VIEWPOINT

KDIGO 2024 Guidelines—Key Points for Pediatricians

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Chronic kidney disease (CKD) care in childhood presents unique challenges, including age-based assessments of kidney function, understanding disease trajectories, and supporting growth. Here, we summarize key takeaways for pediatricians from the Kidney Disease: Improving Global Outcomes (KDIGO) 2024 update of the Clinical Practice Guideline for the Evaluation and Management of CKD.[1]

Estimating Glomerular Filtration Rate and Proteinuria

Glomerular Filtration Rate

It is important to estimate glomerular filtration rate (GFR) in children using validated equations developed or validated in comparable populations (**Figure**). Many pediatric nephrologists will use the Chronic Kidney Disease in Children Under 25 (CKIDU25) estimated GFR (eGFR) equation,[2] an update of the modified Schwartz equation.[3] This equation was developed and validated in pediatric and young adult CKD populations, increasing accuracy in estimating GFR in children with CKD. The development cohort included Black, Hispanic, and White children and was validated in European populations. The CKIDU25 equation has lower accuracy and/or higher bias in very low (<15 mL/min/1.73 m^2) and high GFR (>90 mL/min/1.73 m^2) ranges and in the very young (<5 years). Another commonly used pediatric eGFR equation, the European Kidney Function Consortium (EKFC) equation,[4] was developed using a European general pediatric cohort, with a smaller proportion of children with CKD. The EKFC equation has the advantage of not requiring height, but accuracy was poorer when validated in an external multiethnic CKD population.

Use of a cystatin C–based eGFR equation is recommended in children with low muscle mass (eg, neuromuscular conditions or severe malnutrition), as creatinine-based equations may give falsely high eGFR values.

Proteinuria

Proteinuria should be assessed using a first-morning midstream sample to avoid detecting orthostatic proteinuria, which affects 2% to 5% of adolescents. Exercise, menstruation, and intercurrent infection can cause transient proteinuria.

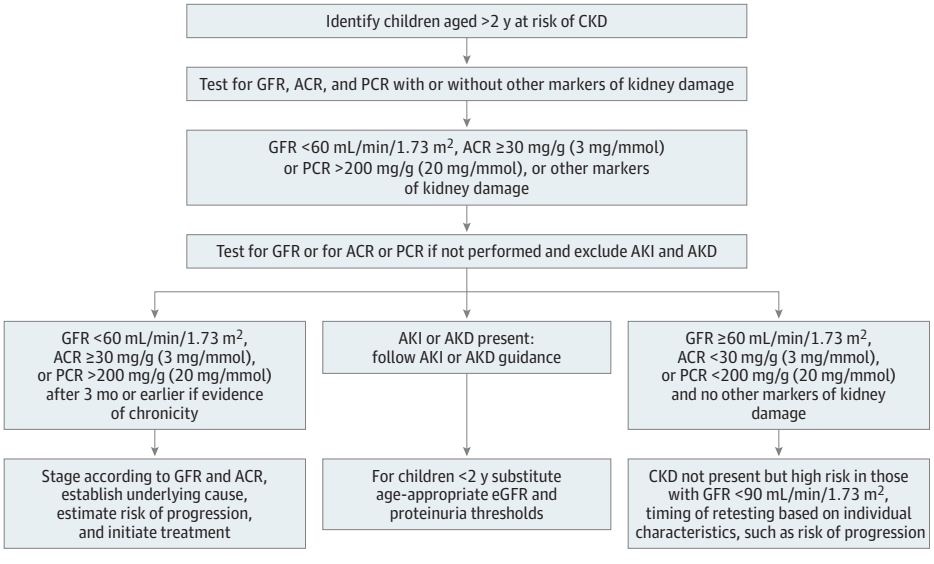
Both protein to creatinine (PCR) and albumin creatinine (ACR) ratios should be included in initial screening, which will capture glomerular (ACR) and glomerular and tubular (PCR) proteinuria. A high PCR and low ACR points to tubular proteinuria. Subsequently, PCR or ACR can be monitored, noting that PCR is cheaper than ACR and more reference data exist for PCR than ACR in neonates and children.[5]

Urine PCR varies with age and body size. Neonates have high glomerular and tubular protein losses with high urine PCR (1000-3000 mg/g [100-300 mg/mmol]) in the first few days of life. With tubular maturity and increase in muscle mass, urine PCR decreases to less than 500 mg/g (50 mg/mmol) by 6 months and further decreases by 2 years to less than 200 mg/g (20 mg/mmol).[5]

Definition of Low eGFR Creatinine in Children

An eGFR creatinine of less than 90 mL/min/1.73 m^2 can be flagged as low in children older than 2 years. This new recommendation em-

Figure. Screening Algorithm for Diagnosis and Staging of Chronic Kidney Disease (CKD) in Pediatrics



Acute kidney disease (AKD) is defined by the abnormalities of kidney function or structure with implications for health and with a duration of 3 months or less. Please also see the Kidney Disease: Improving Global Outcomes (KDIGO) Clinical Practice Guideline for Acute Kidney Injury.[1] ACR indicates albumin to creatinine ratio; AKI, acute kidney injury; eGFR, estimated glomerular filtration rate; PCR, protein to creatinine ratio.

phasizes that children and adolescents should have excellent kidney function. A large study found children with a sustained eGFR of 60 to 90 mL/min/1.73 m^2 had a 10% to 40% risk of a 50% decline in eGFR or reaching kidney failure within 10 years, with risk highest among those with glomerular kidney disease.[6]

Thoroughly Assessing Children for Cause of CKD

Medical history should include birth weight, gestational age, antenatal course, nephrotoxic medications, hematuria, polyuria, and urinary tract infections. Blood pressure (BP), growth, development, and volume status (edema or volume depletion) should also be evaluated. A history of consanguinity and a family history of kidney diseases and hypertension must be sought. Children with a genetic disorder affecting 1 organ system may have associated kidney involvement and must be investigated appropriately.

Monitoring for Disease Progression

The kidneys of children with limited nephron mass may have low potential to adapt to rapid increases in body size and filtration requirements. During periods of rapid growth (such as puberty), children with low GFR may show rapid decline in kidney function and should be monitored closely. A trajectory of preserved GFR or even hyperfiltration is common during childhood because of excellent renal reserves, but these reserves may be exhausted during adolescence or young adulthood. Adolescents with low eGFR should continue to have close monitoring in adulthood for evolution of CKD.

Referral to Specialist Kidney Care Services

We suggest children and adolescents be referred to pediatric specialist kidney care services if they have a sustained early morning PCR of 200 mg/g (20 mg/mmol) or greater or ACR of 30 mg/g (3 mg/mmol) or greater when well, persistent hematuria, any sustained decrease in eGFR (ie, greater than expected from variability), hypertension, kidney stones, kidney outflow obstruction or anomalies of the kidney and urinary tract, known or suspected CKD, or recurrent urinary tract infections.

Blood Pressure

Children with CKD stage 3 to 5 should have annual BP monitoring by ambulatory blood pressure monitoring (ABPM) and office BP, measured manually by auscultation following standardized protocols, every 3 to 6 months. Where ABPM is not available, manual auscultatory office systolic BP measurements can be used.

A randomized clinical trial (RCT)[7] reported that intensive BP control delayed the progression of CKD in children. There were low risks of adverse effects in intensive BP lowering.[7,8] We suggest that in children with CKD and 24-hour mean arterial pressure by ABPM should be lowered to the 50th centile (or office systolic BP in the range of the 50th to 75th percentile) for age, sex, and height, unless achieving this target is limited by signs or symptoms of hypotension. Renin-angiotensin system inhibitors (RASi) can be used.

Diet

An RCT[9] in children showed a low protein diet leads to growth impairment, so protein restriction is not recommended. The target protein and energy intake in children with CKD should be 100% to 140% of the dietary reference intake (DRI) for ideal body weight in children with CKD3 and at 100% to 120% of the DRI in children with CKD stage 4 or 5.

Conclusions

The 2024 iteration of the KDIGO CKD guideline provides an evidence-informed approach to the evaluation and care of children and young adults with CKD. Refinements to estimating GFR, BP targets, and approaches to advanced CKD care will improve outcomes for the young people we care for.

ARTICLE INFORMATION

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