20 Questions – March 2015
Complications of Renal Failure

1. What is the most common cause of renal failure in adults? How about kids?
2. How much impairment does it take (percent) before your kidneys can't perform their job well enough to keep your chemistry balanced (assuming that you are usually balanced)?
3. What are the two general types of dialysis and how do they differ?
4. You are called for a patient with diffuse abdominal pain. He has a peritoneal dialysis catheter in place. What is high on your list of possible causes?
5. Responding to 'one feeling weak' at the dialysis center you find a patient (who had not dialysed yet) appearing shocky. The ECG tracing shows a sine-wave pattern without clear QRS. What is the cause and the cure for this life-threatening problem?
6. Responding to 'one feeling weak' at the dialysis center you find a patient (who had dialysed already) feeling dizzy, weak, and having a headache. You find on history that this is one of the first times that the patient has had hemodialysis. What may be happening?
7. Arriving at a 'short of breath' you find a dialysis patient very dyspneic. Fire is recurrently trying to get a BP, which seems to be extremely high. What should you make sure of (with respect to anatomy) before they continue their BP efforts?
8. The dialysis center calls because one of the patients on dialysis has become confused and started undressing. You are able to calm the patient and cover him up. Enroute to the hospital, you think of all the causes of altered mental status in the renal patient that you can…
9. You are called to a private residence, where a dialysis patient is bleeding from his shunt site. The patient has placed a tourniquet above his shunt, which has controlled the bleeding. What is a less drastic (and safer) way to apply pressure to a bleeding shunt site?
10. A patient who has missed dialysis for the past week because he was at an all-you-can-eat ham buffet at Old Country calls you for shortness of breath. His O2 sats are in the upper 80s, and he has crackles in all lung fields. He tells you he makes no urine anymore. Is Lasix helpful in this patient? What other medications should be administered?
11. The dialysis center calls you for a chest pain. The patient has been having chest pain for a few days, increasing in severity, and better when he is sitting up and forward. His vital signs are currently stable, though he had some hypotension (95 systolic BP) earlier. What could be going on?
12. Another patient at the same center tells you he is having 'terrible' chest pain as well. The pain began during the last part of his run. You do the routine cardiac protocols for him as well, and call another crew. Do all dialysis patients have chest pain, or does it only seem that way?
13. You are unable to obtain an IV on a shocky dialysis patient. Can you access the shunt?
14. Responding to 'one unconscious', you find a patient in VF arrest. While looking for an IV site, you find a shunt on the arm. How will this patient's treatment for his dysrhythmia be different from a 'regular' VF arrest?
15. What intracranial life-threat are dialysis patients at particularly high risk for?
16. Responding to a nursing home patient with hypotension, you note a central catheter on the R chest wall. The nurse tells you it's a Quinton catheter. Is it useful to you?
17. A patient from the nursing home has chronic renal insufficiency listed on her problem list, yet does not dialyse. At what point (for what causes) is dialysis required?
18. When a dialysis patient tells you 'the thrill is gone', why should you worry more than when your partner tells you the same thing?
19. A patient has developed significant hypotension (BP 70s systolic) while on the run. What are a few of the possible causes for significant hypotension in the renal patient?
20. Following a dialysis run, a renal patient develops a nosebleed that just won't stop. What problems do dialysis patients face when trying to form a blood clot?

20 Answers – March 2015 – Renal Disease

1. Diabetic glomerular nephropathy is the number one cause of adult renal failure. In African-Americans, hypertensive nephrosclerosis accounts for up to 25% of renal failure. In the pediatric age group, renal failure is quite rare, and most often due an inherited condition (e.g. Alport's syndrome) or nephrotic syndrome (where the kidneys for a variety of reasons can't filter protein).
2. 85% of your bean's function has to be lost before major changes are noticed by the patient.
3. Hemodialysis is the process of passing blood through a pump, where it is exposed to a membrane across which salts and fluid move, the solution on the other side of the membrane from the blood is balanced to cause it to 'pull' fluids and salts (like potassium) across and out of the blood. This usually takes a few hours three times per week (though in the ICU continuous hemodialysis is often used as the volume shifts aren't as dramatic). Peritoneal dialysis is when a glucose solution is placed in the abdomen (via an indwelling catheter) several times per day and/or overnight, and allowed to stay in the abdomen. Slowly, fluid and salts become absorbed from the body into the fluid in the abdomen. The fluid is then let out, and a new batch put in.
4. One of the major problems with peritoneal dialysis is that the abdomen tends to become infected, due to the connection to the outside, as well as the sugar-containing dialysis solutions. Any time a peritoneal dialysis patient complains of belly pain, look at the fluid they removed. If it's cloudy, it's probably due to peritonitis (they usually will not have a fever and often the belly isn't that tender). Of course, there are all the usual causes of belly pain to worry about as well.
5. Hyperkalemia results in progressive widening of the QRS, sometimes to the point that no complexes can be made out on the rhythm strip (sine wave pattern). This usually is just before the patient goes into VF and dies. Treatment is immediate Calcium Chloride IV, which should cause the QRS to again become visible. If severe, several amps may be required. Sodium bicarbonate IV and albuterol via neb will also help. Both of these drugs cause potassium to shift into the cells and thereby temporarily lower it to a (hopefully) safer level. Hyperkalemia can cause may different cardiac rhythm disturbances including AV block and bradycardia, and should be suspected ANYTIME you have a dysrhythmia in a dialysis patient.
6. "Dialysis disequilibrium" often occurs the first few times a patient undergoes hemodialysis (but may occur anytime). It is thought that the rapid shifts of fluid and salts do not allow time for the salts to equilibrate between the brain and the body's blood supply, causing the brain to still be 'pickled' while the body is normalized. Most often, this results in headache, malaise, nausea, vomiting, and muscle cramps.
7. Make sure that fire isn't taking the BP in an arm that has a shunt in place! Occluding flow to a shunt can cause it to clot, often requiring surgical intervention, and sometimes complete replacement of the shunt.
8. Here's a few: intracranial bleed, tumor, or abscess, meningitis, disequilibrium syndrome, uremia, drug effect, hypertensive encephalopathy, hypotension, seizure, abnormalities of potassium, sodium, calcium, and magnesium, hypoglycemia, hypoxia.
9. Point pressure over the bleeding area of a shunt is much preferred to any proximal or circumferential pressure. Most often, the bleeding from the shunt can be controlled easily with finger pressure. If the patient is bleeding out, more drastic means may be necessary and a tourniquet is certainly fine if nothing else is controlling the bleeding. It's a high pressure circuit, but usually a very small area of bleeding so it's surprising how easily most of them can be controlled with a finger applying gentle pressure right to the bleeding site.
10. Furosemide (Lasix) is primarily a diuretic, but also has some direct pulmonary vasodilating effects, so if you have nothing else it may be of some benefit. However, nitrates (sublingual nitro) are the mainstay of treatment as they help to provide venous and pulmonary vessel dilation that, in essence, provides a bigger container for the fluid overload and reduces some of the stress on the heart and lungs. So give three NTG 5 minutes apart and consider giving more. CPAP is very useful here as it is with CHF-induced pulmonary edema.
11. Your patient may be developing cardiac tamponade from uremic pericarditis. Uremia causes pericardial inflammation, which may lead to fluid accumulating around the heart. This is usually a much slower process than traumatic tamponade, with much larger volumes of pericardial fluid. If you see QRS alternans (a normal QRS followed the next beat by a much smaller, though similarly formed

QRS) that's a good clue – though rarely seen! Keep the patient sitting, apply high-flow O2, and contact medical control.

12. Over 50% of patients with dialysis-requiring renal disease will die from coronary disease. Dialysis causes rapid fluid shifts, often with hypotension and hypoxemia. Renal patients tend to be anemic, hypertensive, and have high blood lipid levels. They also usually are on dialysis due to diseases that cause coronary artery damage over time even without renal failure – diabetes and chronic hypertension. Finally, renal patients may develop angina with much smaller amounts of coronary obstruction than normal individuals. Oh, and don't forget all the other nasty causes of chest pain: pericarditis, dissection, PE, pneumothorax, etc.
13. Yes, but do so only if you need to give fluids or medications immediately. Prep the shunt site carefully, use the smallest catheter size possible, and be careful not to puncture the back wall of the shunt. Do NOT use a tourniquet. Once you have established the line, you will need to maintain pressure on the IV bag to prevent backflow of blood up the tubing. Deliver your medications followed by a saline bolus (especially for calcium chloride). Check to make sure that the shunt still has a thrill (vibration). Bring your line to the attention of the staff on hospital arrival.
14. The most common cause of dysrhythmic death in the dialysis patient is VF due to hyperkalemia. Therefore, in addition to the usual epi, lido, etc. regimen, you should give calcium chloride and sodium bicarb which will help to reduce the toxicity of increased potassium. If the patient's arrest is not due to increased potassium, these interventions will have no significant effect on the resuscitation, therefore they are worth trying.
15. Dialysis patients have an unusually high incidence of subdural hemorrhages. This is mainly due to recurrent anticoagulation and coagulation defects, perhaps made worse by the volume shifts of dialysis. Any dialysis patient with a headache will warrant a thorough work-up, usually including a head CT.
16. Quinton catheters are large catheters that are placed for temporary dialysis use, usually in the subclavian vein. They should have two ports, either of which provides venous access. The heparin solution should be aspirated from them before starting medication / fluid through them. Be careful to make sure with the patient or staff that the line goes where you think it does! Again, accessing these sites should be more of a last resort than a first thought.
17. Indications for dialysis include poor renal function AND at least one of the following: fluid overload, rising potassium, severe hypertension, uremic pericarditis, acidosis and other uncorrectable electrolyte abnormalities, changes from uremia (high BUN) including vomiting and mental status changes.
18. When a shunt ceases to have a thrill – a vibration that signifies blood mixing between high pressure (artery) and low pressure (vein) areas, there is something seriously wrong, as the intent of a shunt is to provide an accessible area of mixed arteriovenous blood under moderate pressure. If the shunt is clotted, surgeons will attempt to declot it with catheters. Occasionally, a new operation must be performed with a new shunt placed.
19. Hypotension has a few causes…hypovolemia (excess fluid removal, hemorrhage, vomiting), sepsis, cardiogenic shock, dysrhythmia, tamponade, abnormalities of calcium, magnesium, or potassium, anaphylaxis to dialysis chemicals/latex, air embolism, and drug effects.
20. Patients who require dialysis are anemic to start with. Also, their platelets don't stick together to form clot very well due to the uremia (high BUN). Finally, those patients on hemodialysis require heparin on the run to keep their blood from clotting in the tubing. All these factors add up to some serious clotting disturbances. That said, most bleeding is more persistent than massive and life-threatening, though there certainly are exceptions (especially GI bleeding). You should follow your standard procedures for nosebleed on this patient. If the blood pressure is extremely high, you may wish to consult with a medical control physician.