CKD is a heterogeneous group of disorders characterized by alterations in kidney structure or function for three or more months.1 Patients with abnormal eGFRs are at significantly increased risk for all-cause and cardiovascular mortality, ESRD, acute kidney injury and CKD progression in comparison to patients with normal eGFRs.2 It's recommended that PCPs proactively identify and manage early stage CKD to reduce the risk of disease progression and associated complications.

Clinical criteria for diagnosing CKD

The clinician should consider linking CKD to other medical conditions such as hypertension (ICD-10: I12.0, I12.9, I13.0, I13.10, I13.11, I13.2), diabetes (E10.22 - type 1 DM, E11.22 - type 2 DM) and anemia (D63.1). CKD diagnostic criteria include duration of abnormal glomerular filtration rate (GFR) and/or indicators of kidney damage (e.g., albuminuria, urine sediment abnormalities, or structural abnormalities detected by imaging).1 When evaluating lab findings (e.g., creatinine, BUN, electrolytes, etc.), clinicians should consider context (e.g., patient’s age, acute kidney injury/acute renal failure, malnutrition, major limb amputation and cirrhosis) and transient causes (e.g., volume depletion, exposure to nephrotoxic substances, etc.).

Staging CKD assists in clinical management, including risk stratification for disease progression and development of complications. The staging criteria include disease cause, Albuminuria category and GFR category.

Currently, the most common indirect measure of glomerular filtration is based upon serum creatinine. Serum creatinine is used to calculate GFR in individuals with stable kidney function (e.g., normal kidney function or CKD). GFR estimation (eGFR) equations incorporate known demographic and clinical variables that address unmeasured physiologic factors affecting serum creatinine concentration thereby GFR estimates. Cockcroft-Gault equation, MDRD study equation and CKD-EPI equation are used with recognized limitations.

The National Kidney Foundation3 recommends using the 2009 CKD-EPI equation to calculate eGFR for the general population and individuals with GFR near or above 60mL/min per 1.73m. A calculator for the CKD-EPI equation is found at www.kidney.org/professionals/kdoqi/gfr_calculator.cfm.

CKD may be documented by evaluating past measures of GFR. If the GFR is found to be abnormal for at least a three month period of time, then a functional assessment of the kidney should be performed in the event that the GFR resides CKD stages 1 or 2. The additional CKD stage 1 or stage 2 functional assessment should be in the form of a: urine albumin and sediment assessment, or through renal imaging study to document reduced kidney volume, reduction in cortical thickness, and cysts. If the GFR is classified as beyond stage 3, then the clinician is not required to document a functional renal assessment, i.e urine albumin, sediment and/or renal imaging study.
<table>
<thead>
<tr>
<th>CKD stage (ICD-10-CM)</th>
<th>Description (GFR – mL/min/1.73m²)</th>
<th>Clinical presentation/clinician action</th>
<th>Monitoring/testing</th>
<th>Treatment considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>None/normal</td>
<td>GFR &gt; 90</td>
<td>Often risk factors present SCREEN for CKD with GFR ADDRESS – co-morbidities START – CKD risk reduction</td>
<td>Every 12 months • BP, Fasting lipids, electrolytes, glucose, BUN, Cr, eGFR • UA for hematuria or proteinuria &amp; microscopic exam</td>
<td>Tobacco cessation; Weight reduction; Aspirin approximately 75mg q day</td>
</tr>
<tr>
<td>1 (N18.1)</td>
<td>Kidney damage and GFR &gt; 90 AER &gt; 30 mg/24 hours; ACR &gt; 30 mg/g (&gt; 3 mg/mol)</td>
<td>Often asymptomatic IDENTIFY etiology of CKD DIAGNOSE &amp; TREAT CKD risk factors and comorbid conditions</td>
<td>Every 12 months • BP, Fasting lipids, Electrolytes, glucose, BUN, Scr, eGFR • UA for hematuria/ proteinuria &amp; microscopic exam &amp; UAC if non-DM • UACR if DM</td>
<td>Consult nephrology consult if eGFR declines by &gt; 4mL/min/yr</td>
</tr>
<tr>
<td>2 (N18.2)</td>
<td>Kidney damage and GFR 60-89 AER &gt; 30 mg/24 hours; ACR &gt; 30 mg/g (&gt; 3 mg/mol) Most lower GFRs are age related. If no proteinuria no further evaluation.</td>
<td>Moderate complications ESTIMATE CKD progression rate DIAGNOSE &amp; TREAT CVD risk factors and co-morbid conditions</td>
<td>Every 3-12 months • BP, UACR or UPC Every 6-12 months • Electrolytes, glucose, BUN, Scr, eGFR Every 12 months • If hemoglobin &lt; 10-12 - CBC, reticulocyte count, TSAT, ferritin CONSIDER – Ca/P/PTH/25(OH)D evaluation</td>
<td>Avoid nephrotoxins; rule out AKI/ARF (e.g., obstruction)</td>
</tr>
<tr>
<td>3 (N18.3)</td>
<td>IIIA – GFR 45-59 IIIB – GFR 30-44 Complications more frequent Proteinuria is a serious CV risk factor and prognostic importance for progression of CKD</td>
<td>Moderate complications ESTIMATE CKD progression rate DIAGNOSE &amp; TREAT CVD risk factors and co-morbid conditions</td>
<td>Baseline • Ca/P/PTH/Alk phos/25(OH)D; repeat depending upon baseline, progression, response to treatment • eGFR Every 3-6 months • CBC. If Hb &lt; 10 g/dL then q 1-3 months until Hb 10-12 g/dL then q 3 months; if Hb &lt;13 g/dL in male or 12 g/dL in female, collect TSAT and ferritin. Collect again after treatment. Every 3-12 months • BP, Electrolytes, glucose, BUN, Scr, eGFR Every 6 -12 months • UPC or UACR EVALUATE for extraskeletal calcification</td>
<td>Avoid of nephrotic meds (e.g., NSAIDs) and adjust dosing based on renal function; rule out ARF (e.g., obstruction) Nutritional assessment – anytime once Stage III-V</td>
</tr>
<tr>
<td>4 (N18.4)</td>
<td>GFR 15-29 Major increase in CVD risk – equivalent to a major CVD event</td>
<td>Severe complications CONSULT nephrology START discussions kidney replacement therapy DIAGNOSE &amp; TREAT CVD risk factors and co-morbid conditions</td>
<td>Baseline • Ca/P/PTH/Alk phos/25(OH)D; repeat q 6-12 months Every 3-6 months • BP monitoring Every 3-12 months • Electrolytes, glucose, BUN, Scr, eGFR, PC or UACR EVALUATE for extraskeletal calcification</td>
<td>Specific patient/family education: kidney replacement therapy modality Immunizations: TIV, PPV-23, HBV (consider Tdap, VZ) Reinforce dietary prescription, Renal-formulated multivitamin Vascular access surgery evaluation, protect dominant arm</td>
</tr>
<tr>
<td>5 (N18.5)</td>
<td>GFR &lt;15 w/o dialysis treatment</td>
<td>Managed by nephrologist</td>
<td>Managed by nephrologist</td>
<td></td>
</tr>
<tr>
<td>ESRD (N18.6)</td>
<td>Requires dialysis treatment - use additional code to identify dialysis status (Z99.2)</td>
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<td>(N18.9) CKD, unspecified</td>
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</table>

**Abbreviations**

- **ACEI** - angiotensin-converting enzyme inhibitor
- **AKI** - acute kidney injury
- **anti-RAS** - anti-renin-angiotensin-aldosterone system
- **ARB** - angiotensin II receptor blocker
- **ARF** - acute renal failure
- **BP** - blood pressure
- **BUN** - blood urea nitrogen
- **Ca** - calcium
- **CKD** - chronic kidney disease
- **Cr** - serum creatinine
- **CVD** - cardiovascular disease
- **DM** - diabetes mellitus
- **FBS** - fasting blood sugar
- **GFR/eGFR** - glomerular filtration rate/estimated glomerular filtration rate
- **Hb** - hemoglobin
- **HBV ab** - hepatitis B virus antibody
- **P** - phosphate
- **PTH/PTH** - parathyroid hormone/intact parathyroid hormone
- **UA** - urine analysis
- **UACR** - urine albumin to creatinine ratio
- **UPC** - urine protein creatinine ratio
- **US** - ultrasound
- **25(OH)D** - 25-hydroxyvitamin D

**References**