Primary Care Approach to Management of CKD
Low CKD recognition is a public health problem

KIDNEY DISEASE: A HIDDEN RISK

AMERICANS WITH CHRONIC KIDNEY DISEASE (CKD)

30 MILLION

Only 10% know they have CKD

26 MILLION remain undiagnosed

$100B MEDICARE COST
The Role of CKD Recognition in Population Health

• Early recognition of CKD:
  – Offers opportunity to enhance kidney protective care by improving management of modifiable risk factors
  – Improves prediction of incident cardiovascular events beyond traditional risk factors\(^1\)
  – Encourages appropriate and timely referral to nephrology
  – Can limit patient safety risk associated with CKD

Risk Factors for CKD

• **Modifiable**
  – Diabetes
  – Hypertension
  – Frequent NSAID use
  – History of acute kidney injury

• **Non-modifiable**
  – Family history of kidney disease
  – Age 60 or older
  – Ethnicity: African American, Hispanic, Asian/Pacific Islander, American Indian
Improved CKD Diagnosis

• Studies demonstrate clinician behavior changes when CKD diagnosis improves.
  – Significant improvements realized in:
    • Increased urinary albumin testing
    • Increased appropriate use of ACEi or ARB
    • Avoidance of NSAIDs prescribing among patients with low eGFR
    • Appropriate referral and timely to nephrology

CKD is diagnosed using two laboratory tests

- Estimated glomerular filtration rate (eGFR) provides insight regarding overall kidney function

- Albumin-creatinine ratio, urine (ACR) provides insight regarding the extent of kidney damage

Many laboratories offer these two tests as a Kidney Profile to streamline the ordering process.
Estimated Glomerular Filtration Rate (eGFR)

- Normal eGFR varies according to age, sex and body size
  - eGFR will decline with age
- The National Kidney Foundation recommends the CKD-EPI creatinine equation (2009) as the most accurate and least biased method to estimate eGFR

The National Kidney Foundation provides an eGFR calculator at:
https://www.kidney.org/professionals/kdoqi/gfr_calculator

Summary of the MDRD Study and CKD-EPI Estimating Equations:
**Albumin-creatinine Ratio, Urine**

- Urine albumin-creatinine ratio (ACR) is calculated by dividing albumin concentration in milligrams by creatinine concentration in grams.
- The urine creatinine assists in adjusting albumin levels of varying urine concentrations, which allows for more accurate results versus albumin alone.
- Spot urine albumin-creatinine ratio for quantification of proteinuria.
  - New guidelines classify three levels of albuminuria as normal/mild, moderate or severe.
- First morning void preferable – 24-hour urine test is rarely necessary to assess albuminuria or proteinuria.
Diagnostic Criteria for CKD

- Abnormalities of kidney structure or function present for 3 or more months, with implications for health
- Either of the following must be present for >3 months:
  - eGFR: <60 mL/min/1.73m²
  - ACR: >30 mg/g
  - Markers of kidney damage (one or more*)

*Markers of kidney damage can include urinalysis abnormalities such as glomerular hematuria, kidney biopsy abnormalities or polycystic kidney disease on imaging studies.
### Classification of CKD using eGFR and ACR

<table>
<thead>
<tr>
<th>eGFR categories (ml/min/1.73m²)</th>
<th>Description and range</th>
<th>Albuminuria categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>Normal or High</td>
<td>≤ 90</td>
</tr>
<tr>
<td>G2</td>
<td>Mildly decreased</td>
<td>60-89</td>
</tr>
<tr>
<td>G3a</td>
<td>Mildly to moderately decreased</td>
<td>45-59</td>
</tr>
<tr>
<td>G3b</td>
<td>Moderately to severely decreased</td>
<td>30-44</td>
</tr>
<tr>
<td>G4</td>
<td>Severely decreased</td>
<td>15-29</td>
</tr>
<tr>
<td>G5</td>
<td>Kidney Failure</td>
<td>&lt; 15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal to mildly increased</td>
<td>&lt;30mg/g</td>
<td>30-299 mg/g</td>
<td>≥300 mg/g</td>
</tr>
<tr>
<td>&lt;3 mg/mmol</td>
<td>3-29 mg/mmol</td>
<td>≥30 mg/mmol</td>
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#### Prognosis of CKD by eGFR and Albuminuria Categories

CKD and Patient Safety

Medication Errors
- Toxicity (nephrologic or other)
- Improper dosing
- Inadequate monitoring

Electrolytes
- Hyperkalemia
- Hypoglycemia
- Hypermagnesemia
- Hyperphosphatemia

Miscellaneous
- Multidrug-resistant infections
- Arm preservation/dialysis access

Diagnostic tests
- Iodinated contrast media: AKI
- Gadolinium-based contrast: Nephrogenic systemic fibrosis (NSF)
- Sodium Phosphate bowel preparations: AKI, CKD

Cardiovascular Disease
- Missed diagnosis
- Improper management

Fluid management
- Hypotension
- AKI
- CHF exacerbation

AKI = acute kidney injury; CHF = congestive heart disease
CKD & Patient Safety Acute Kidney Injury Risks

- Remind CKD patients to avoid NSAIDs.
- Avoid Dual RAAS blockade.
- Any med with >30% renal clearance probably needs dose adjustment for CKD.
- No bisphosphonates for eGFR <30 mL/min/1.73m².
- Avoid gadolinium-based contrast for eGFR <30 mL/min/1.73m².

CKD, Medications and Patient Safety

• CKD patients at high risk for drug-related adverse events.
• 50% of FDA approved drugs are cleared by the kidneys.
• Consider kidney function and current eGFR (not just SCr) when prescribing medications.
• Minimize pill burden as much as possible.
Indications for Nephrology Referral

• Acute kidney injury
• eGFR <30 mL/min/1.73m² (eGFR categories G4-G5)
• Persistent albuminuria (ACR >300 mg/g)*
• Atypical Progression of CKD**
• Urinary red cell casts, RBC more than 20 per HPF sustained and not readily explained

*Significant albuminuria is defined as ACR 300 mg/g (30 mg/mmol) or AER 300 mg/24 hours, approximately equivalent to PCR 500 mg/g (50 mg/mmol) or PER 500 mg/24 hours

**Progression of CKD is defined as one or more of the following: 1) A decline in GFR category accompanied by a 25% or greater drop in eGFR from baseline; and/or 2) rapid progression of CKD defined as a sustained decline in eGFR of more than 5mL/min/1.73m²/year. KDOQI US Commentary on the 2012 KDIGO Evaluation and Management of CKD.
Indications for Nephrology Referral

- Hypertension refractory to treatment with 4 or more antihypertensive agents
- Persistent abnormalities of serum potassium
- Recurrent or extensive nephrolithiasis
- Hereditary kidney disease