

ESTIMATION OF GLOMERULAR FILTRATION RATE IN CHILDREN

If a measured glomerular filtration rate (GFR) using exogenous filtration markers is not available, many Pediatric Nephrologists will use the Chronic Kidney Disease in Children Under 25 (CKiD U25) estimated GFR (eGFR) equation (https://qxmd.com/calculate/calculator_822/ckid-u25-egfr-calculator)^{1,2}, an update of the modified Schwartz equation². The CKiD U25 equation has lower accuracy and/or higher bias in very low (<15 mL/min/1.73m²) and high GFR (>90 mL/min/1.73m²) ranges and in the very young (< 5 years).

An alternative would be to use the “beside Schwartz” equation to estimate GFR in children older than 1 year of age with stable kidney function:

$$\text{eGFR} = \frac{36.5 \times \text{height (cm)}}{\text{SCr (umol/L)}}$$

eGFR = estimated glomerular filtration rate (mL/min./1.73 m²)

SCr = serum creatinine (enzymatic method)

There are limitations to creatinine-based GFR estimates. This equation cannot reliably estimate GFR in the following:

- Neonates or infants < 1 year old. Interpret eGFR cautiously in children 1-2 years old, and consider normative renal clearance based on patient age
- Patients with unstable or rapidly changing kidney function
- Patients with severely impaired kidney function (eGFR less than 10 mL/min/1.73 m²)
- Patients receiving dialysis (PD, HD, CRRT)
- Patients with reduced muscle mass (eg. Duchenne muscular dystrophy, malnourished children) or extremes of body size

Considerations for Drug Dosing in Renal Impairment:

1. Drug dosage-adjustment recommendations are typically based on other creatinine-based eGFR estimates such as Cockcroft-Gault. Extrapolate recommendations with caution.
2. When dosing drugs that require [rapid therapeutic effect](#), (e.g. analgesics or antibiotics), consider administration of a usual first dose and adjusting subsequent dose or interval based on both patient response and kidney function.
3. Consult appropriate references and a pharmacist for dosing guidance as needed.
4. Make use of appropriate therapeutic drug monitoring whenever available.

Useful Resources:

1. Drug prescribing in renal failure 5th edition. Aronoff GR et al, contents available online at : <https://kdpnet.kdp.louisville.edu/drugbook/pediatric/>
2. Individual drug monographs on UptoDate, Lexi-Comp or Micromedex
3. Drug dosing in hemodialysis : <http://www.dialyzeihd.com>

References:

1. CKiD U25 eGFR calculator. https://qxmd.com/calculate/calculator_822/ckid-u25-egfr-calculator
2. Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. KDIGO 2024 clinical practice guideline for the evaluation and management of chronic kidney disease. Kidney Int 2024; 105(4S): S117-S314

3. Pierce CB, Muñoz A, Ng DK, et al. Age- and sex-dependent clinical equations to estimate glomerular filtration rates in children and young adults with chronic kidney disease. *Kidney Int* 2020; 99: 948–956
4. Schwartz GJ et al. New equations to estimate GFR in children with chronic kidney disease. *J Am Soc Nephrol* 2009; 20(3): 629-637

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