

## Acute Renal Failure Case Questions

Reference: AFP 11-1-05

- Objectives:**
- Define the three main categories of ARF
  - Understand lab values that can help distinguish between etiologies of ARF
  - Know how to calculate creatinine clearance
  - Know and appropriately manage three drugs that commonly cause or exacerbate ARF
  - Know initial management strategies for each of three categories of ARF

**Case:**

**67 yo male with PMH of HTN, obesity, diabetes mellitus type II, and prostate cancer presents to ER with 2 day history of fever, shaking chills, right lower quadrant abdominal pain, nausea and vomiting.**

ROS notable for chronic urinary frequency. Denies chest pain, shortness of breath, changes in BM, dysuria, rashes, joint pain, focal neuro sx. No smoking or alcohol use. ROS otherwise negative.

PMH – Diabetes well-controlled – HA1c 7.0	Meds -	Metformin
No known retinopathy, neuropathy, nephropathy		Lipitor
HTN, well-controlled		Glyburide
Adenosine nuclear ETT negative 5/04		Enalapril
Obesity – BMI 34		HCTZ
Lipids, well controlled – LDL 89		
Prostate Cancer – diagnosed 2000 – T4N1M0		
s/p RT and chemo, stable PSA since – last 2 yrs ago		

VS – T 102.0 HR 111 RR 18 BP 142/62 SpO2 97% RA Weight 220  
Ill-appearing, and diaphoretic, but no resp distress  
OPM tacky, poor dentition  
Lungs CTAB  
Cor tachycardic, regular, no murmurs, flat neck veins  
Abd normal BS, soft, RLQ tenderness but no rebound or guarding, right CVAT  
Guiac negative, no apparent prostate nodules, enlargement or tenderness  
Ext warm, no rashes, no edema, DP pulses 2+ bilaterally

Labs notable for: WBC 22 – 80% N, 22% L, 5% B  
BUN 55, Creatinine 2.6, K 5.2, Na 142, glucose 222, bicarb 20  
UA- SG 1.025, +LE, + nitrate, 1-4 RBC, 10-20 WBC, 3+ bacteria, no casts, no protein  
Liver function, CXR, EKG unremarkable

**1. What are three admitting diagnoses for this patient?**

Pyelonephritis, Acute Renal Failure, Dehydration

**2. There are three main categories of causes of acute renal failure – please name them.**

Pre-renal / Post-renal / Renal or Intrinsic

**3. Which type of renal failure does this patient appear to have at this time?**

**4. Name two exam findings that support your choice.**

Pre-renal due to hypovolemia– supported by:  
Tachycardia, dry mucous membranes, flat neck veins, diaphoresis

**5. The ratio of BUN to creatinine can be used to help determine the type of ARF. Please calculate this ratio. Does this support your proposed type of ARF?**

$55/2.6 = 21$  - Yes, supports pre-renal

**6. The fractional excretion of sodium (FENa) is another useful calculation to help determine the cause of ARF. What additional labs will you need to order to calculate this ratio? What medications might make this calculation less useful?**

Urine sodium and creatinine / Diuretics – HCTZ, especially Lasix

**7. You need to write admitting orders for this patient.**

**What type of fluids and what rate will you order?**

Normal saline. 150cc / hour?

**What “nursing orders” will help you to monitor the patient’s renal failure?**

Strict I/Os. Consider Foley placement.

**What medications from his chronic list will you continue?**

Lipitor, Glyburide, HCTZ

**What new medications will you add – name, dose, frequency?**

Regular insulin? Tylenol for fever?  
Levaquin, Unasyn, Ceftriaxone, or Cipro

**Many medications require “renal dosing”. Please calculate the creatinine clearance and renally dose any medication as needed from those you have ordered above.**

$CCl = 26$  / Dose antibiotics - Levaquin 500 once, then 250 q 24  
Interestingly, the article suggests that this is not needed??

**While you are busy thinking through these issues and writing your orders in the ER, the nurse comes to say that the patient’s blood pressure has dropped to 80/40 (double checked manually), his pulse is now 130, and he has not had any urine output since coming to the ER.**

**8. What is your first order?**

Normal saline bolus

9. **The medical student asks if now would be a good time to start dopamine because he has heard that this increases renal perfusion. What do you tell him based on your reading?**

Not useful! Consider use only after intravascular volume normalized (CVP 8-10) if BP remains low. “Renal protection” of low-dose Dopa is a myth.

**The patient is admitted with fluids and medications as you have ordered. By HD 2, tachycardia, fever, and hypotension have resolved. BUN and Creatinine have improved to 35 / 1.9. The patient’s abdominal pain persists, however, and an abdominal CT is ordered.**

10. **Name three things that you might consider to help prevent worsening renal failure from contrast dye administration? (You may have already done these things.)**

Hold Metformin / Fluid administration / Mucomyst

**Orders written in response to question 10 were unfortunately missed by the unit secretary. The CT was performed with IV contrast, but PACS is broken and no results or images are available. In the evening of HD 2, you are called because the patient has had “no urine output this shift” and has had increasing abdominal discomfort.**

11. **What can you ask the nurses to do while you are on your way to see the patient?**

Repeat vital signs  
Flush Foley. Bladder scan.  
Get actual I/Os ready for you

12. **As you walk down the stairs, what is the differential diagnosis you are generating in your head for oliguria / anuria in this patient? You should have at least one or two diagnoses in each of the three categories of renal failure.**

Pre-renal – Dehydration from ongoing untreated infection, vomiting  
Continuation of ACE-I or diuretic  
Renal - ATN from contrast dye administration, persistent dehydration, or gent  
Renal damage from pyelonephritis  
Post-renal- Blocked Foley  
Obstruction from metastatic prostate cancer.

**You come to see the patient. He appears uncomfortable.**

**Recent vitals: T 99.0 HR 103 BP 100/80 RR 18 SpO2 98% RA**

**Exam notable for mild abdominal distention, normal BS, no guarding or rebound, diffuse and non-localizable abdominal tenderness. CVAT is present, but less prominent than on previous exam. Foley with 100cc dark brown urine in the bag – last emptied about 7 hours ago.**

**Patient’s only medications at this time are the antibiotics and fluids you ordered on admit.**

13. **What two interventions could be done immediately on the floor to help decide if there is a post-renal cause of oliguria?**

Flush Foley, Bladder scan

14. **What lab studies would you like to order at this time to try to distinguish renal from pre-renal causes?**

BMP, UA, urine sodium, urine creatinine

**15. Assuming your tests in #13 were unremarkable, and while you are waiting for your lab results to return, which of the following interventions would be the most reasonable next step?**

- Lasix 40mg IV once now
- Dopamine infusion 2mcg/kg/min
- Normal saline bolus 500 cc once now
- Continuous IV fluids – D5 ½ NS at 125 cc/hour

**The patient's lab values return.**

**Urine – SG 1.020, RBC 1-4, WBC 10-20, protein 1+ / Urine Creat - 45 / Urine Na – 22  
Sodium 147 / Potassium 5.5 / Chloride 113 / Bicarb 22 / BUN 66 / Creat 3.6 / glucose 189  
The patient has not had additional urine output with your therapy chosen in #15.**

**16. Please calculate the FENa and the BUN/Creat ratio.**

FENa = 1.2

BUN / Creat = 18

**17. You call your attending with these issues, your interventions and the above labs. Keeping in mind the three categories of ARF, what is your differential diagnosis of anuria now? Please use lab interpretation and clinical history/exam to support your assessment.**

Labs suggest renal causes.

Obstruction higher than bladder has not been ruled out.

ATN due to contrast dye should not cause a high FENa

Ddx: ATN due to pyelonephritis, ongoing hypovolemia  
Post-renal obstruction from metastatic prostate CA

**Your attending suggests a renal ultrasound. These results return in the morning along with the CT – both demonstrating right sided hydronephrosis and ureteral dilation. A Urologist is consulted, but has not been by yet. Over the next 24 hours, with supportive care only, the UO increases notably and Creatinine stabilizes at 2.6.**

**18. Can you explain this clinical presentation with a series of unifying diagnoses?**

Ureteral obstruction, right-sided due to metastatic prostate CA, causing pyelonephritis  
Pyelonephritis causing dehydration, sepsis, and pre-renal azotemia  
Persistent azotemia leading to ATN, complicated by contrast dye administration

ATN now resolving, but unilateral obstruction persists leading to persistent elevated creatinine.