CKD and ESKD Management for the Hospitalist

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Update for Hospital Medicine 2021

Disclosure

- Employed by Vertex Pharmaceuticals

Outline

Case presentations in CKD patient

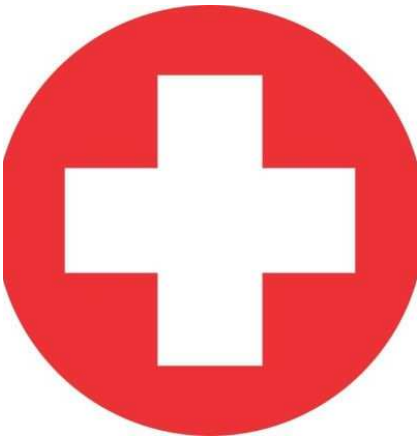
- Medication overview
- Contrast induced nephropathy
- PICC placement
- CKD-MBD management

Case presentation in ESRD patient

- Catheter associated infection
- Blood pressure management
- Anemia management
- Gadolium use

Case Presentation #1

- A 62 year old woman with a history of chronic kidney disease stage IV with baseline eGFR 20-25 ml/min, type 2 diabetes mellitus, hypertension, abdominal aortic aneurysm, coronary artery disease, and gout presents with upper abdominal pain and cough that has been progressive over the past 3 days.



Medication Review

- Lisinopril 20 mg QD
- Carvedilol 12.5 mg BID
- Furosemide 40 mg QD
- Empagliflozin 25 mg QD
- Atorvastatin 80 mg QD
- Metformin 1000 mg QD

- What should we do with these medications?

Medication Review

- In patient with baseline CKD, aim to continue ACEi/ARB and diuretics if no other contraindication (hypovolemic, switching to IV diuretics, baseline eGFR but concern for ensuing AKI)
- Discontinue Metformin in patient's with CKD and eGFR <30 ml/min
- If ACEi/ARB or SGLT2i are stopped during hospitalization, there is mortality benefit of continuing and reinitiating these medications prior to discharge if safe.

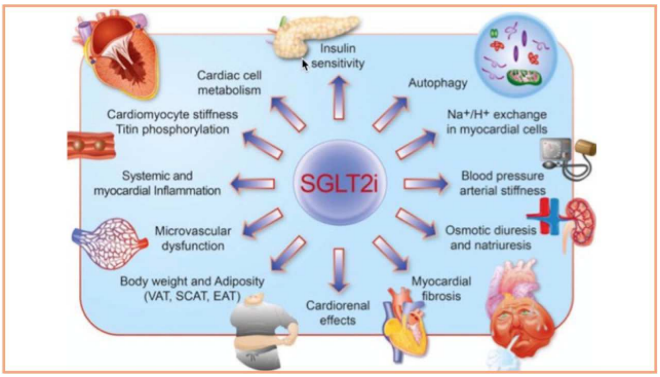
Full Title: Multi-centre Randomised Controlled Trial of Angiotensin Converting Enzyme inhibitor (ACEi) / Angiotensin Receptor Blocker (ARB) withdrawal in advanced renal disease

Short Title: The STOP-ACEi Trial

Aim of the study: To test the hypothesis that stopping treatment with ACEi, ARB or a combination of both, compared with continuing on these treatments, improves or stabilises renal function in patients with progressive stage 4 or 5 Chronic Kidney Disease (CKD).

SGLT2i: When to use them and when not to

- Indications
  - Proteinuric kidney disease(> 200 mg albumin) with eGFR >25 to 45 ml/min (different cutoffs depending on specific SGLT2i)
  - Data to prove efficacy in non-diabetic kidney disease
- Contraindications
  - Type 1 Diabetes
  - History of Ketoacidosis
  - High risk of LE ulceration, vascular compromise
  - High risk of bone fractures



Treatments for Diabetic Kidney Disease

- Blood pressure Control <130/80 mmHg
- Glycemic control with goal A1c < 7

- Other Medications
  - GLP-1 agonist, liraglutide, decreased composite renal outcomes but primarily driven by new-onset albuminuria
  - Finerenone, non-steroidal mineralocorticoid receptor antagonist, decrease rate of 40% decline in eGFR and ESKD

Update

- Labs are significant for creatinine at baseline of 2.3 with eGFR 28 ml/min. WBC count is 16k with 93% neutrophils.
- She receives an abdominal/pelvis CT scan with oral contrast and without IV contrast that identified a right lower lobe consolidation abdominal imaging is otherwise unremarkable except for a comment on the radiology report stating abdominal aortic aneurysm dimensions could not be appreciated without IV contrast and previous imaging was 5 years prior.

Intravenous contrast use in Chronic Kidney Disease

Risk factors

- Intra-arterial iodinated contrast load
- Amount of iodinated contrast
- History of CKD, particularly eGFR < 30 ml/min
- Significant proteinuria (>1 g per a day or 1 g/g creatinine)
- History of diabetes mellitus or heart failure
- Hypovolemia/Hypotension

Contrast-induced AKI

- Clinical Characteristics
  - Non-oliguric
  - AKI noted with 24-48 hrs after contrast exposure
  - Can have renal tubule epithelial cells and/or granular casts on urinary sediment (consistent with ATN)
  - Usually does not require dialysis

Contrast use in Kidney disease: Key Points

- Identify risk factors for contrast induced AKI to assess risk/benefit given indication for IV contrast
- Ensure use of low or iso-osmolar iodinated contrast.
- Optimize renal perfusion prior to contrast exposure in high risk patients.
  - IV fluids – 1 ml/kg/hr for 6-12 hours pre and post-contrast load. Isotonic saline or lactated ringer's suitable. Do not provide fluid for hypervolemic patients or patients with impaired ability of handling IV fluid (AKI pts on dialysis)
  - Preference for holding ACEi/ARB the day though limited evidence
- No current evidence for sodium bicarbonate or acetylcysteine for prophylaxis

ORIGINAL ARTICLE

Outcomes after Angiography with Sodium Bicarbonate and Acetylcysteine

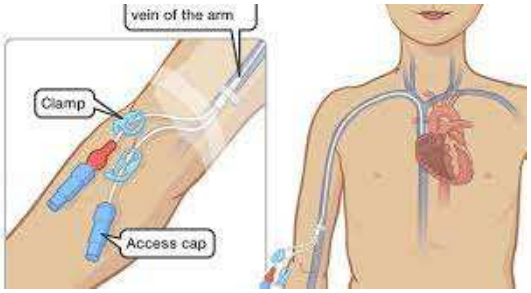
Steven D. Weisbord, M.D., Martin Gallagher, M.D., Ph.D., Hani Jneid, M.D., Santiago Garcia, M.D., Alan Cass, M.D., Ph.D., Soe-Soe Thwin, Ph.D., Todd A. Conner, Pharm.D., Glenn M. Chertow, M.D., M.P.H., Deepak L. Bhatt, M.D., M.P.H., Kendrick Shunk, M.D., Ph.D., Chirag R. Parikh, M.D., Ph.D., Edward O. McFalls, M.D., PhD., et al., for the PRESERVE Trial Group*

Update

- Patient blood cultures in 4/4 turned positive for Staph Aureus resistant to methicillin
- A TTE showed vegetations on the mitral valve
- Plan for 6 week course of IV vancomcyin

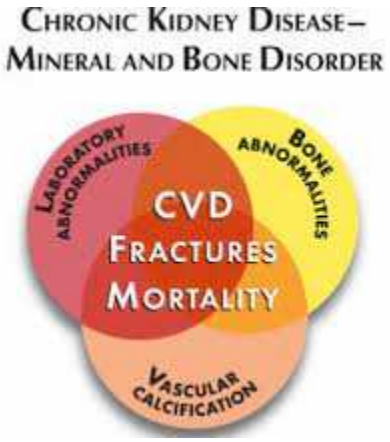
IV Access: To PICC or not to PICC?

- PICCs increase risk of central venous stenosis and thrombosis of upper extremity veins
- Increased central venous stenosis and vascular injury leads to higher failure rate of arteriovenous fistula maturation.
- In patients with CKD, ESKD, or kidney transplant consult Nephrology prior to PICC placement to determine likelihood of requiring fistula for access in patient's lifetime.
- Alternatives such as small bore (Hickman) tunneled catheters do not carry same risk as PICC.



Update

- Patient is all set with a small bore catheter to receive her antibiotics and her eGFR has remained stable.
- The day prior to discharge, the medical student suggested getting some additional labs based on a recent lecture they went:
  - Phosphorus – 5.8 mg/dl
  - Serum Calcium – 8.6 mg/dl
  - 25-OH Vitmin D – 18 ng/ml
  - PTH – 158 pg/ml
- Frequency of monitoring depending on Stage of CKD.



Hyperphosphatemia in CKD

- Counseling on minimizing dietary phosphate to <900 mg phosphate daily. Plant based phosphates have decreased GI absorption.
- If Phosphorus remains >5.5 would aim for phosphate binder initiation with food.
  - Prefer non-calcium based binders given concern for increasing vascular calcification and shown to be associated with lower all cause mortality
    - Sevelamer starting at 800 mg TID with meals and uptitrate until achieving phosphorus<5.5
    - Lanthanum carbonate 1.5g TID with meals up to 4.5 g TID
    - Ferric Citrate can be utilized 1 g tablet TID with meals and can increase to 2 g
    - Sucroferric oxyhydroxide 2.5 g TID with meals and can titrate up to 10 g TID with meals
    - Avoid long-term use of aluminum based binders given neurologic and bone deposition and toxicity

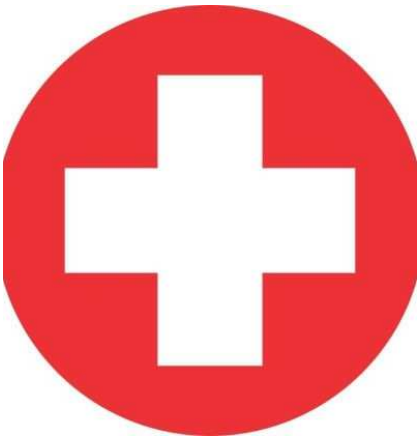
Vitamin D deficiency

- Control Hyperphosphatemia, Vitamin D increases phosphorus reabsorption
- Vitamin D supplementation with D2 ergogocalciferol 50k U weekly for 8 weeks when <12 ng/dl. Vitamin D3 1,000 U daily for 12-20 ng/ml
- Activated Vitamin D supplementation with calcitriol not given for mild hypocalcemia (>7.5 mg/dl) given risk of hypercalcemia. Calcitriol primarily given to manage progressive secondary hyperparathyroidism. No specific PTH cutoffs given CKD stage given significant dynamic serum levels.

- Be careful of Bisphophonate therapy with patients with CKD stage IV-V given risk of AKI

Case Presentation #2

- A 52 year old woman with a history of focal segmental glomerulosclerosis s/p failed kidney transplant with ESKD on HD through tunneled dialysis catheter on MWF who presents with headaches, fevers, and chills for the past 3 days found to have cerebellar mass on head CT. There is erythema and tenderness at site of insertion of tunneled dialysis catheter. Blood cultures completed on admission grow MRSA.



Next Steps

- With infection concern in patient with tunneled dialysis catheter, obtain peripheral venous blood cultures and additional set of blood cultures from dialysis catheter prior to providing empiric antibiotics (Vancomycin and 4th generation cephalosporin).

Tunneled Dialysis Catheter Associated Infection

- If need for urgent hemodialysis (hyperkalemia, volume overload, etc.), can perform through potentially infected catheter.
- Tunneled dialysis catheter should be removed if:
  - tenderness/pus at site of catheter
  - hemodynamic instability
  - concern for metastatic infection
  - Staph Aureus bacteremia or Candida fungemia
- Non-tunneled dialysis catheter should be placed as temporary access for dialysis
- Tunneled dialysis catheter can be replaced after patient has stabilized and blood cultures are negative for 48 hrs.

Treatment without Catheter Removal

- Aim for three week of therapy with IV antibiotic therapy tailored to organism.
- Antibiotic catheter lock solution found to be most effective in controlling infection related to gram negative infections and less effective with gram positive infections. (Cetazidime, Vancomycin, and Cefazolin antibiotic locks typically used)
- Limited options for IV antibiotic therapy that can be provided at outpatient HD centers and differ from center to center. Most outpatient HD centers capable of IV Vancomcyin, cefazolin, ceftazidime, and gentamicin.

Update

- Blood pressure has remained elevated at 150-170/70-90 during hospitalization.
- She notes that her blood pressure is typically 150-160/80-90 mmHg when measured at her outpatient dialysis unit but improves after dialysis.

Hypertension in Dialysis patients

Target BP<140/80 though has not been validated in a large trial with dialysis patients

Volume management is critical driver of hypertension in dialysis patients

- Important to identify dry weight and determine if dry weight has changed based on clinical status the preceding months prior to admission.

Neurohormonal activation including increased activation of the renin-angiotensin-aldosterone system.

- ACEi/ARBs can be utilized but may decrease effectiveness of ESAs.
- Mineralocorticoids receptor antagonists (MRA) rarely can cause hyperkalemia by impacting potassium secretion in the colon and thus can be trialed.
- Additional anti-hypertensives effective include beta-blockers (carvedilol with minimal clearance with dialysis) and CCB such as amlodipine.

Update

- About 30 to 60 minutes after dialysis, her blood pressure drops to 80/40
- Is there anything that can be done?

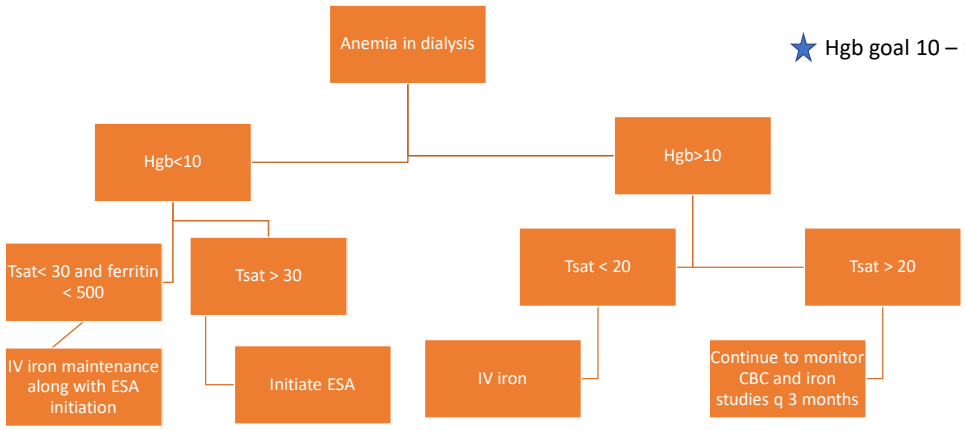
Intradialytic hypotension

- For new instance, rule out systemic process (infection, hemorrhage, cardiac compromise)
- Impacted by rate and amount of fluid removal during dialysis but often exacerbated by autonomic dysnfunction with longstanding diabetes
- Potential treatments
  - Reassess dry weight and minimize fluid removal and monitor response. In acute setting would stop ultrafiltration
  - If patient continues to generate urine, utilizing diuretics to minimize volume removal requirement during dialysis
  - Hold antihypertensive on dialysis days
  - Avoid food during HD
  - Cool dialysate temperature and increase dialysate calcium
  - Midodrine 2.5-10 mg 15-30 minutes prior to dialysis.

Update

- Patient presented with Hgb 8.1 mg/dl, which has improved to 8.4 mg/dl one week into admission. MCV 90
- Is there anything that can be done?

Treatment of Anemia in Dialysis patients



★ Hgb goal 10 – 11.5 in dialysis patients

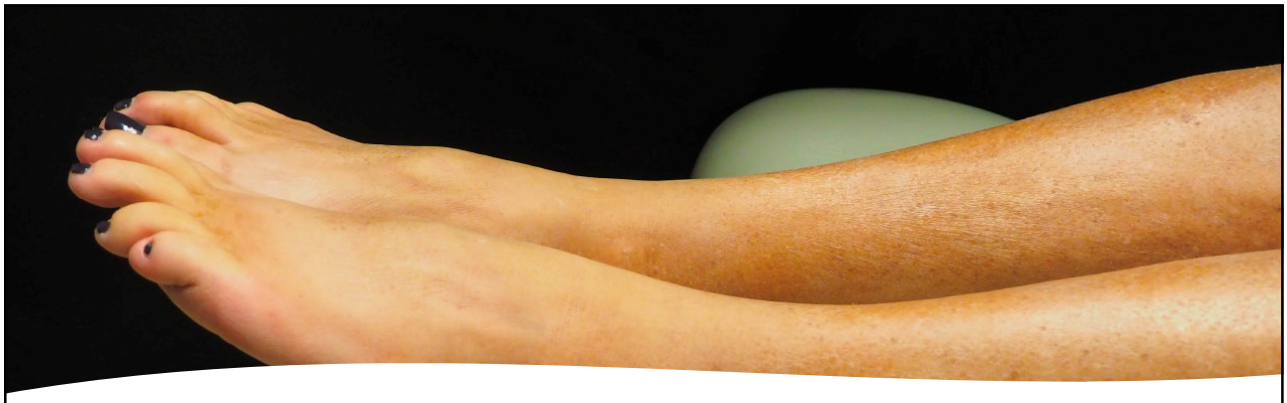
Pitfalls

- IV iron
  - Low risk of anaphylaxis with current formulations of IV iron (ferric gluconate, iron sucrose, ferric carboxymaltose or ferumoxytol). Though urticaria, palpitations, dizziness can be experienced with infusions.
  - No current evidence for increasing risk of infection with IV iron compared to oral.
- Erythropoietin stimulating agents
  - Increased risk of stroke (particularly in patients with history of stroke)
  - Exacerbate Hypertension
  - Can increase proliferation of certain cancers

★ Prolyl hydroxylase inhibitors have not yet been approved for Anemia management in dialysis patients

MRI with contrast

- Patient has an MRI with gadolinium contrast to evaluate her cerebellar mass.
- 3 years after admission she presents with tightening of skin and severe pain particularly around both legs.



Nephrogenic Systemic Fibrosis

- PATHOLOGIC DIAGNOSIS:

A. SKIN, RIGHT THIGH, PUNCH BIOPSY:
Fibrosing dermopathy compatible with nephrogenic systemic fibrosis.

Questions