Current Data and Recommendations for Staging Kidney Disease and Estimating GFR

Dr. Tarra I. Faulk, DO, FASN

ACOi 2023 October 11-14 Tampa • Hybrid

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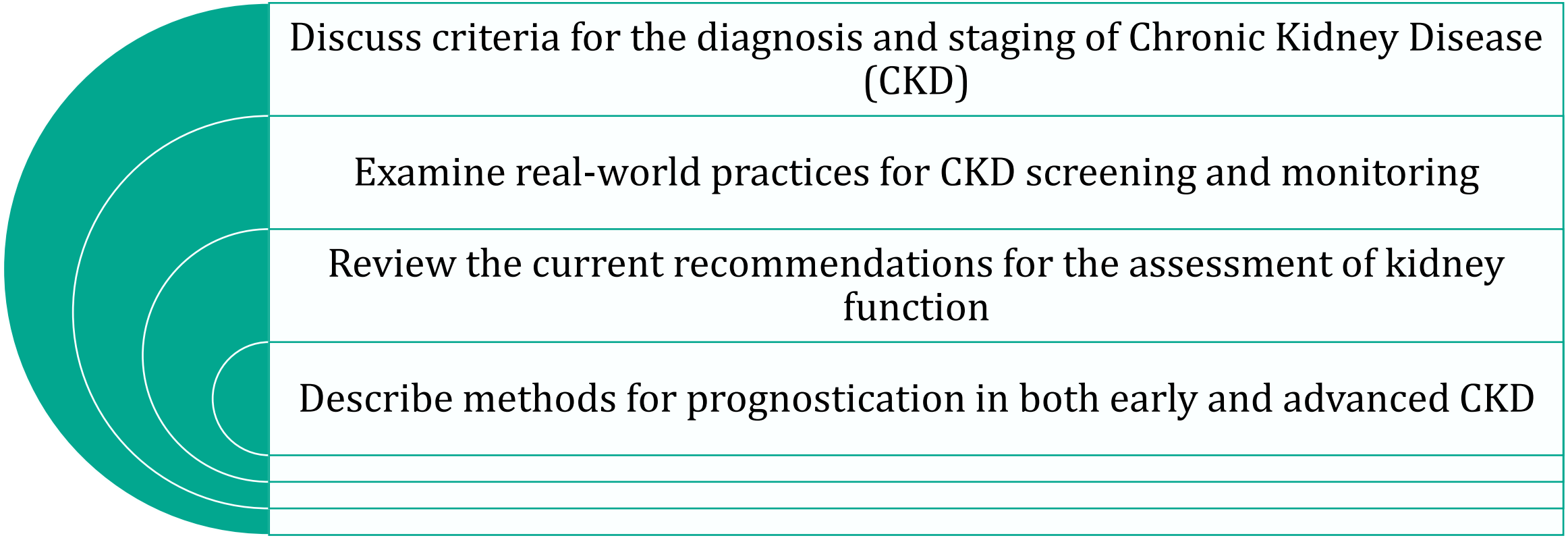
Disclosures

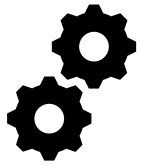
- I have no financial interests or relationships to disclose
- The views expressed in this material are those of my own [Dr. Tarra Faulk] and do not reflect the official policy or position of the U.S. Government, the Department of Defense, or the Department of the Air Force.

Educational Objectives



Icon Legend

Know

Think about it 

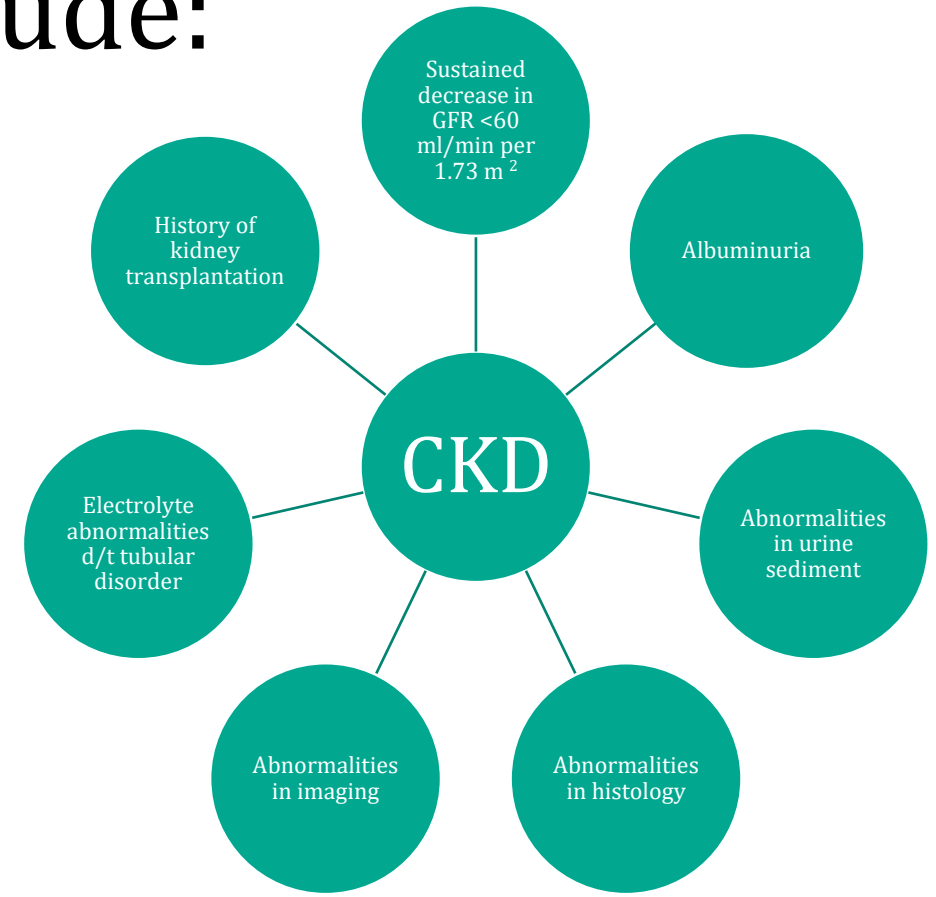
Further reading recommended

Definition of Chronic Kidney Disease

- Abnormalities of kidney structure or function, present for >3 months, with implications for health and is classified based on cause, GFR category, and albuminuria category (CGA)

KDIGO 2012 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease

Abnormalities of Kidney Structure or Function Include:



CKD Awareness

- Approximately 15% of the US adult population has CKD
- Most patients are asymptomatic until late stages of disease
- The vast majority of patients do not know they have CKD
  - Low CKD awareness

- Why?
  - Lack of provider driven education vs lack of screening?

CKD Screening- Why, Who & How?

- Why?
  - Many effective treatments exist to slow CKD progression and/or reduce CV risk
- Proposal- universal screening for persons with HTN, diabetes, and cardiovascular disease
- CKD screening must include assessment of eGFR AND albuminuria
  - Both strongly a/w increased risk of morbidity and mortality

CKD Screening- Real World Practices

- 523,165 adults with type 2 diabetes, over 1 year [1]
  - 51.6% tested for both urine ACR and eGFR (89.5% eGFR alone)
- 1,344,594 adults with diabetes [2]
  - 35% tested for both urine ACR and eGFR
- 2,334,461 adults with HTN (no diabetes) [2]
  - 4%

[1] Stempniewicz, et.al. Diabetes Care 44: 200-2009, 2021
[2] Shin, et.al. Hypertension 78: 1042-1052, 2021

CKD Screening- Why & How?

- Proposal- universal screening for persons with HTN, diabetes, and cardiovascular disease
- CKD screening must include assessment of eGFR and albuminuria
  - Both strongly a/w incr risk of morbidity and mortality

- Why?
  - Many effective treatments exist to slow CKD progression and/or reduce CV risk
    - Adherence to guideline-recommended therapy

- Lifestyle modification
- Blood pressure and glycemic control
- RAAS inhibition
- Statin therapy
- Sodium-glucose cotransporter-2 inhibitors
- Nephrotoxin avoidance
- Others – targeted therapies

Cause

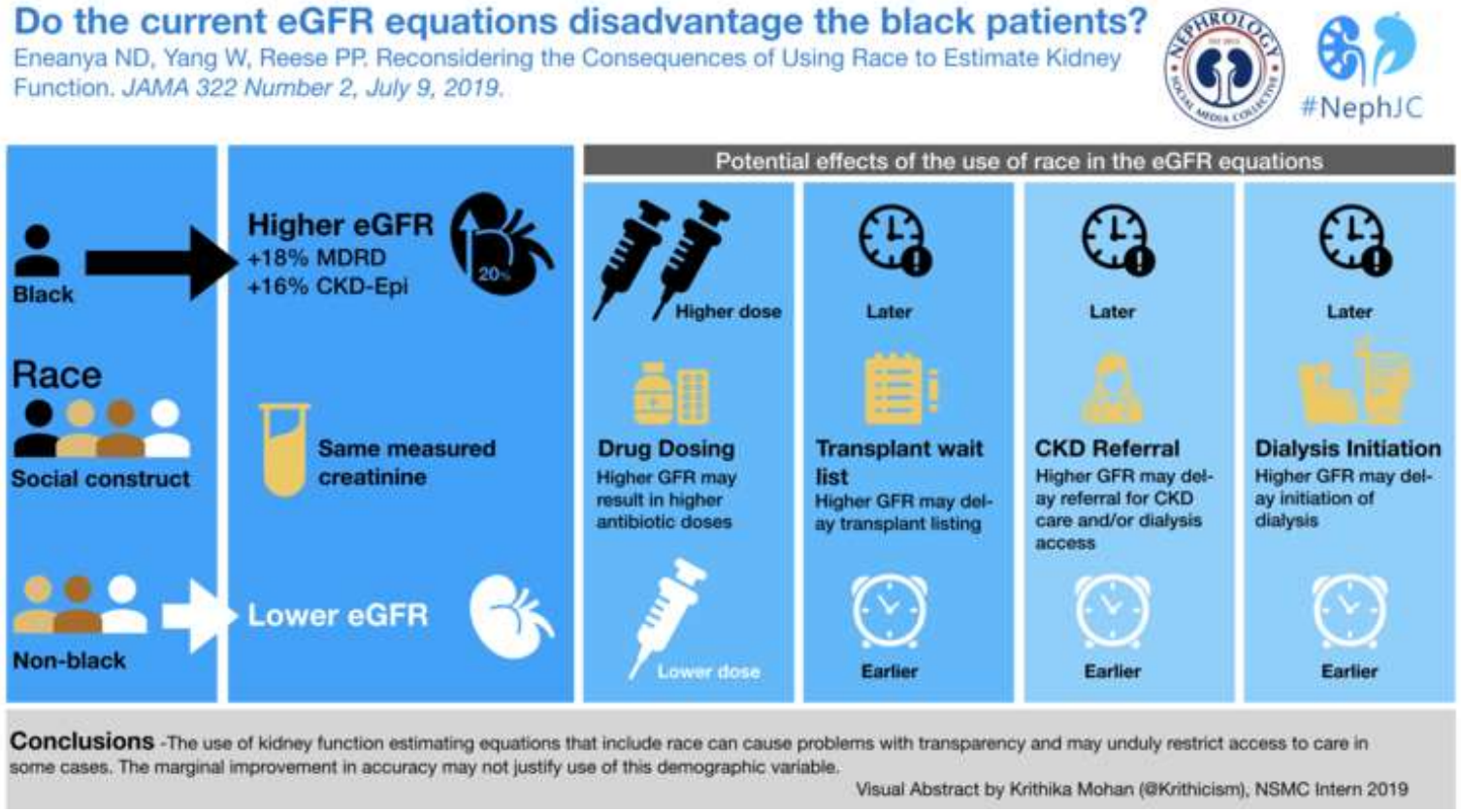
- Clinical Suspicion/Presumption
- Biomarkers
- Genetic Testing
- Imaging
- Renal Biopsy

Estimated Glomerular Filtration Rate (eGFR)

- Summary of Recommendations (2012, 2021) [1,2]
  - Adoption of new CKD-EPI estimating equation based on creatinine and refit without the race variable
    - Result: increase the prevalence of CKD among Black individuals and decrease the prevalence among non-Black individuals
  - Expand the use of cystatin C
    - Equations using both creatinine and cystatin C are more accurate than the singular use of either
  - Therefore, change from CKD-Epi 2009 to CKD-Epi 2021 equation

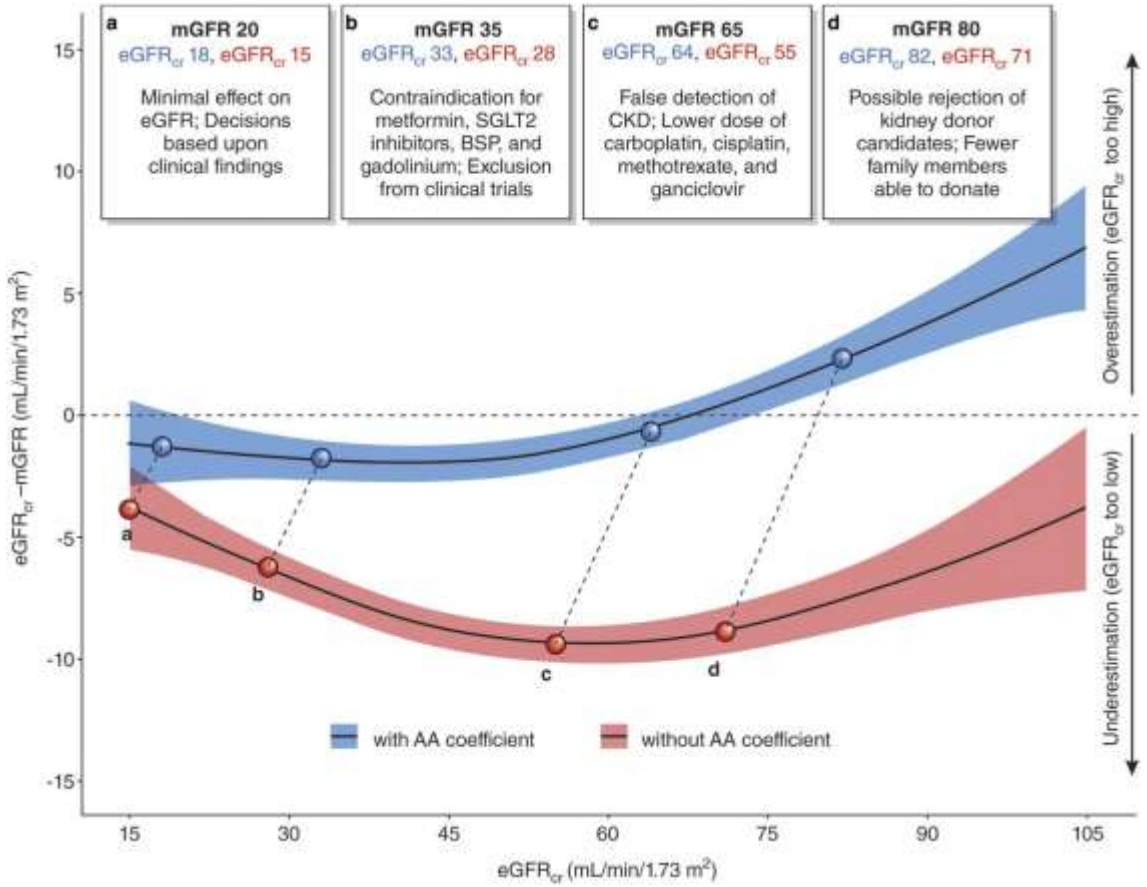
[1] Delgado, et.al. J Am Soc Nephrol 32: 2994-3015, 2021
[2] Inker, et.al. N Eng J Med 385: 1737-1749, 2021

Do Current eGFR Equations Disadvantage Black Patients?



Krithika Mohan (@krithicism)

Clinical Decisions Affected by Accuracy of GFR



Levey. CJASN August 2020, 15 (8) 1203-1212

Albuminuria Estimation

- Why albuminuria?
  - Along with eGFR has been strongly associated with incr. risk of morbidity and mortality [1,2,3]

Goal- 24-hour albuminuria or first morning urine ACR (ACR, not PCR)

[1] Levey, et.al. Kidney Int 80: 17-28, 2011
[2] Koye, et.al. Am J Kidney Dis 72: 653-661, 2018
[3] Halbesma, et.al. J Am Soc Nephrol 17: 2582-2590, 2006

Classification of CKD

Prognosis of CKD by GFR and albuminuria category

Prognosis of CKD by GFR and Albuminuria Categories: KDIGO 2012

GFR categories (ml/min/ 1.73 m²) Description and range				Persistent albuminuria categories Description and range		
				A1	A2	A3
				Normal to mildly increased	Moderately increased	Severely increased
				<30 mg/g <3 mg/mmol	30-300 mg/g 3-30 mg/mmol	>300 mg/g >30 mg/mmol
	G1	Normal or high	≥90			
	G2	Mildly decreased	60-89			
	G3a	Mildly to moderately decreased	45-59			
	G3b	Moderately to severely decreased	30-44			
	G4	Severely decreased	15-29			
	G5	Kidney failure	<15			

Green: low risk (if no other markers of kidney disease, no CKD); Yellow: moderately increased risk; Orange: high risk; Red, very high risk.

KDIGO 2012 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease

Clinically Speaking…

- 48/F with CKD G4A1 of unknown etiology but with h/o DM, HTN, and family history of multiple persons on dialysis
- 55/M with CKD G3A2 presumed 2/2 Diabetic Nephropathy
- 35/M with CKD G2A2 2/2 biopsied IgA Nephropathy

Prognostication

- Kidney biopsy findings
- Risk prediction equations

Table 1. Risk tools in CKD

Tool	Study Population	Variables	Outcome	Time Frame	Weblink
4-variable KFRE[32]	eGFR <60 ml/min per 1.73 m^2	Age, sex, eGFR, urine ACR	Kidney failure	2 and 5 years	kidneyfailurerisk.com
8-variable KFRE[32]	eGFR <60 ml/min per 1.73 m^2	Age, sex, eGFR, urine ACR, serum albumin, phosphate, bicarbonate, corrected calcium	Kidney failure	2 and 5 years	kidneyfailurerisk.com
Advanced CKD[33]	eGFR <30 ml/min per 1.73 m^2	Age, sex, race, eGFR, urine ACR, systolic blood pressure, history of cardiovascular disease, diabetes, smoking history	Kidney failure, cardiovascular disease, death	2 and 4 years	ckdpcrisk.org/lowgfrevents
Incident CKD[34]	eGFR >60 ml/min per 1.73 m^2	Age, sex, race, eGFR, urine ACR (optional if no diabetes), history of cardiovascular disease, body mass index, smoking history, hypertension, diabetes, diabetes medications and hemoglobin A1c (if diabetes)	Incident eGFR <60 ml/min per 1.73 m^2	5 years	ckdpcrisk.org/ckdrisk
PCR to ACR[25]	Urine PCR >50 mg/g	Urine PCR or urine dipstick, (sex, hypertension, diabetes optional)	Urine ACR	NA	ckdpcrisk.org/pcr2acr

KFRE, kidney failure risk equation; ACR, albumin-creatinine ratio; PCR, protein-creatinine ratio.

Nephrology Self-Assessment Program- Vol 21, No2, June 2022

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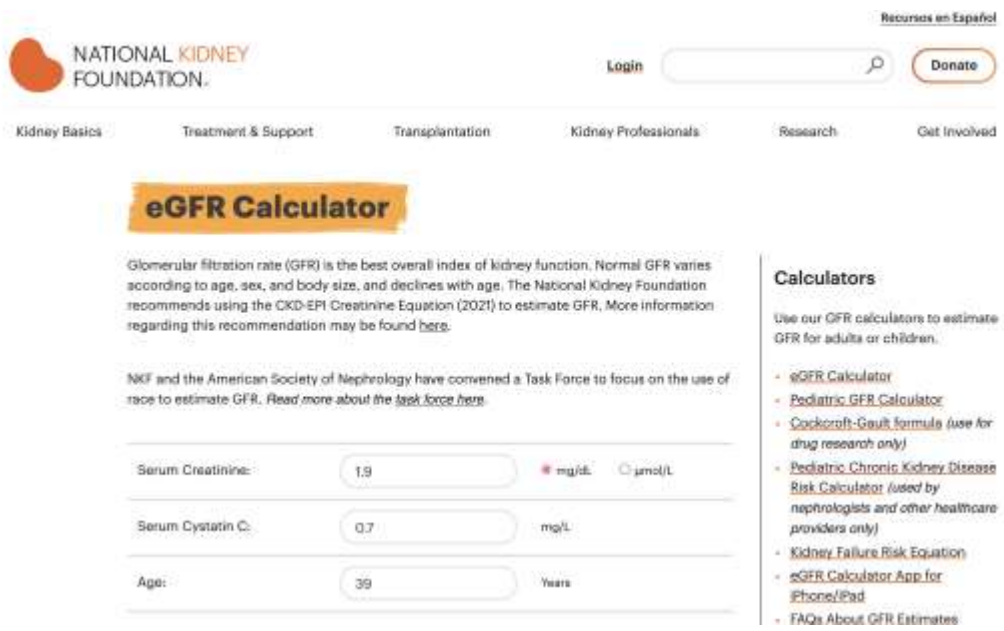
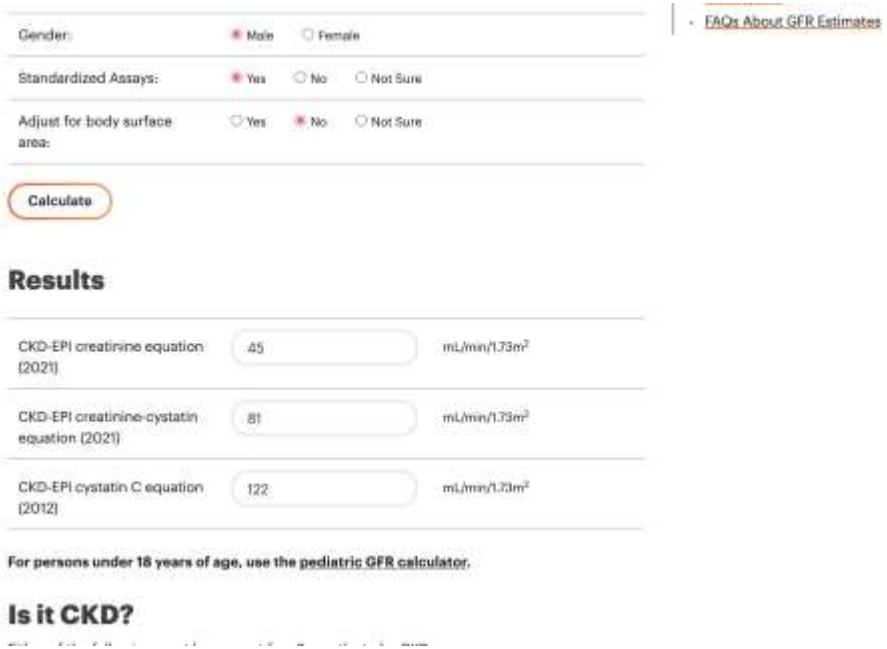
eGFR Calculator





https://www.kidney.org/professionals/kdoqi/gfr_calculator

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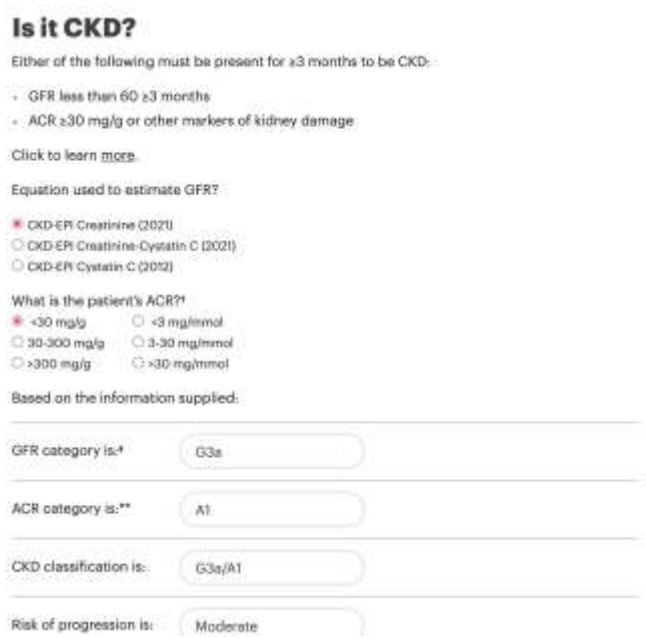


Is it CKD?

Either of the following must be present for ≥3 months to be CKD:

- GFR less than 60 ≥3 months
- ACR ≥30 mg/g or other markers of kidney damage

Click to learn more.

Equation used to estimate GFR?

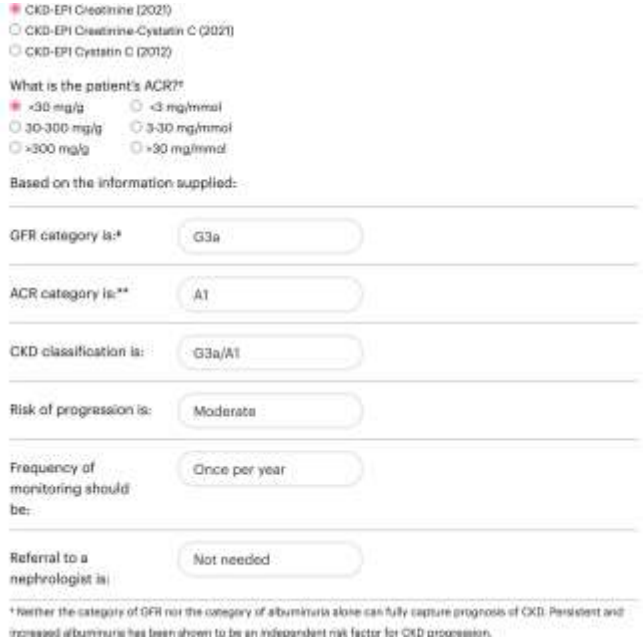
- CKD-EPI Creatinine (2021)
- CKD-EPI Creatinine-Cystatin C (2021)
- CKD-EPI Cystatin C (2012)

What is the patient's ACR?†

- <30 mg/g
- <3 mg/mmol
- 30-300 mg/g
- 3-30 mg/mmol
- >300 mg/g
- >30 mg/mmol

Based on the information supplied:

GFR category is:*	G3a
ACR category is:**	A1
CKD classification is:	G3a/A1
Risk of progression is:	Moderate



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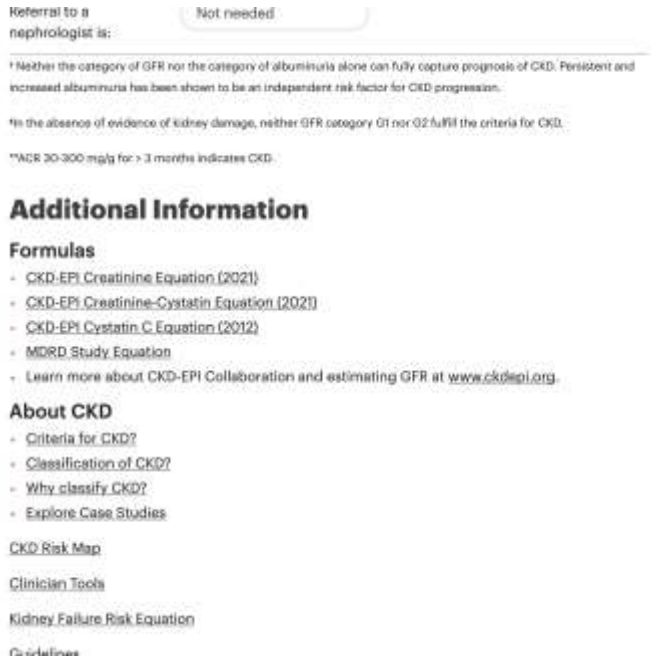
Based on the information supplied:

GFR category is:*	G3a
ACR category is:**	A1
CKD classification is:	G3a/A1
Risk of progression is:	Moderate
Frequency of monitoring should be:	Once per year
Referral to a nephrologist is:	Not needed

† Neither the category of GFR nor the category of albuminuria alone can fully capture prognosis of CKD. Persistent and increased albuminuria has been shown to be an independent risk factor for CKD progression.

https://www.kidney.org/professionals/kdoqi/gfr_calculator

eGFR Calculator



Referral to a nephrologist is: Not needed

† Neither the category of GFR nor the category of albuminuria alone can fully capture prognosis of CKD. Persistent and increased albuminuria has been shown to be an independent risk factor for CKD progression.

‡In the absence of evidence of kidney damage, neither GFR category G1 nor G2 fulfill the criteria for CKD.

**ACR 30-300 mg/g for > 3 months indicates CKD.

Additional Information

Formulas

- CKD-EPI Creatinine Equation (2021)
- CKD-EPI Creatinine-Cystatin Equation (2021)
- CKD-EPI Cystatin C Equation (2012)
- MDRD Study Equation
- Learn more about CKD-EPI Collaboration and estimating GFR at www.ckdepi.org.

About CKD

- Criteria for CKD?
- Classification of CKD?
- Why classify CKD?
- Explore Case Studies

CKD Risk Map

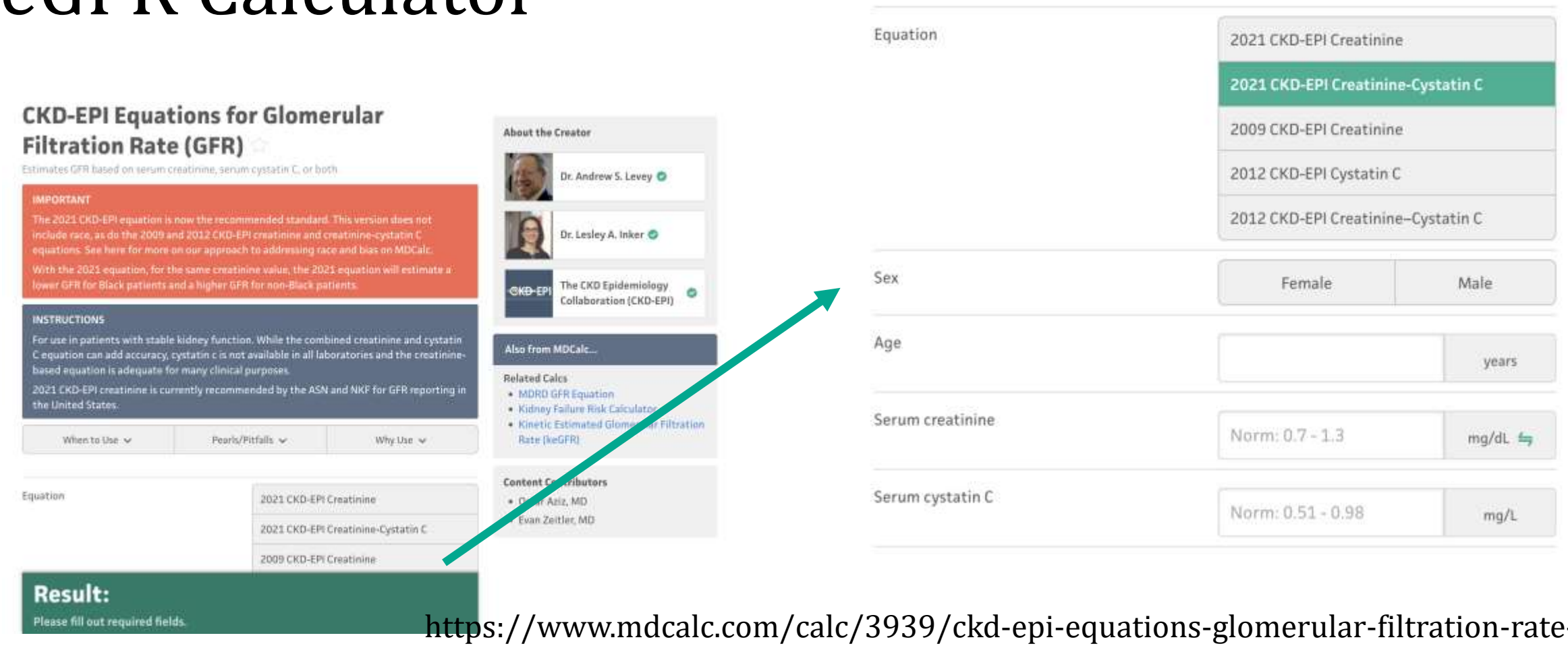
Clinician Tools

Kidney Failure Risk Equation

Guidelines

https://www.kidney.org/professionals/kdoqi/gfr_calculator

eGFR Calculator



https://www.mdcalc.com/calc/3939/ckd-epi-equations-glomerular-filtration-rate-gfr

“The good physician treats the disease; the great physician treats the patient who has the disease.
- William Osler

Review- Educational Objectives

- Discuss criteria for the diagnosis and staging of Chronic Kidney Disease (CKD)
- Examine real-world practices for CKD screening and monitoring
- Review the current recommendations for the assessment of kidney function
- Describe methods for prognostication in both early and advanced CKD

Questions?

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