Chronic Kidney Disease: Screening and Staging

This is the third in the series of articles about chronic kidney disease.

Andrew S. Narva, MD; and Theresa A. Kuracina, MS, RD, CDE, both from the Indian Health Service Kidney Disease Program. Albuquerque, New Mexico

All American Indian patients should be assessed as part of routine care to determine their risk for chronic kidney disease (CKD). Patients with a family history of CKD and those of older age have increased susceptibility for developing CKD. Diabetes and high blood pressure are also potential risk factors. Autoimmune diseases, systemic infections, urinary tract infections, urinary stones, lower urinary tract obstruction, low birth weight, and drug toxicity are other initiating factors.

Screening includes an assessment of glomerular filtration rate (GFR) and measurement of urinary protein excretion. Neither requires a 24-hour urine collection. GFR can be estimated from the creatinine using the Cockcroft-Gault formula as described in the previous article in this series (and repeated below). Protein excretion can be estimated from a spot urine specimen. The ratio of albumin or total protein to creatinine is roughly equivalent to the 24-hour protein excretion in grams. Albumin is the predominant protein in adults with glomerular disease, and an albumin-to-creatinine ratio is preferred. Children may be somewhat more likely to have interstitial disease, and the total protein-to-creatinine ratio is recommended. However, either test may be used. The important concept is to quantify the proteinuria.

Estimation of GFR and testing for other markers of kidney disease are the recommended standard of care. Formulae to estimate GFR are as follows:

Adults	$\frac{(140 - \text{age}) (\text{body wt in kg})}{72 \times \text{serum creatinine}}$ (For women: multiply x 0.85)
Children	$\frac{0.55 \times (\text{length in cm})}{\text{serum creatinine}}$

The following are some general points about measuring protein in the urine:

- No need to collect 24-hour urine samples
- Use untimed "spot" urines to detect and monitor proteinuria
- First morning voids are preferable; however random samples are acceptable
- Standard urine dipsticks are acceptable to screen for proteinuria
- Albumin-specific dipsticks are acceptable to screen for albuminuria
- A 1+ or greater result should have quantitative measurement within three months
- protein-to-creatinine ratio OR albumin-to-creatinine ratio useful
- Two or more positive quantitative tests spaced within 1 - 2 weeks confirms proteinuria

Specific Guidelines for Proteinuria in Adults and Children are as follows:

	Adult	Children w/o Diabetes	Children w/ Diabetes
Screening: Use spot urine	• Albumin-specific dipstick • Albumin-to-creatine ratio	• First morning void prefrred to rule out orthostatic proteinuria • Standard urine dipstick • Total protein-to- creatinine ratio	• For post-pubertal children with diabetes for 5 or more years, follow adult screening and monitoring guidelines
Monitoring: Use spot urine	• Albumin-to-creatinine ratio • If albumin-to-creatinine ratio is high (>500 - 1000 mg/g), can use total protein-to creatinine ratio	• Total protein-to- creatinine ratio	• For younger children and those with DM < 5 years, follow screening and monitoring guidelines for children without diabetes

Other Markers of Chronic Kidney Disease

Abnormalities in urine sediment or abnormal imaging studies are other markers of CKD. The clinician can further determine the type of kidney disease by assessing these other markers

Urine Sediment Examination

- "Fresh" first morning void is preferred when assessing urine sediment
- Examine for casts, as casts are formed only in the kid ney. These casts entrap materials in the lumen at the time of cast formation
- In hematuria, the presence of red blood cell castsstrongly suggests glomerulonephritis

- Leukocyte casts along with hematuria may indicate glomerulonephritis
- Urinary eosinophils are associated with allergic tubulointerstitial nephritis

Imaging Studies

Ultrasound is available in many Indian health facilities and is usually the initial imaging procedure of choice. Use caution when using iodinated contrast; this may cause acute kidney damage, especially in the presence of decreased kidney function.

Staging Chronic Kidney Disease

The diagnosis and type of kidney disease, comorbid conditions, severity (as assessed by GFR), complications, risk for loss of kidney function, and presence of cardiovascular disease should be evaluated for all patients with CKD. Diabetic kidney disease will progress faster with higher levels of proteinuria and higher blood pressure, poor glycemic control, and smoking.

The treatment plan is based on a staged approach, as follows:

Stage	Description	GFR (mL/min/1.73 m²)	Metabolic Consequences
1	Kidney damage w/ normal or ↑ GFR	≥ 90	Diagnose/treat, treat comorbid conditions, slow progression, CVD risk reduction
2	Kidney damage with mild ↓ GFR	60 - 89	Estimate progression
3	Moderate ↓GFR	30 - 59	Evaluate and treat complications: assess for anemia, check iPTH, Ca, P; refer to dietitian; conduct functional assessment
4	Severe ↓GFR	15 - 29	Prepare for kidney replacement therapy: refer to specialist; consider low protein diet
5	Kidney failure	< 15 (or dialysis)	Kidney replacement therapy, if uremic

A detailed approach to management of these problems (e.g., anemia, bone disease, malnutrition) will be discussed in upcoming articles.