrate
- C) Increase fluid intake, decrease salt intake
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- Need for work-up is equivocal after 1st stone, However more than 50% of stone formers recur within 10 years. Risk of recurrence in this case higher due to presence of multiple stones on imaging
- Calcium oxalate is most common form of stone (70%), followed by calcium phosphate (10%)
- Stone analysis should be performed wherever feasible so that therapy can be tailored to preventing super-saturation of urine with stone constituents
- Stones less than 8 mm usually pass spontaneously
- 24 hour urine reveals low volume, high calcium excretion, hypocitraturia and high sodium intake. Supersaturations may be more important than absolute excretion
- Increasing urine volume to > 2L/day is cornerstone of therapy

- High Na intake promotes calcium excretion. Thus, it may be reasonable to increase urine volume and decrease Na intake as first step with repeat collection in 4-6 weeks.
- Allopurinol effective in hyperuricosuria calcium stone formers
- Thiazides can decrease calcium excretion and prevent recurrence
- Citrate shown to prevent recurrent stones when given as K-citrate but not as Na-citrate
- A low calcium diet-NEVER THE ANSWER-may promote osteopenia, in hypercalciuric patients and may increase urinary oxalate excretion.

Question 13

A 82-year-old man is admitted to the intensive care unit following exploratory laparotomy and resection of a perforation at the ileocecal junction. Over the 1st 4 post-operative days his pressors are weaned and ventilatory requirements are weaned. On hospital day 5 the patient becomes lethargic, hypotensive and oliguric and is noted to have intermittent atrial arrhythmias and ventricular ectopy. Abdominal exam is notable for marked tenderness, and labs are notable for an amylase of 225 mg/dL, creatinine of 1.9 mg/dL, bicarbonate of 14, anion Gap of 18 and CPK of 5800. What is the most likely explanation of this patients presentation?

- A) Propofol toxicity
- B) Propylene glycol toxicity
- C) ATN from pancreatitis
- D) Dehiscence at suture line with intra-abdominal sepsis

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- Propylene glycol (PG) toxicity can be seen with prolonged infusion of lorazepam, digoxin, phenytoin, trimethoprim and diazepam, but most common with lorazepam. NOT MIDAZOLAM.
- PG is the carrier for the drug and has higher concentration in lorazepam infusion than in other medications
- PG is osmotically active, renally cleared, and metabolized to lactate
- Accumulation can result in osmolar gap, anion gap acidosis, and osmotic diuresis with resultant renal failure
- Can be dialyzed in severe cases

- Multiple potential explanations for patients symptoms but pancreatitis alone unlikely to explain arrhythmias, confusion or CPK elevation. Surgical catastrophe less likely to be associated with left upper quadrant symptoms, elevated amylase, or CK leak
- Patient has propofol infusion syndrome which is characterized by confusion, cardiac toxicity, pancreatitis, rhabdomyolysis, lactic acidosis and kidney injury
 - Risk factors include rapid infusion of propofol or prolonged infusion (>48 hours)
 - Treat with propofol withdrawal and supportive measures

Question 14

A 77-year-old dialysis patient complains of progressive discomfort on his arms and legs. Physical examination reveals the following:



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What is the most likely diagnosis?

- A) Scleroderma
- B) Calciphylaxis
- C) β -2 microglobulin amyloidosis
- D) Nephrogenic fibrosing dermopathy



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- A) Scleroderma
- B) Calciphylaxis
- C) β -2 microglobulin amyloidosis
- D) Nephrogenic fibrosing dermopathy**

- This patient has nephrogenic fibrosing dermopathy
- Characterized by diffuse hyperpigmented or yellow brawny induration of the skin particularly over forearms and shins
 - May be diffuse and progressive
 - May lead to disabling flexion contractures
 - Appearance similar to plaques of scleroderma but distribution is different and not associated with auto-antibodies.
- Biopsy demonstrates CD34 expressing, dermal fibrocystic spindle-cell proliferation with minimal inflammation
- Strongly associated with prior Gadolinium exposure which should be avoided in patients with ESRD
 - Role of prophylactic dialysis post-Gadolinium exposure uncertain

Question 15

A 32 year old woman is pregnant for the first time. Her past medical history is notable for bipolar disease currently controlled on carbamazepine. She is admitted at 11 weeks of pregnancy with nausea and vomiting. Admission labs are notable for a creatinine 0.5 mg/dL, Na of 133, K of 4.0, and exam is remarkable for a blood pressure of 100/60, heart rate of 70, moist mucous membranes and brisk capillary refill. Nephrology consult is requested for evaluation of hyponatremia.

What interventions should you recommend for treatment of hyponatremia?

- A) Start normal saline for volume depletion
- B) Fluid restriction to <1.5 L/day while awaiting urine electrolytes for work-up of hyponatremia
- C) Hypertonic saline
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- The sodium level in this patient is normal for pregnancy. No further testing is needed
- Sodium level decreases approximately 5 meq/L during pregnancy due to changes in threshold for ADH release, production of placental vasopressinase, and changes in thirst threshold
- Hypertonic saline indicated only for severe symptomatic hyponatremia

Question 16

The patient is discharged and has an uneventful pregnancy. At 38 weeks she is admitted with vaginal bleeding. On review of systems, she complains of frequent urination and thirst. Serum sodium is 138 and urine volume is 5 liters/day.

Choose the correct answer.

- A) The patient most likely has lithium induced diabetes insipidus
- B) Serum glucose should be checked to rule out pregnancy induced diabetes
- C) dDAVP is likely to be a better treatment than AVP
- D) A water restriction test should be performed

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- The rise in serum sodium at this stage of pregnancy is suggestive of pregnancy-induced diabetes insipidus
- Placental vasopressinase increases during pregnancy, and at 22-24 weeks vasopressin clearance is increased 4-fold compared to pre-pregnancy values. Pre-existing diabetes insipidus may be exacerbated by this increase in vasopressin clearance
- In a minority of patients, the increase in vasopressin may be exaggerated and cause *de novo* diabetes insipidus that typically has an onset during the late 2nd or during the 3rd trimester of pregnancy
- Placental vasopressinase inactivates vasopressin but has no effect on its structural analogue dAVP
 - In the appropriate setting a failure to increase urine osmolality with AVP while appropriately responding with the same dose of dAVP is diagnostic of pregnancy induced DI
- Typically resolves within a few days of delivery

Question 17

A 76 year old PD is patient is admitted with profound hypoglycemia. He takes 10 units of long-acting insulin twice daily and uses short-acting insulin at meals according to a sliding scale. His wife states that the patient has been in his usual state of health. Exam is unremarkable and temperature is 36.8°C. White count is 7 with a normal differential. Chest x-ray, abdominal imaging, urinalysis and blood and urine cultures are negative. The most likely cause of hypoglycemia is:

- A) Malfunctioning glucometer
- B) Occult infection
- C) Icodextrin
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- Icodextrin is a glucose polymer that is metabolized in the circulation and lymphatics to maltose, maltotriose and maltotetraose
- Glucometers measure glucose based on enzymatic reactions such glucose oxidase (GOD) and glucose dehydrogenase using pyrroloquinolinequinone cofactor (GDH/PQQ)
- Maltose and other icodextrin metabolites may react in these enzymatic processes and cause **spurious hyperglycemia that can result in insulin overdose**

Question 18

A 38 year-old male presents with slowly progressive azotemia and hypertension that is well controlled on a thiazide diuretic and low-dose ACE-inhibitor. Family history is notable for a mother who developed ESRD in her 50s of uncertain etiology. He has no other medical history. Physical exam is notable only for a blood pressure of 135/85. Urinalysis is bland, and other labs are notable for a creatinine of 1.7 mg/dL, urea nitrogen of 38 mg/dL, potassium of 4.2 meq/L, calcium of 9.6 mg/dL, phosphorous of 4.3 mg/dL and uric acid of 8.1 mg/dL. Protein:creatinine ratio is 0.45. Renal ultrasound show 9 cm kidneys with 1 simple cyst on the left. The most likely diagnosis is:

- A) Hypertensive nephropathy
- B) Polycystic kidney disease
- C) Sarcoidosis
- D) Juvenile hyperuricemia nephropathy

Question 18

A 38 year-old male presents with slowly progressive azotemia and hypertension that is well controlled on a thiazide diuretic and low-dose ACE-inhibitor. Family history is notable for a mother who developed ESRD in her 50s of uncertain etiology. He has no other medical history. Physical exam is notable only for a blood pressure of 135/85. Urinalysis is bland, and other labs are notable for a creatinine of 1.7 mg/dL, urea nitrogen of 38 mg/dL, potassium of 4.2 meq/L, calcium of 9.6 mg/dL, phosphorous of 4.3 mg/dL and uric acid of 8.1 mg/dL. Protein:creatinine ratio is 0.45. Renal ultrasound show 9 cm kidneys with 1 simple cyst on the left. The most likely diagnosis is:

- A) Hypertensive nephropathy
- B) Polycystic kidney disease
- C) Sarcoidosis
- D) Juvenile hyperuricemia nephropathy**

- This patient has juvenile hyperuricemia nephropathy type 2
 - Caused by genetic defects in uromodulin gene (Tamm-Horsfall protein)
 - Associated with hyperuricemia, gout, and slowly progressive bland renal failure that first appears in the 3rd-5th decades and progresses over 10+ years
 - Small kidneys on ultrasound
 - Medullary cysts may be present at late stages but are difficult to detect on ultrasound
 - Proteinuria generally < 1 gm/day
 - Renal biopsy may show interstitial nephritis but changes are non-specific on standard biopsy
 - Distribution of Tamm-Horsfall protein altered

- Non-hypouricemic forms of hereditary interstitial kidney disease
 - Medullary Cystic Kidney Disease Type 1
 - MUC1 mutation
 - Gout late or absent
 - ESRD onset 20-70
 - Renin Gene Defects
 - REN mutation
 - Gout late or absent
 - No medullary cysts
 - Onset age 40-70
 - Associated with childhood hypoproliferative anemia
 - Frequent hyperkalemia and hypotension

Question 19

What is the appropriate dose of CVVH for patients with AKI?

- A) ≥ 2000 mL/hour of effluent
- B) ≥ 35 mL/kg/hour of replacement solution
- C) ≥ 20 mL/kg/hour of replacement solution
- D) ≥ 20 mL/kg/hour of effluent solution

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- With convective renal replacement therapy (CVVH), effluent is fully saturated with respect to low molecular weight substrates
 - Equivalent to saying sieving coefficient is 1
 - Clearance is thus equal to the effluent rate minus correction for any pre-dilution
- Data has been conflicting but larger studies including Australia-New Zealand trial and VA-NIH trial suggest no benefit above effluent rate of 20 mL/kg/hour

Question 20

A 71 kg 18 year male with no significant medical history is in an a high speed motor vehicle accident rupturing his spleen and injuring his bowel. He receives intravenous contrast for a CT scan while hypotensive in the emergency room and develops oliguric acute kidney injury. 3 days later, urine output has increased to 1 liter/day. However he remains intubated and potassium has increased to 7.2 meq/L and renal is called to initiate hemodialysis. Platelets are 80,000 and INR is 1.5. What is the most appropriate site and type of dialysis access?

- A) Non-tunneled subclavian
- B) Tunneled internal jugular
- C) Non-tunneled femoral
- D) Non-tunneled jugular

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- B) Tunneled internal jugular
- C) Non-tunneled femoral
- D) Non-tunneled jugular

- Tunneled lines may reduce risk of infection and may reduce need for later transition to tunneled access (with 2nd procedure) in patients without infection and those with preexisting CKD
- Subclavian access associated with high risk of venous stenosis. May “ruin” ipsilateral side for future AV access and should generally be avoided as site of temporary lines

- In RCT no site-related difference in risk of infection with short term (<1 wk) placement of dialysis access in jugular or femoral location
 - Jugular site may be better in obese patients
- No difference in dialysis efficacy rates with femoral vs. jugular location
- Femoral vessels more compressible and may be better choice in coagulopathic patients

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