### How to Manage Your CKD Patients

**Conditions of ↑ CKD Risk?**
- Diabetes
- Hypertension
- Cardiovascular Disease
- Obesity
- Age >60 years
- Ethnic/Racial Minority
- Family History of CKD
- AKI History

**Screen for CKD**
- "Spot" urine for albumin-to-creatinine ratio (ACR) to detect albuminuria
- Serum creatinine to estimate glomerular filtration rate (GFR)

**Is either of the following present for 3 months or more?**
- eGFR <60 ml/min/1.73 m²
- ACR >30 mg/g

**Classify CKD stage**

#### Assign GFR Category

<table>
<thead>
<tr>
<th>GFR Category</th>
<th>Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>45 – 59</td>
<td>3a</td>
</tr>
<tr>
<td>30 – 44</td>
<td>3b</td>
</tr>
<tr>
<td>15 – 29</td>
<td>4</td>
</tr>
<tr>
<td>&lt;15</td>
<td>5</td>
</tr>
</tbody>
</table>

**Assign Albuminuria Category**
- <30 = normal or mild ↑
- 30-299 = moderately ↑
- >300 = severely ↑

**Patient Safety**
- eGFR <60 = Patient Safety Risk
  - Drug dosing consider eGFR
  - Continue metformin use
  - Avoid contrast-induced AKI prevention
  - Avoid contrast or minimize dose
  - Consider isotonic saline infusion before, during, and after procedure
  - Withhold metformin, RAAS blockers, and diuretics
- eGFR 45 - <60
  - Avoid prolonged NSAIDs
  - Continue metformin use
- eGFR 30 - <45
  - Avoid prolonged NSAIDs
  - Use metformin with close monitoring at 50% dose
- eGFR <30
  - Avoid any NSAIDs
  - Avoid biphosphonates
  - Avoid metformin
  - Avoid PICC; lines use single and double lumen central catheters instead
  - Monitor PT/INR closely given increased risk of warfarin anticoagulation bleeding

**CKD Progression + Complications**
- Blood Pressure Goal <140/90
- Consider BP goal <130/80 only if ACR >300
- ACE-I or ARB for HTN if ACR >30
- Avoid ACE-I and ARB in general
- Diuretic usually required
- Dietary sodium <2000 mg/day
- DM - Target HbA1c ~7%
- CKD Complications Testing
  - Anemia - CKD 3: Evaluation if Hb <13.0 for men and <12.0 for women. Treat iron deficiency first. Use ESA to treat Hb <10 g/dl (Target 9–11.5) or refer to nephrology
  - Acidosis - Bicarbonate goal >22-26 use sodium bicarbonate 850 mg thrice daily
  - CKD-MBD - CKD 3+ calcium, phosphate, 25-OH vitamin D, and iPTH. Supplement vitamin D deficiency. If hyperphosphatemia or significant iPTH elevation refer to nephrology.
  - Vaccination for influenza + pneumococcus
  - Nephropathy Referral
    - eGFR <30 or ACR >300 mg/g
    - 25% decrease in eGFR (AKI or progressive CKD may be difficult to distinguish)
    - Persistent hyperkalemia/metabolic acidosis
    - Recurrent kidney stones
    - Unexplained hematuria
    - Horsely or unknown cause of CKD

**CKD and CVD**
- CKD = ↑ CVD risk
- Consider lipid lowering therapy
  - All >50 years
  - 18-50 years at high CVD risk (h/o CAD, DM, h/o ischemic CVA, 10 yr risk of MI >10%)
- ASA for secondary prevention unless bleeding risk outweighs benefits

**Abbreviations**
- ACE-I, angiotensin-converting enzyme inhibitor; ACR, albumin-to-creatinine ratio; AER, albumin excretion rate; AKI, acute kidney injury; ARB, angiotensin receptor blocker; ASA, acetylsalicylic acid (aspirin); A stage, Albuminuria category; CAD, coronary artery disease; CKD, chronic kidney disease; CKD-MBD, chronic kidney disease mineral and bone disorder; CVA, cerebrovascular accident; CVD, cardiovascular disease; DM, diabetes mellitus; eGFR, estimated glomerular filtration rate; ESA, erythropoietin-stimulating agent; HB, hemoglobin; HTN, hypertension; iPTH, intact-parathyroid hormone; NSAIDs, nonsteroidal anti-inflammatory drugs; 25-OH vitamin D; 25-OH vitamin D; PICC, peripherally inserted central catheter line; PT/INR, prothrombin time, international normalized ratio; RAAS, renin angiotensin aldosterone system.

How to Evaluate for Chronic Kidney Disease

Know the criteria for chronic kidney disease (CKD).

• Abnormalities of kidney structure or function, present for >3 months, with implications for health
• Either of the following must be present for >3 months:
  * Markers of kidney damage (one or more)
  * GFR <60 ml/min/1.73 m²

Screen for CKD with two simple tests.

• "Spot" urine for albumin-to-creatinine ratio (ACR) to detect albuminuria
• Serum creatinine to estimate glomerular filtration rate (GFR)

What if CKD is detected?

• Classify CKD based on cause, GFR category, and albuminuria category
• Implement a clinical action plan based on patient's CKD classification (See flip side)
  * Consider co-management with a nephrologist if the clinical action plan cannot be carried out
  * Refer to a nephrologist when GFR <30 mL/min/1.73 m² or ACR >300 mg/g
• Learn more at www.kidney.org/professionals

Why should you classify CKD?

• To have a more precise picture of each patient's condition
• To guide decisions for testing and treatment
• To evaluate patient's risk of progression and complications
• Because neither the category of GFR nor the category of albuminuria alone can fully capture prognosis of CKD

How do you classify CKD?

• Identify cause of CKD*
• Assign GFR category
• Assign albuminuria category

*Cause of CKD is classified based on presence or absence of systemic disease and the location within the kidney of observed or presumed pathologic-anatomic findings.

<table>
<thead>
<tr>
<th>GFR categories in CKD</th>
<th>Terms</th>
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<tbody>
<tr>
<td>G1 e90</td>
<td>Normal or high</td>
</tr>
<tr>
<td>G2 60-89</td>
<td>Mildly decreased*</td>
</tr>
<tr>
<td>G3a 45-59</td>
<td>Mildly to moderately decreased</td>
</tr>
<tr>
<td>G3b 30-44</td>
<td>Moderately to severely decreased</td>
</tr>
<tr>
<td>G4 15-29</td>
<td>Severely decreased</td>
</tr>
<tr>
<td>G5 &lt;15</td>
<td>Kidney failure</td>
</tr>
</tbody>
</table>

*Relative to young adult level. In the absence of evidence of kidney damage, neither GFR category G1 nor G2 fulfill the criteria for CKD.

<table>
<thead>
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<th>Albuminuria categories in CKD</th>
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<tr>
<td>A1 &lt;30</td>
<td>Normal to mildly increased</td>
</tr>
<tr>
<td>A2 30–300</td>
<td>Moderately increased*</td>
</tr>
<tr>
<td>A3 &gt;300</td>
<td>Severely increased†</td>
</tr>
</tbody>
</table>

*Relative to young adult level. ACR 30–300 mg/g for >3 months indicates CKD.
†Including nephrotic syndrome (albumin excretion ACR >2220 mg/g)

References

Abbreviations
A Stage, albuminuria category; ACE-I, angiotensin-converting-enzyme inhibitor; ACR, albumin-to-creatinine ratio; AER, albumin excretion rate; AKI, acute kidney injury; ARB, angiotensin receptor blocker; ASA, acetylsalicylic acid (aspirin); CAD, coronary artery disease; CKD, chronic kidney disease; CKD-MBD, chronic kidney disease mineral and bone disorder; CVA, cerebrovascular accident; CVD, cardiovascular disease; DM, diabetes mellitus; eGFR, estimated glomerular filtration rate; ESA, erythropoietin-stimulating agent; G Stage, GFR category; Hb, hemoglobin; HTN, hypertension; iPTH, intact-parathyroid hormone; NSAIDs, nonsteroidal anti-inflammatory drugs; PICC, peripherally inserted central catheter line; PT INR, prothrombin time, international normalized ratio; RAAS, renin angiotensin aldosterone system.

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