What can you do?

1. **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:
     - ACR >30 mg/g
     - Markers of kidney damage (one or more)
     - GFR <60 mL/min/1.73 m²

2. **Recognize** risk factors
   - Diabetes
   - Hypertension
   - Age 60 years or older
   - Family history of CKD, diabetes, or hypertension
   - U.S. ethnic minority status
   - History of acute kidney injury

3. **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)

4. **Classify** CKD to guide testing and treatment
   - Assign albuminuria category
   - Identify cause of CKD
   - Assign GFR category
   - Classify CKD based on ACR and GFR at www.kidney.org/ckdchart

5. **Diagnose and implement** a clinical action plan based on patient’s CKD classification
   - Consider comanagement with a nephrologist if the clinical action plan cannot be carried out.³
   - Refer to a nephrologist when GFR <30 mL/min/1.73 m² or ACR >300 mg/g

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### Albuminuria categories in CKD²

<table>
<thead>
<tr>
<th>Category</th>
<th>ACR (mg/g)</th>
<th>Terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>&lt;30</td>
<td>Normal to mildly increased</td>
</tr>
<tr>
<td>A2</td>
<td>30-300</td>
<td>Moderately increased*</td>
</tr>
<tr>
<td>A3</td>
<td>&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)

### GFR categories in CKD²

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

GFR = mL/min/1.73 m²

*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 a kidney replacement therapy when GFR <30 mL/min/1.73 m²

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1. 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.


How do you detect albuminuria?

Measure urinary albumin-to-creatinine ratio (ACR)

ACR >300 mg/g?

Yes

Severely increased albuminuria

No

ACR ≥30 mg/g?

No

Send 2 further early morning urine (EMU) samples for ACR within 3 months

Yes

Refer for specialist assessment eg, possible biopsy

EMU ACR ≥30 mg/g in at least 1 of 2 subsequent samples?

Yes

Hematuria?

No

Moderately increased albuminuria

Yes

Diagnose and follow a clinical action plan. For more information, visit www.kidney.org/screening

How do you estimate GFR?

- Use confirmatory tests in specific circumstances when eGFR based on serum creatinine is less accurate:
  - Cystatin C-based equations
  - Combined cystatin and creatinine-based equations

Do you know?

- Serum creatinine alone should not be used to estimate kidney function. This is because a rise in blood creatinine levels is observed only after significant loss of functioning nephrons. A better way to measure kidney function is to estimate GFR with equations that use serum creatinine levels and some or all of the following variables: gender, age, weight, and race.
- Normal GFR varies according to age, sex, and body size; in young adults it is approximately 120-130 mL/min/1.73 m² and declines with age. A persistently reduced GFR is a specific indication of CKD.
- All patients with CKD should be tested for albuminuria at least annually. Persistent and increased albuminuria is an independent risk factor for CKD progression.
- Measuring urinary ACR in a spot urine sample is the recommended method to evaluate albuminuria. ACR is calculated by dividing albumin concentration in milligrams by creatinine concentration in grams. Creatinine assists in adjusting albumin levels for varying urine concentrations, which allows for more accurate results versus albumin alone.

Abbreviations: ACR, albumin-to-creatinine ratio; CKD, chronic kidney disease; EMU, early morning urine; GFR, glomerular filtration rate.


www.kidney.org/screening

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Siemens Healthcare Diagnostics supports the goals of the National Kidney Foundation to increase awareness, prevention, and treatment of chronic kidney disease (CKD). Through early intervention and education, the Alliance encourages timely testing for at-risk individuals by Primary Care Practitioners.

National Kidney Foundation is not involved in the manufacture of any Siemens Healthcare Diagnostics products. Always consult a physician or qualified healthcare provider for advice regarding your health.

Strategic Alliance for Education and Screening

For more information on urine ACR testing, please visit: www.siemens.com/acr