Primary Care Interventions to Optimize Chronic Kidney Disease Care

ACP COLORADO CHAPTER MEETING 2/9/2018
BRENT ARNOLD, MD
Objectives:

- **Review diagnosis and etiology of CKD**
- Mange to the three major goals of caring for CKD patients
  - HTN, ACE / ARB therapy, CV risk reduction
- Prevent hyperkalemia
- Manage the progression of acidosis with bicarbonate therapy
- Ascertain the correct dose of diuretics in CKD patients
Establish the Diagnosis

- Definition – On 2 separate occasions, > 90 days apart (i.e. to rule out AKI).
- Race specific eGFR < 60 or >= moderate albuminuria (>30)
- Considerations:
  - Risk factors, Confounding factors, Supporting evidence - imaging
Establish the Diagnosis

Factors that impact creatinine labs and may spuriously impact eGFR

- Muscle mass - body building, amputations, malnutrition, very high or low BMI
- Supplements - creatine, high protein diets
- Aggressive exercise - especially resistance
- Medications – trimethoprim, cimetidine, NSAIDS
- Dehydration
Establish an Etiology - Diabetes

- Duration - 10 yrs
- Course - usually indolent
- Proteinuria – typically precedes the decline in eGFR, < 2000 typically
- Hematuria not uncommon – requires evaluation
- Other supporting evidence
  - retinopathy, neuropathy and microalbuminuria (ace/arb may mask)
Establish an Etiology - Hypertension

- Duration - 10 years
- Course - indolent
- Proteinuria - Ma/Cr < 1000 typically
- Hematuria uncommon – requires evaluation
- Other supportive evidence – evidence of poor control historically, CHF, MI, CVA, LVH, atherosclerosis
Establish an Etiology – no HTN or DM

- Consider IGA nephropathy – proteinuria and hematuria
- Consider anatomy (ultrasound)
  - PKD, congenital abnormalities, stones, cancer, hydronephrosis, vascular causes
- Consider prior AKI’s
- Consider exposure to renal toxic meds - Nsaids, Lithium
- Consider heavy metal exposures – Lead, Cadmium
- Consider infectious - HIV, Hepatitis C
- Consider nephrology referral
Watch for Red Flags

- Rapid progression (25-30% decline)
- Hematuria and proteinuria
- Severe proteinuria
- Severe hypertension
- When to refer: red flags, gfr < 30, gfr < 45 and etiology unknown
Indications for Dialysis

- Uremic symptoms – usually eGfr approximately 10
  - Anorexia/Nausea/vomiting
  - Metallic taste in the mouth
  - Severe fatigue/insomnia/restless legs
  - Poor mentation
  - Pruritis
- Pericarditis
- Volume overload
  - Dyspnea
- Electrolytes
Determine ESRD and CV risk


<table>
<thead>
<tr>
<th>Cardiovascular mortality</th>
<th>Kidney failure (ESRD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ACR &lt;10</td>
</tr>
<tr>
<td>eGFR &gt;105</td>
<td>0.9</td>
</tr>
<tr>
<td>eGFR 90-105</td>
<td>Ref</td>
</tr>
<tr>
<td>eGFR 75-90</td>
<td>1.0</td>
</tr>
<tr>
<td>eGFR 60-75</td>
<td>1.1</td>
</tr>
<tr>
<td>eGFR 45-60</td>
<td>1.5</td>
</tr>
<tr>
<td>eGFR 30-45</td>
<td>2.2</td>
</tr>
<tr>
<td>eGFR 15-30</td>
<td>14</td>
</tr>
</tbody>
</table>
Follow Up: Based on risk

<table>
<thead>
<tr>
<th>Persistent albuminuria categories</th>
<th>Description and range</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal to mildly increased</td>
<td>&lt;30 mg/g &lt;3 mg/mmol</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Moderately increased</td>
<td>30–300 mg/g 3–30 mg/mmol</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Severely increased</td>
<td>&gt;300 mg/g &gt;30mg/mmol</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

**Guide to Frequency of Monitoring (number of times per year) by GFR and Albuminuria Category**

- **G1**: Normal or high; GFR ≥90 ml/min/1.73 m²
  - Frequency: 1 if CKD
- **G2**: Mildly decreased; 60–89 ml/min/1.73 m²
  - Frequency: 1 if CKD
- **G3a**: Mildly to moderately decreased; 45–59 ml/min/1.73 m²
  - Frequency: 1
- **G3b**: Moderately to severely decreased; 30–44 ml/min/1.73 m²
  - Frequency: 2
- **G4**: Severely decreased; 15–29 ml/min/1.73 m²
  - Frequency: 3
- **G5**: Kidney failure; <15 ml/min/1.73 m²
  - Frequency: 4+

GFR and albuminuria grid to reflect the risk of progression by intensity of coloring (green, yellow, orange, red, deep red). The numbers in the boxes are a guide to the frequency of monitoring (number of times per year).
Engage and Educate the patient

- Hydrate with 1.5-2 liters of fluid daily
- Exercise routinely
- Maintain a good body weight
- Take your medications as prescribed
- Get labs at least annually
- Good blood pressure and Diabetes control
- Follow a low salt diet
- Avoid tobacco
- Limit medications that can harm the kidneys (i.e. NSAIDS)
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- **Mange to the three major goals of caring for CKD patients**: HTN, ACE / ARB therapy, CV risk reduction
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- Ascertain the correct dose of diuretics in CKD patients
Treatment Goals

- Blood pressure goals – >110/60 & <130/80
  - Ace/arb medications indicated - > 300 ma/cr (30 in DM)
- CV reduction – moderate intensity statin for Gfr < 45-60
- DM – A1c 7-8%
Treatment of hypertension in patients with CKD

BP goal <130/80 mm Hg (Class I)

> Albuminuria (≥300 mg/d or ≥300 mg/g creatinine)

- Yes
  - ACE inhibitor (Class IIa)
  - ACE inhibitor intolerant
    - Yes
      - ARB* (Class IIb)
    - No
      - ACE inhibitor* (Class IIa)
- No
  - Usual “first-line” medication choices
### 9.3. Chronic Kidney Disease

#### Recommendations for Treatment of Hypertension in Patients With CKD

References that support recommendations are summarized in Online Data Supplements 37 and 38 and Systematic Review Report.

<table>
<thead>
<tr>
<th>COR</th>
<th>LOE</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>SR B-R</td>
<td>1. Adults with hypertension and CKD should be treated to a BP goal of less than 130/80 mm Hg (1-6).</td>
</tr>
<tr>
<td></td>
<td>C-EO</td>
<td></td>
</tr>
<tr>
<td>IIa</td>
<td>B-R</td>
<td>2. In adults with hypertension and CKD (stage 3 or higher or stage 1 or 2 with albuminuria [≥300 mg/d, or ≥300 mg/g albumin-to-creatinine ratio or the equivalent in the first morning void]), treatment with an ACE inhibitor is reasonable to slow kidney disease progression (3, 7-12).</td>
</tr>
<tr>
<td>IIb</td>
<td>C-EO</td>
<td>3. In adults with hypertension and CKD (stage 3 or higher or stage 1 or 2 with albuminuria [≥300 mg/d, or ≥300 mg/g albumin-to-creatinine ratio in the first morning void]) (7, 8), treatment with an ARB may be reasonable if an ACE inhibitor is not tolerated.</td>
</tr>
</tbody>
</table>

SR indicates systematic review.
### 9.6. Diabetes Mellitus

**Recommendations for Treatment of Hypertension in Patients With DM**

References that support recommendations are summarized in Online Data Supplements 46 and 47 and Systematic Review Report.

<table>
<thead>
<tr>
<th>COR</th>
<th>LOE</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>SBP: B-R&lt;sup&gt;SR&lt;/sup&gt;</td>
<td>1. In adults with DM and hypertension, antihypertensive drug treatment should be initiated at a BP of 130/80 mm Hg or higher with a treatment goal of less than 130/80 mm Hg (1-8).</td>
</tr>
<tr>
<td>I</td>
<td>DBP: C-EO</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>A&lt;sup&gt;SR&lt;/sup&gt;</td>
<td>2. In adults with DM and hypertension, all first-line classes of antihypertensive agents (i.e., diuretics, ACE inhibitors, ARBs, and CCBs) are useful and effective (1, 9, 10).</td>
</tr>
<tr>
<td>IIb</td>
<td>B-NR</td>
<td>3. In adults with DM and hypertension, ACE inhibitors or ARBs may be considered in the presence of albuminuria (11, 12).</td>
</tr>
</tbody>
</table>

SR indicates systematic review.
### Recommendations for Treatment of Hypertension in Older Persons

References that support recommendations are summarized in Online Data Supplement 54.

<table>
<thead>
<tr>
<th>COR</th>
<th>LOE</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>A</td>
<td>1. Treatment of hypertension with a SBP treatment goal of less than 130 mm Hg is recommended for noninstitutionalized ambulatory community-dwelling adults (≥65 years of age) with an average SBP of 130 mm Hg or higher (1).</td>
</tr>
<tr>
<td>IIa</td>
<td>C-EO</td>
<td>2. For older adults (≥65 years of age) with hypertension and a high burden of comorbidity and limited life expectancy, clinical judgment, patient preference, and a team-based approach to assess risk/benefit is reasonable for decisions regarding intensity of BP lowering and choice of antihypertensive drugs.</td>
</tr>
</tbody>
</table>
Hypertension Summary

- Take advantage of nighttime dosing
- DASH Diet
- Salt restriction < 2-2.3 gm per day
- Healthy body weight
- Adequate physical activity
- Avoid unhealthy alcohol intake
CV risk reduction – Statin therapy

- ASCVD risk assessment is recommended in all adults with hypertension, including adults with CKD & DM
- Majority of adults with DM and/or CKD have a 10-year ASCVD risk ≥ 10%, placing them in the high risk category.
CV reduction: Statin therapy

- ACC / AHA guideline for statin therapy
  - LDL-C levels ≥190 mg/dL
  - Age 40 to 75 years with diabetes and LDL-C levels 70 to 189 mg/dL
  - Age 40 to 75 years without diabetes and with a 10-year ASCVD risk ≥7.5% when statins are used for primary prevention

- USPSTF recommends a 10% threshold and the presence of a CV risk factor (B)
CV reduction: Statin therapy in CKD

- SHARP trial
- Lower incidence (9.5 vs 11.9 percent) of the primary composite outcome of coronary death, MI, CVA or revascularization in the CKD subgroup (6247) that received treatment (simvastatin plus ezetimibe) vs placebo.
- These findings are supported by multiple meta-analyses (RR 0.75-0.8)
Diabetes:

- A1c goal of 7-8.
  - Lower in the newly diagnosed and higher in the elderly and frail
- Tight control?
  - UKPDS/Kumamoto showed that tight glucose control *early in the course of diabetes* decreases microvascular complications
  - In *long standing diabetes* results are less supportive (ADVANCE, VADT & ACCORD)
Objectives:

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- Ascertain the correct dose of diuretics in CKD patients
Manage/Avoid Complications

- **Chronic Mild Hyperkalemia**
  - Gfr > 25-30
  - Potassium < 5.5-5.9
  - Not acutely ill/no symptoms (Dehydration, AKI, DKA, HNK, Paralysis, Arrhythmia)
  - Tolerated well – noted while processing labs, patient without complaint

- **Severe hyperkalemia**
  - Usually with K+ > 7 with chronic progression, lower if acute
  - Weakness, paralysis, arrhythmia
Manage/Avoid Complications: hyperkalemia causes

- Diminished renal function
- Type 4 RTA (hyporeninemic hypoaldosteronism)
- Ace/arb, spironolactone
- Dietary indiscretion
- Acidosis
- Beta blockers
- Exercise
- Fasting
- NSAIDS
Manage/Avoid Complications
Avoid hyperkalemia

- Start low and go slow – sub-therapeutic doses can be helpful
- One step at a time – start/advance only one med at a time
- Add diuretics prior to others
- Frequent labs
- Patient education – enlist your dietitian, invest in the patient
- Treat acidosis if present – bicarbonate therapy
Manage/Avoid Complications
Treatment of hyperkalemia

- Diuretics
- Low potassium diet – patient re-education
- Dose adjustments: (5-5.5) Discontinue: (> 5.5)
- Medications:
  - Sodium polystyrene sulfonate if needed for rare intermittent use
  - Patiromer, chronic (new)
- Treat underlying conditions
## Manage/Avoid Complications
### hyperkalemia: diet sources

<table>
<thead>
<tr>
<th>Very high in potassium</th>
<th>High in potassium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baked potatoes</td>
<td>Apricots</td>
</tr>
<tr>
<td>Baked acorn squash</td>
<td>Bananas</td>
</tr>
<tr>
<td>Baked butternut squash</td>
<td>Dried fruits</td>
</tr>
<tr>
<td>Beans</td>
<td>Strawberries/Kiwi</td>
</tr>
<tr>
<td>Olives</td>
<td>Nectarine/Oranges/ Grapefruit</td>
</tr>
<tr>
<td>Pumpkin seeds</td>
<td>Prunes/Prune juice</td>
</tr>
<tr>
<td>Pomegranate</td>
<td>Artichokes</td>
</tr>
<tr>
<td>Sauerkraut</td>
<td>Avocado</td>
</tr>
<tr>
<td>Vegetable juice cocktail</td>
<td>Broccoli</td>
</tr>
<tr>
<td>Vegetable soups/stews</td>
<td>Greens/Spinach</td>
</tr>
<tr>
<td></td>
<td>Potato/Yams</td>
</tr>
<tr>
<td></td>
<td>Tomato</td>
</tr>
<tr>
<td></td>
<td>Milk/Yogurt</td>
</tr>
<tr>
<td></td>
<td>Ensure &amp; Boost supplements</td>
</tr>
<tr>
<td></td>
<td>Salt substitute No Salt</td>
</tr>
<tr>
<td></td>
<td>Pinto beans/ Dried beans</td>
</tr>
<tr>
<td></td>
<td>Soy products</td>
</tr>
<tr>
<td></td>
<td>Nuts</td>
</tr>
</tbody>
</table>
Objectives:

➢ Review diagnosis and etiology of CKD
➢ Mange to the three major goals of caring for CKD patients
   - HTN, ACE / ARB therapy, CV risk reduction
➢ Prevent hyperkalemia
➢ **Manage the progression of acidosis with bicarbonate therapy**
➢ Ascertain the correct dose of diuretics in CKD patients
Manage/Avoid Complications
Acidosis

- Associated with progression of CKD (AASK, CRIC).
- Diminished functional renal mass (gfr approx. 30) increases ammonium production in remaining nephrons, this activates complement & renin-angiotensin systems which cause tubulo-interstitial damage
- Supplementation decreases ammonium production and delays progression
Manage/Avoid Complications
Acidosis

- Initiate Rx for persistent CO2<22
- Goal CO2 22-28
- Dosing: start 325mg bid watch for CO2 level change, edema or worsening hypertension
- Generally well tolerated and typical dose is 650 bid-tid
- Each oral tablet (650 mg) contains 8 mEq each of sodium and bicarbonate
Manage/Avoid Complications
Acidosis

- Benefits of acidosis treatment
  - Bone health
  - Lean body mass preservation
  - Improved nutritional status
- Acidosis etiology
- Dietary interventions
Objectives:

- Review diagnosis and etiology of CKD
- Manage to the three major goals of caring for CKD patients
  - HTN, ACE / ARB therapy, CV risk reduction
- Prevent hyperkalemia
- Manage the progression of acidosis with bicarbonate therapy
- **Ascertain the correct dose of diuretics in CKD patients**
Manage/Avoid complications
Volume Overload

- Diuretic dosing
  - Consider your objectives
    - Potassium, volume, proteinuria, blood pressure
  - Doses may need to be increased – hypoalbuminemia, gut edema
  - Lasix once daily vs. twice daily
    - IV may be required at times
Manage/Avoid complications
Volume Overload

- Avoid over-diuresis
- Avoid hypotension
- Frequent labs and clinical evaluation
- Patient education – enlist your dietitian, salt and k+ restriction
- Determine goal weight – adjust as needed
Manage/Avoid Complications

Diuretics

Edema Causes

- Severe hypertension
- Nephrotic – albumin < 3, 3.5 grams proteinuria
- Right heart failure
- Liver disease
- Salt indiscretion
- Peripheral calcium channel blockers
Manage/Avoid Complications
Diuretics

- Edema Treatment
  - Diuretics
  - Salt restriction
  - Limit peripheral calcium channel blockers
  - Other – elevation, water exercise and ted hose
Manage/Avoid Complications

Diuretic Options

➢ Thiazides
  ➢ Metolazone
  ➢ Hydrochlorothiazide
  ➢ Chlorthalidone

➢ Loop diuretics
  ➢ Furosemide
  ➢ Bumetanide

➢ Aldosterone receptor blockers
  ➢ Spironolactone
A 58 year old woman is evaluated during a follow-up visit for a 5 year hx of stage G3b/A1 CKD caused by an analgesic nephropathy. History is also notable for hypertension. She takes amlodipine and no longer uses analgesics. On physical examination, temp is 98.6' F, BP is 132/78 mm Hg, pulse 82 and RR 14. BMI 26. Cardiac exam reveals no murmur, rub or gallop. Lungs are clear. Labs:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Creatinine</td>
<td>1.8 mg/dl</td>
</tr>
<tr>
<td>Sodium</td>
<td>140 mEq/L</td>
</tr>
<tr>
<td>Potassium</td>
<td>5.4 mEq/L</td>
</tr>
<tr>
<td>Chloride</td>
<td>110 mEq/L</td>
</tr>
<tr>
<td>Bicarbonate</td>
<td>18 mEq/L</td>
</tr>
<tr>
<td>pH</td>
<td>7.36</td>
</tr>
<tr>
<td>PCO2</td>
<td>35 mm Hg</td>
</tr>
<tr>
<td>eGFR</td>
<td>33 mL/min/1.73 m2</td>
</tr>
</tbody>
</table>
Item 101

Which of the following is the most appropriate treatment?

a) Intravenous sodium bicarbonate
b) Oral potassium citrate
c) Oral sodium bicarbonate
d) Continue current therapy
Which of the following is the most appropriate treatment?

a) Intravenous sodium bicarbonate
b) Oral potassium citrate
c) Oral sodium bicarbonate
d) Continue current therapy
A 65 year old man is evaluated during a follow-up visit for a 5 year hx of stage G3b/A3 CKD due to diabetic nephropathy. He describes doing well with good exercise tolerance and no dyspnea. Medical history is also notable for Type 2 DM and hypertension. Medications are basal bolus insulin and Lisinopril. He takes amlodipine and no longer uses analgesics. On physical examination, temp is normal, BP is 145/75 mm Hg, pulse 82 and RR 16. BMI 28. There is no jugular venous distention and lungs are clear.

<table>
<thead>
<tr>
<th>Bicarbonate</th>
<th>normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>creatinine</td>
<td>1.9 mg/dL</td>
</tr>
<tr>
<td>Potassium</td>
<td>4.0 mEq/L</td>
</tr>
<tr>
<td>Chloride</td>
<td>110 mEq/L</td>
</tr>
<tr>
<td>eGFR</td>
<td>42mL/min/1.73m2</td>
</tr>
<tr>
<td>Urine protein/creatinine ratio</td>
<td>3900 mg/g</td>
</tr>
</tbody>
</table>
Item 69

Which of the following is the most appropriate treatment?

a) Add an angiotensin receptor blocker
b) Increase Lisinopril dose
c) Replace Lisinopril with Amlodipine
d) No Change in current medicines
Item 69

Which of the following is the most appropriate treatment?

a) Add an angiotensin receptor blocker
b) Increase Lisinopril dose
c) Replace Lisinopril with Amlodipine
d) No Change in current medicines
Questions?
References:

- Hypertension. 2017; Whelton PK, et al
References:

- Statement: statin use for the primary prevention,....U.S. Preventive Services Task Force (USPSTF); 2016 Nov [11 p].
- SHARP Lancet. 2011;377(9784):2181
- Kidney International Supplements (2013) 3—bicarb
- Htn in CKD: Beyond Guidelines... Adv Chronic Kidney Dis. 2015 March; 116-122
- Thiazides in advanced CKD,... J Am Soc Hypertens. 2012;6(5)299-308
References:

- James PA, MD; Suzanne Oparil S; Carter BL, et al. 2014 Evidence-based guideline for the management of high blood pressure in adults, from the panel members appointed to the Eighth Joint National Committee (JNC 8). JAMA 2013.


References:

References:


- Lee Y, Kim J, Roh Y et al. The combination of vitamin d deficiency and mild to moderate chronic kidney disease is associated with low bone mineral density and deteriorated femoral microarchitecture: results from the KNHANES


