

MANAGEMENT OF THE INPATIENT ON DIALYSIS FOR HOSPITALISTS

Mark Rudy, MD

Assistant Professor

University of Kentucky

Division of Nephrology, Bone and Mineral Metabolism

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Educational Need/Practice Gap

- Hospitalization of patients on dialysis remains a constant issue in this population
- Improved care in the inpatient relies heavily on communication between the hospitalist and nephrologist

Objectives

Upon completion of this educational activity, you will be able to:

1. Identify the quality measures used in medical management of a patient on dialysis
2. Interpret laboratory values in the context of a patient on dialysis
3. Diagnose and treat acute medical conditions in patients receiving dialysis

Expected Outcome

1. Improved inpatient care for patients on dialysis
2. Improved communication between the hospitalist and nephrologist about medical management of inpatients on dialysis

Quality Measures for Patients on Dialysis

1. Hospitalizations
2. Vascular Access
3. Adequacy
4. Volume status
5. Bone and Mineral Metabolism
6. Anemia
7. Nutrition

Hospitalization of Dialysis Patients

- ESRD patients in the USA were approximately 1.48 person per year¹
- For patients on hemodialysis (includes AKI-D) the all-cause hospitalization rates were 1.82 persons per year¹
- Rehospitalization of ESRD patients at 35% and deaths at 4.3% within 30 days of hospital discharge¹

- What can we do to improve these rates?

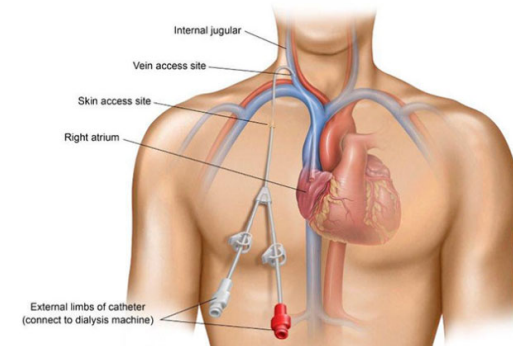
¹NIH NIDDK USRDS annual Data report. <https://usrds-adr.niddk.nih.gov/2022/end-stage-renal-disease/5-hospitalization>

Vascular Access

- Types of access:
 - Arteriovenous fistulas and grafts
 - Temporary CVC and tunneled dialysis catheter
 - Peritoneal dialysis catheter
- Who can use dialysis access?
 - ONLY trained individuals
- Why?
 - Infection, air embolism, clotting



AV fistula. Kidney News 6, 2



Tunneled dialysis catheter. Endovascular Today 2021

Adequacy

- Adequacy: How well dialysis removes waste products and toxins from the patient's blood (urea, electrolytes etc.)
- Measurements: Kt/V (Fractional Urea Clearance) and URR (Urea Reduction Ratio)
 - K = Dialyzer clearance (mL/min or L/hr)
 - t = time (mins or hrs)
 - V = volume of distribution (Liters)
- What can we modify in the hospital? TIME
- Why might this be a problem in the inpatient setting?
 - Availability of dialysis unit chairs, patient procedure times

Volume Status

- Signs of hypervolemia: High BP, Edema, Dyspnea
- 2 questions for every dialysis patient: What is their dry weight and are they still making urine?
- “Safe” volume removal or ultrafiltration rate (UFR): 10-13 mL/kg/hr
 - Limitations of dialysis inpatient: **Time**
 - **E.g.** 100 Kg patient UFR ~1 L/hr
- Diuretics? **YES!** Continue diuretics on non-dialysis days (or everyday if patient is on peritoneal dialysis)

Bone and Mineral Metabolism

- An important chronic issue
- Why? Cardiovascular disease, renal osteodystrophy, calciphylaxis
- Serum measurement goals CKD 5/HD (KDIGO 2017)²:
 - Phosphorous 3.0-5.5 mg/dL.
 - Calcium 8.4 – 10.2 mg/dL
 - PTH 150 – 600 pg/mL (normal PTH 10-65 pg/mL)
- Management in the hospital:
 - Binders must be given with food. What about tube feeds?
 - When to use Calcitriol and Cinacalcet?



Aorta calcifications in ESRD patient.⁴

²<https://kdigo.org/wp-content/uploads/2017/02/2017-KDIGO-CKD-MBD-GL-Update.pdf>

Anemia

- Why are patients on dialysis anemic?
 - Erythropoietin, iron deficiency, chronic blood loss
- Management in the hospital: IV Iron and ESA
 - Hemoglobin > 10 g/dL and < 12 g/dL on Erythropoietin stimulating agent³
 - Ferritin: >200 mg/mL if on hemodialysis and <1000 mg/mL
 - Transferrin saturation: 30-50%

³<https://kdigo.org/wp-content/uploads/2016/10/KDIGO-2012-Anemia-Guideline-English.pdf>

Nutrition

- Renal Diet: High protein, low phosphorus, low potassium
- Why do they need high protein?
- Does this diet change in the hospital? YES
 - Patients with poor PO intake may need diet liberalized
 - Check labs 2-3x per week at least
- What to do with difficult to control potassium?
 - Potassium binders on non-dialysis days. E.g Sodium polystyrene sulfonate, sodium zirconium cyclosilicate, patiromer

Acute Presentations in Dialysis Patients

- When is dialysis emergent vs urgent?
- What is the role of contrast?
- Other complications in dialysis patients
 - Access problems
 - Bleeding
 - Wounds i.e. calciphylaxis

Clinical Case

- 61 yo male with ESRD on hemodialysis MWF schedule presents on Sunday night at 8pm with shortness of breath. He last had dialysis on Wednesday, but missed Friday due to diarrheal illness. He reports a dry weight of 80 kg and that he still makes 200-300 mL of urine per day. On exam he appears in mild distress, he has LUE AVF with palpable thrill, 1+ edema in his lower extremities, mentation is appropriate. His blood pressure is 170/91, HR 90, O₂ saturation 91% on room air and standing weight 85 kg.
- Laboratory studies significant for serum creatinine 8.9 mg/dL, BUN 99 mg/dL, potassium 6.1 mg/dL, pH 7.29 on VBG.
- CXR shows increased prominence of pulmonary vascular and B/L mild pleural effusions
- EKG showing normal sinus rhythm

Clinical Case Cont'd

What is your initial differential diagnosis for patients dyspnea?

Pulmonary edema from missed dialysis >> Pulmonary Embolism >> myocardial infarction

Do you order a CT PE Protocol? Is D-dimer useful in dialysis patients? What happens to the contrast?

D-dimer will be elevated in >50% of patients on hemodialysis⁴

IV contrast is a source of intravascular volume which could exacerbate patient's current hypervolemic state

Clinical Case Cont'd

A reasonable initial management plan:

1. Consultation: Discuss case with on-call nephrology
2. Volume management: Give IV diuretic (200 mg IV furosemide)
3. Hyperkalemia – a loading dose of an oral potassium binder such as 10 grams sodium zirconium cyclosilicate
4. Anticoagulation: If high enough concern for PE ok to give a dose of LMWH which is safe to use in ESRD patient population⁵

5. Lai KN, Am J Kidney Dis. 1996

When is Dialysis Urgent vs. Emergent?

A.E.I.O.U. Refractory to medical management

Acidemia – pH <7.2*

Electrolyte abnormalities – severe hyperK, hyperP, hyperCa

Intoxications – alcohols, drugs (metformin, lithium, TCA)

Overload (volume) – “high” blood pressure and respiratory failure

Uremia – pericarditis, unable to protect airway

Other Acute Medical Problems

- Access troubles: Typically managed by Nephrology
 - Line Infections – antibiotics or replacement
 - Malfunction – replacement
 - AVF/AVG bleeding or other concerns – (vascular surgery or interventional nephrology)
- Acute bleed:
 - Desmopressin can be given if life-threatening or other significant bleed
- Wounds: Calciphylaxis
 - Diagnosis Gold standard is biopsy
 - Often treat empirically due to risks of biopsy

Concluding Remarks

- Patients on dialysis are complex and require collaboration between multiple hospitalists, nephrologists and other specialties to provide high quality care in the inpatient setting

Questions?

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