# Chronic Kidney Disease in Primary Care

Monica Plesa, MD

UCLA Family Medicine Residency Lecture

1/22/20

# Objectives

- Review available guidelines re: diagnosis and management of CKD
- Review our roles as PCPs in screening and treating pts with CKD
- Identify resources available to PCPs to help early detection and management of CKD

# KDIGO

- Kidney Disease: Improving Global Outcomes
- Global organization “developing and implementing evidence based clinical practice guidelines in kidney disease”
- Independent volunteer-led self-managed charity incorporated in Belgium
- Established in 2003 by National Kidney Foundation
- 2013 became an independently incorporated non-profit governed by an international volunteer Executive Committee (international nephrologists)

# National Kidney Foundation

- “the leading organization in the U.S. dedicated to awareness, prevention and treatment of kidney disease for hundreds of thousands of healthcare professionals, millions of patients and their families, ad tens of millions of Americans at risk.”

*From the National Kidney Foundation website*

# What is CKD?

# CKD Criteria

- Abnormalities of kidney structure or function, present for >3 months, with implications for health.
- Either of the following must be present for >3 months:
  - ACR > 30 mg/g
  - Markers of kidney damage (one or more*)
  - GFR <60 mL/min/1.73m$^2$ (GFR G3a-G5)

# *Markers of kidney damage

- Albuminuria
- Urine sediment abnormalities (nephrotic, nephritic syndromes)
- Electrolyte and other abnormalities due to tubular disorders
- Abnormalities detected by histology
- Structural abnormalities detected by imaging
- H/o kidney transplant
- HTN 2/2 kidney disease

# Assign Albuminuria Category

***Albuminuria is the earliest marker of glomerular disease and usually appears before GFR is reduced!***

| Albuminuria Categories in CKD | | |
|---|---|---|
| Category | ACR (mg/g) | Terms |
| A1 | <30 | Normal to mildly increased |
| A2 | 30-300 | Moderately increased* |
| A3 | >300 | Severely increased** |
| *Relative to young adult level. ACR 30-300 mg/g for >3 months indicates CKD. | | |
| **Including nephrotic syndrome (albumin excretion ACR >2220 mg/g). | | |

Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. *Kidney Int Suppls*. 2013;3:1-150.

# Assign GFR Category

| GFR Categories in CKD | | | |
|---|---|---|---|
| **Category** | GFR | Terms | Clinical Presentations |
| **G1** | ≥90 | Normal or high | Markers of kidney damage (nephrotic syndrome, nephritic syndrome, tubular syndromes, urinary tract symptoms, asymptomatic urinalysis abnormalities, asymptomatic radiologic abnormalities, hypertension due to kidney disease) |
| **G2** | 60-89 | Mildly decreased* | |
| **G3a** | 45-59 | Mildly to moderately decreased | • Mild to severe complications:<br>  ○ Anemia<br>  ○ Mineral and bone disorder<br>  ▪ Elevated parathyroid hormone<br>  ○ Cardiovascular disease<br>  ▪ Hypertension<br>  ▪ Lipid abnormalities<br>  ○ Low serum albumin |
| **G3b** | 30-44 | Moderately to severely decreased | |
| **G4** | 15-29 | Severely decreased | |
| **G5** | <15 | Kidney failure | • Includes all of the above<br>• Uremia |

GFR = mL/min/1.73m$^2$

*Relative to young adult level

In the absence of evidence of kidney damage, neither GFR category G1 nor G2 fulfill the criteria for CKD.

Refer to a nephrologist and prepare for kidney replacement therapy when GFR <30 mL/min/1.73m$^2$.

Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. *Kidney Int Suppls.* 2013;3:1-150.

# *Classification of CKD Based on GFR and Albuminuria Categories used by KDIGO*

**Prognosis of CKD by GFR and Albuminuria Categories**

| GFR categories (mL/min/1.73m²) Description and range | | | | Albuminuria categories Description and range | | |
|---|---|---|---|---|---|---|
| | | | | **A1** | **A2** | **A3** |
| | | | | Normal to mildly increased | Moderately increased | Severely increased |
| | | | | <30 mg/g <3 mg/mmol | 30-299 mg/g 3-29 mg/mmol | ≥300 mg/g ≥30 mg/mmol |
| | **G1** | Normal or high | ≥90 | | | |
| | **G2** | Mildly decreased | 60-89 | | | |
| | **G3a** | Mildly to moderately decreased | 45-59 | | | |
| | **G3b** | Moderately to severely decreased | 30-44 | | | |
| | **G4** | Severely decreased | 15-29 | | | |
| | **G5** | Kidney failure | <15 | | | |

Green: low risk (if no other markers of kidney disease, no CKD); Yellow: moderately increased risk; Orange: high risk; Red, very high risk.

KDIGO 2012

# Screening Tools: eGFR

- Considered best overall index of kidney function
- Normal GFR varies according to age, sex, and body size and declines with age.
- NKF recommends using the CKD-EPI Creatinine Equation (2009) to estimate GFR (search GFR calculator NKF), can also use MDRD and Cockcroft-Gault

**NKF*

# Average GFR by Age in People Without CKD

| Age (Years) | Average Measured GFR ($mL/min/1.73m^2$) |
|---|---|
| 20-29 | 116 |
| 30-39 | 107 |
| 40-49 | 99 |
| 50-59 | 93 |
| 60-69 | 85 |
| 70+ | 75 |

# Clinical Evaluation of Patients with CKD

- Blood pressure
- A1C
- Serum creatinine
- UA (sediment, ACR)
- Electrolytes
- Blood glucose
- CBC
- Renal imaging (e/o kidney disease or obstruction)

# Clinical Evaluation of Patients with CKD (continued)

- Depending on stage: albumin, phosphate, calcium, iPTH
- Depending on age and H&P: light chain assay, SPEP, UPEP, HIV, HCV, HBV, complements

# Screening Tools: ACR

- Urinary albumin-to-creatinine ratio (ACR) = albumin (mg) / creatinine concentration (g)
- Spot urine ACR quantifies proteinuria (if present): ***mild, moderately, severely increased***
- Urine dipsticks not sensitive enough for mild proteinuria (detect total protein >30g/dL)
- First morning void preferable

# Albuminuria and Proteinuria Definitions

- Normal-mild Albuminuria:
  - ACR <30 mg/g
- Moderate Albuminuria:
  - ACR 30-300 mg/g
  - 24-hr urine albumin 30-300 mg/d
- Severe Albuminuria:
  - ACR ≥300 mg/g
  - 24-hr urine albumin >300 mg/d
- Proteinuria:
  - Positive Udip (>30 mg/dL)
  - ≥200 mg protein/g creatinine
  - 24-hr urine protein >300 mg/d

# BP Goals in CKD

- DM and non-DM adults with CKD and urine albumin excretion <30 mg/24 hrs or equivalent: ≤140/90
- DM and non-DM adults with CKD and urine albumin excretion ≥30 mg/24 hrs or equivalent: ≤130/80

# BP Agents: ACE-Is and ARBs

- Renin-angiotensin-aldosterone system blockers (RAAS inhibitors) if albuminuria
- Recommended for treating HTN in DM and non-DM pts with CKD and albuminuria
  - Watch for decrease in GFR, hyperK (NSAIDs, potassium sparing diuretics, spironolactone, COX-2 inhibitors)
  - Caution in childbearing-age women

# BP Agents: Spironolactone

- Aldosterone antagonists help decrease albuminuria when used with ACE-I or ARB
- Watch for hyperK

# BP Agents: Thiazides and Thiazide-like diuretics

- Salt and water retention are major contributors to HTN and morbidity and mortality in pts with CKD
- Thiazide (like HCTZ) and Thiazide-like (like Chlorthalidone) diuretics: better long term BP control than loop diuretics
- May induce or aggravate hyperglycemia/metabolic syndrome

# BP Agents: Loop Diuretics

- Not as efficacious as Thiazides/Thiazide-like Diuretics in primary HTN control
- Good options for treating edema and HTN in pts with CKD 4-5 with or as alternative to thiazides/thiazide-like diuretics

# BP Agents: K sparing Diuretics

- Triamterene and amiloride
- Usually avoided in pts with CKD 2/2 risk of hyperK
- Less effective than other diuretics

# BP Agents: BBs

- Consider if other indications for BB
- Watch for accumulation of Rx/metabolites with atenolol and bisoprolol

# BP Agents: CCBs

- Dihydropyridines (amlodipine, nifedipine, lercanidipine) – more risk of fluid retention, edema, increase urine albumin excretion*
- Non-dihydropyridine benzothiazepines (diltiazem)
- Phenylalkylamines (verapamil)
- Caution in pts with CKD also on BBs (can potentiate bradycardia)
- Avoid dihydropyridine CCBs in pts with CKD and established albuminuria, especially if not on concomitant ACE-I or ARB
- Non-dihydropyridines can interfere with certain immunosuppressants' metabolism and excretion

# BP Agents: Alpha-andrenergic agonists

- Clonidine, methyldopa, moxonidine
- Reduce sympathetic outflow from brain -> vasodilation
- Can be useful adjuncts for pts with CKD and resistant HTN 2/2 minimal interactions with other anti-HTN agents or immunosuppressants but limited use 2/2 side effects

# BP Agents: Alpha-blockers

- Prazosin, doxazosin, terazosin
- Cause peripheral vasodilation
- Can be useful adjuncts especially for pts with BPH

# BP Agents: Direct Vasodilators

- Hydralazine, minoxidil
- May consider but not generally recommended (side effects, low efficacy in pts with CKD)

# Other interventions that may slow progression of CKD:

- Dietary protein restriction
- Tobacco cessation
- Use of bicarb to treat chronic metabolic acidosis
- Blood sugar/DM control
  - SGLT2 inhibitors (-gliflozin's) may reduce the risk of kidney disease progression in pts with DM type 2

# DM Control

- Target A1C 7

# Our Role in CKD Patient Care

1. Identify patients with CKD (risk factors*)
2. Assess GFR, albuminuria
3. Determine etiology, treat reversible causes (if any)
4. Assess for e/o progression
5. Assess for associated complications (HTN, HL, uremia complications, acid base disorders, electrolyte abnormalities, fluid overload, anemia, bone disease, depression, decreased functionality)
6. Patient education (including dietary recs/nutrition referral)
7. Assess life expectancy/pt wishes re: HD and transplantation
8. Vaccinate!

# CKD Risk Factors

| Modifiable | Non-Modifiable |
| --- | --- |
| DM | FHx of kidney disease, DM or HTN |
| HTN | Age ≥ 60 yo (GFR declines normally with age) |
| H/o AKI | Race/U.S. ethnic minority status |
| Frequent NSAID use | |

# CKD Patient Safety Issues

- Medication errors
  - Toxicity (nephrologic or other)
  - Improper dosing
  - Inadequate monitoring
- Electrolytes
  - HyperK
  - Hypoglycemia
  - Hypermag
  - Hyperphos
- Miscellaneous
  - Multidrug-resistant infections
  - Arm preservation/HD access

# CKD Patient Safety Issues (continued)

- Diagnostic tests
  - Iodinated contrast media: AKI
  - Gadolinium-based contrast: Nephrogenic systemic fibrosis (NSF)
  - Sodium phosphate bowel preparations: AKI, CKD
- CVD
- Fluid management
  - Hypotension
  - AKI
  - CHF exacerbation

# Medication Considerations

- CKD pts at high risk for drug-related adverse events
- Several classes of drugs renally excreted
- Consider kidney function and current eGFR (not just SCr!) when prescribing/dosing Rx
- Minimize pill burden as much as possible
- Avoid NSAIDs (and remind your CKD pts)
- No dual RAAS blockade
- Any med with >30% renal clearance probably needs renal dose adjustment
- No bisphosphonates for eGFR <30
- Avoid gadolinium with eGFR<30

# CKD and When to Refer?

- AKI or abrupt sustained fall in GFR
- GFR <30 (G4-G5)
- Persistent albuminuria (ACR >300mg/g)*
- **Atypical progression of CKD**
- **Urinary red cell casts, RBCs > 20 per hpf and not readily explained**
- **HTN refractory to treatment with ≥4 meds**
- **Persistent abnormalities of serum K**
- **Recurrent or extensive nephrolithiasis**
- **Hereditary kidney disease**

*Progression of CKD: 1) decline in GFR category plus **≥25% drop in eGFR from baseline and/or 2) rapid progression of CKD = sustained decline in eGFR ≥5mL/min/1.73m2/year (KDOQI US Commentary on the 2012 KDIGO Evaluation and Management of CKD)**

# CKD Labs

- BMP (eGFR, creatinine, Calcium, K, Bicarb)
- CBC
- PTH – responds to both hyperphosphatemia and hypocalcemia
- Vitamin D
- ACR

# How Often?

- CKD 3: q6-12 months
- CKD 4: q3-6 months
- CKD 5: q1-3 months
  - PTH and vit D may be less frequent

# Hyperparathyroidism

- Limit dietary phosphate intake
- Oral phosphate binders
- Vitamin D analogs (calcitriol = 1,25-dihydroxyvitamin D)
- Calcimimetics (increase sensitivity of calcium-sensing receptor in the parathyroid gland to Ca) = cinacalcet (Sensipar)

# Vit D Goal

- Treat to normal level

# Metabolic Acidosis

- Goal serum bicarb ≥ 22 mmol/L
- Start with 0.5-1 mEq/kg per day
- Tablets, solution (avoid if on aluminum phosphate binders) or baking soda

# Vaccines

- Flu: offer yearly to adult patients with CKD of any stage
- HBV: adults with CKD 4-5 who are at high risk of progression of CKD, confirm response with Ab testing
- Pnuemococcal vaccines: adults with CKD 4-5 who are at high risk of progression of CKD, booster in 5 years if <65, still need additional ≥65yo dose of Pneumovax

# Medications, Contrast, and All That Good Stuff

# *CKDintercept*

- National Kidney Foundation's initiative to provide the knowledge and tools to alter CKD outcomes, improve patients' QOL, and have an impact on CKD healthcare spending nationwide through early dx and treatment.
- As many as 22 million Americans – 90% of people living with CKD – are at risk for a heart attack, stroke or premature death.

# *CKDinform*

- First component of NKF's *CKDintercept*: to help PCPs recognize CKD earlier and develop treatment protocols to slow its progression
- CME symposiums, resources
- Preview of modules available online

# References:


- KDIGO 2012 Clinical Practice Guidelines for the Evaluation and Management of Chronic Kidney Disease. *Kidney International Supplements* (2013) 3, 2; doi:10.1038/kisup.2012.74
- KDIGO 2012 Clinical Practice Guideline for the Management of Blood Pressure in Chronic Kidney Disease. *Kidney International Supplements* (2012) 2, 339; doi:10.1038/kisup.2012.48
- National Kidney Foundation www.kidney.org Retrieved on 1/22/20
- Rosenberg, M. (2019) Overview of the management of chronic kidney disease in adults. Motwani, S. *UpToDate*. Retrieved January 16, 2020, from https://www.uptodate.com/contents/overview-of-the-management-of-chronic-kidney-disease-in-adults?search=Overview%20of%20the%20management%20of%20chronic%20kidney%20disease%20in%20adults&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1

# Questions?

# Thank you!