# Estimated Glomerular Filtration Rate (eGFR)

NATIONAL **KIDNEY** FOUNDATION®

CKD *intercept*®

Serum creatinine with estimated glomerular filtration rate (eGFR) is one of the two tests utilized to assess kidney function. Estimated GFR is utilized because measured GFR (mGFR) is the most accurate test that is not practical in routine clinical practice.

## GFR ESTIMATING EQUATION RECOMMENDED BY NATIONAL KIDNEY FOUNDATION (NKF) IS THE 2021 CKD-EPI EQUATION USING CREATININE

**RATIONALE:** The Final Report of the NKF-ASN Task Force to Reassess the Inclusion of Race in Diagnosing Kidney Diseases has recommended this equation for the race-free estimation of GFR.

| Sex | Creatinine | Equation |
|---|---|---|
| Female | ≤ 0.7 | $GFR = 143 \times (Scr/0.7)^{-0.241} \times 0.994^{Age}$ |
| | > 0.7 | $GFR = 143 \times (Scr/0.7)^{-1.200} \times 0.994^{Age}$ |
| Male | ≤ 0.9 | $GFR = 142 \times (Scr/0.9)^{-0.302} \times 0.994^{Age}$ |
| | > 0.9 | $GFR = 142 \times (Scr/0.9)^{-1.200} \times 0.994^{Age}$ |

NKF recommends increased use of creatinine and cystatin C, especially for confirmation of eGFRcr.

## THE EQUATION RECOMMENDED FOR COMBINED CREATININE AND CYSTATIN C IS THE EGFRCR-CYS 2021 CKD EPI EQUATION

| Sex | Creatinine | Cystatin C | Equation |
|---|---|---|---|
| | | 0.8 | $GFR = 135 \times (Scr/0.9)^{-0.601} \times (Scys/0.8)^{-0.711} \times 0.995^{Age}$ |
| Female | ≤ 0.7 | ≤ 0.8 | $GFR = 130 \times (Scr/0.7)^{-0.219} \times (Scys/0.8)^{-0.323} \times 0.996^{Age}$ |
| | | > 0.8 | $GFR = 130 \times (Scr/0.7)^{-0.219} \times (Scys/0.8)^{-0.778} \times 0.996^{Age}$ |
| | > 0.7 | ≤ 0.8 | $GFR = 130 \times (Scr/0.7)^{-0.544} \times (Scys/0.8)^{-0.323} \times 0.996^{Age}$ |
| | | 0.8 | $GFR = 130 \times (Scr/0.7)^{-0.544} \times (Scys/0.8)^{-0.778} \times 0.996^{Age}$ |
| Male | ≤ 0.9 | ≤ 0.8 | $GFR = 135 \times (Scr/0.9)^{-0.144} \times (Scys/0.8)^{-0.323} \times 0.996^{Age}$ |
| | | > 0.8 | $GFR = 135 \times (Scr/0.9)^{-0.144} \times (Scys/0.8)^{-0.778} \times 0.996^{Age}$ |
| | > 0.9 | ≤ 0.8 | $GFR = 135 \times (Scr/0.9)^{-0.544} \times (Scys/0.8)^{-0.323} \times 0.996^{Age}$ |
| | | 0.8 | $GFR = 135 \times (Scr/0.9)^{-0.544} \times (Scys/0.8)^{-0.778} \times 0.996^{Age}$ |

National Kidney Foundation
**eGFR CALCULATORS**

**MOBILE APP**

**ONLINE** ⤤

## CALCULATION OF EGFR WITHOUT A RACE TERM

Since 1999, eGFR equations have included race (Black or non-Black) as a coefficient in the calculations. As race is self-ascribed or socially ascribed on the basis of physical characteristics, such as skin color, and may not directly correlate to the diverse genetic ancestry of communities of color in the United States, use of a race coefficient is problematic and no longer recommended. For more information, see the NKF-ASN Task Force Recommendations.⤤

## WHY IS CKD ASSESSMENT IMPORTANT?

Those with chronic kidney disease (CKD) diagnosed by a primary care clinician are more likely to:

- avoid risky use of nonsteroidal anti-inflammatory drugs

- use angiotensin-converting-enzyme inhibitors or angiotensin receptor blockers when indicated

- receive appropriate nephrology care

Epidemiologic data have shown that impaired kidney function increases the risk of systemic complications (eg, cardiovascular disease, hypertension, progression to end-stage renal disease, and mortality).[1]

## WHAT TESTS ASSESS FOR CKD?

**Choosing Wisely®**
*An initiative of the ABIM Foundation*

**Use serum creatinine with eGFR and urinary albumin-creatinine ratio (Kidney Profile, where available).[2]**

CKD, independent of the cause, is based on 3 or more months of either kidney damage (albuminuria) or an estimated glomerular filtration rate <60 mL/min/1.73 m[2].[1]

## WHO SHOULD BE TESTED FOR CKD?

Asymptomatic individuals who are at high risk for CKD should be tested at least annually[1]: diabetes, hypertension, family history of kidney disease, and cardiovascular disease.[1,3]

| | | | | Albuminuria categories Description and range | | |
|---|---|---|---|---|---|---|
| **CKD is classified based on:**<br>-Cause (C)<br>-GFR (G)<br>-Albuminuria (A) | | | | A1 | A2 | A3 |
| | | | | Normal to mildly increased | Moderately increased | Severely increased |
| | | | | <30 mg/g<br><3 mg/mmol | 30-300 mg/g<br>3-30 mg/mmol | >300 mg/g<br>>30 mg/mmol |
| GFR categories (ml/min/1.73m²) Description and range | G1 | Normal or high | ≥90 | **1 if CKD** | **Treat 1** | **Refer* 2** |
| | G2 | Mildly decreased | 60-89 | **1 if CKD** | **Treat 1** | **Refer* 2** |
| | G3a | Mildly to moderately decreased | 45-59 | **Treat 1** | **Treat 2** | **Refer 3** |
| | G3b | Moderately to severely decreased | 30-44 | **Treat 2** | **Treat 3** | **Refer 3** |
| | G4 | Severely decreased | 15-29 | **Refer* 3** | **Refer* 3** | **Refer 4+** |
| | G5 | Kidney failure | <15 | **Refer 4+** | **Refer 4+** | **Refer 4+** |

The eGFR and albuminuria grid depicts the risk of progression, morbidity, and mortality by color, from lowest to highest (green, yellow, orange, red, deep red). The numbers in the boxes are a guide to the frequency of assessment annually. Green: annual assessment for those at risk. (Green can reflect CKD with normal eGFR and albumin-to-creatinine ratio (uACR) only in the presence of other markers of kidney damage, such as imaging showing polycystic kidney disease or kidney biopsy abnormalities); Yellow suggests assessment at least once per year; Orange suggests assessment twice per year; Red suggests assessment three times annually; Deep red suggests assessment four times annually. These are general parameters only, based on expert opinion and must consider underlying comorbid conditions and disease state, as well as the likelihood of impacting a change in management for any individual patient.[1]

## Abbreviation

**ACE-I**, angiotensin-converting-enzyme inhibitor; **AKI**, acute kidney injury; **ARB**, angiotensin receptor blocker; **ASA**, acetylsalicylic acid (aspirin); **BP**, blood pressure; **CAD**, coronary artery disease; **CKD**, chronic kidney disease; **CVA**, cerebrovascular accident; **CVD**, cardiovascular disease; **DM**, diabetes mellitus; **DOAC**, Direct Oral Anticoagulant; **eGFR**, estimated glomerular filtration rate; **GLP1-RA**, glucagon-like peptide 1 receptor agonists **Hb**, hemoglobin; **HTN**, hypertension; **MI**, myocardial infarction; **NSAIDs,** nonsteroidal anti-inflammatory drugs; **PICC**, peripherally inserted central catheter line; **PT INR**, prothrombin time, international normalized ratio; **SGLT-2i**, sodium-glucose cotransporter-2 inhibitors; **uACR** urine albumin-creatinine ratio.

## References

1. Vassalotti JA, Centor R, Turner BJ, Greer RC, Choi M, Sequist TD. Practical Approach to Detection and Management of Chronic Kidney Disease for the Primary Care Clinician. The American Journal of Medicine 2016;129:153-62.e7.

2. Choosing Wisely Recommendation for Chornic Kidney Disease Testing. 2018. at bit.ly/2SFSz3u

3. Inker LA, Astor BC, Fox CH, et al. KDOQI US commentary on the 2012 KDIGO clinical practice guideline for the evaluation and management of CKD. Am J Kidney Dis 2014;63:713-35.

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