Original Article

Race-modified estimated glomerular filtration rate underestimates chronic kidney disease prevalence in Black patients undergoing partial and radical nephrectomy: Implications for surgical planning

Hunter L. Hasley[1], Teona Iarajuli[1], Jennifer Nguyen[2], Daniel Thiemann[1], Martin Malik[1], Jacquelyn Roth[1], Michael Raver[2], Michael Stifelman[1,2], Ravi Munver[2], Mutahar Ahmed[2], Nitin Yerram[2]

[1]Department of Urology, Hackensack Meridian School of Medicine, Nutley, [2]Department of Urology, Hackensack University Medical Center, Hackensack, NJ, USA

Abstract

Introduction: In estimated glomerular filtration rate equations (eGFR), the race multiplier (RM) yields greater eGFR values and may assign less severe chronic kidney disease (CKD) stages to black individuals. When deciding on appropriateness for partial nephrectomy (PN), patients with CKD are often considered a relative or absolute indication. We hypothesize that the eGFR RM may have ramifications for patients being counseled for radical nephrectomy (RN) versus PN to manage their renal tumor.

Methods: We utilized prospective and retrospective, IRB-approved single-center databases to select patients who underwent PN or RN between 2016 and 2022. Demographics, preoperative risk factors, preoperative eGFR, and surgical management were collected. Descriptive statistics and two-tailed difference of proportion tests compared the percentage of patients with CKD who underwent nephrectomy.

Results: This cohort included 1137 patients who underwent RN or PN, including 74 (6.5%) Black patients and 93.5% ($n = 1063$) non-Black patients. There was no statistically significant difference between the eGFR of Black and non-Black individuals using the Modification of Diet in Renal Disease equation ($P = 0.24$) or Chronic Kidney Disease Epidemiology Collaboration 2009 (CKD-EPI 2009) ($P = 0.45$); however, there was statistically significant difference in eGFR between sample populations when using CKD-EPI 2021 ($P = 0.0055$). Of the Black patient cohort, 16.2% of patients reclassified to a worse CKD class using CKD-EPI 2021, including 9.5% of Black patients reclassified to CKD3a or worse, and 14.6% of all patients (Black and non-Black) reclassified to a different CKD class under the CKD-EPI 2021 equation.

Conclusions: There are quantitative differences in the evaluation of eGFR when utilizing different equations that may impact clinical considerations and health equity outcomes for nephrectomy across racial groups.

Keywords: Nephrectomy, partial nephrectomy, race, radical nephrectomy, renal cancer

Address for correspondence: Dr. Hunter L. Hasley, Department of Urology, Hackensack Meridian School of Medicine, 123 Metro Boulevard, Nutley, NJ 07110, USA.
E-mail: hunter@hasley.net

Received: 19.01.2024, **Revised:** 27.01.2024, **Accepted:** 16.05.2024, **Published:** 03.07.2024.

Access this article online	
Quick Response Code:	**Website:** www.urologyannals.com
	DOI: 10.4103/ua.ua_7_24

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Hasley HL, Iarajuli T, Nguyen J, Thiemann D, Malik M, Roth J, *et al.* Race-modified estimated glomerular filtration rate underestimates chronic kidney disease prevalence in Black patients undergoing partial and radical nephrectomy: Implications for surgical planning. Urol Ann 2024;16:221-6.

INTRODUCTION

The kidney carries multiple responsibilities, including maintenance of acid-base balance, regulation of fluid and electrolytes, absorption of certain small molecules, and clearance of toxins and metabolic waste products. A broad assessment of renal function is often determined by calculating the rate of filtration of creatinine, known as the estimated glomerular filtration rate (eGFR). The American Urological Association (AUA) guidelines highlight the use of eGFR for precise staging of preoperative kidney disease in assessing renal functional and suitability of surgical intervention.[1] The role of eGFR may also expand to systemic therapies as well as provide a basis to determine candidacy for dialysis or renal transplantation.[2,3] eGFR influences multiple aspects of clinical decision-making for possible nephrectomy patients requiring a reliable standardized method of determining preoperative renal function.

Creatinine is the most widely utilized endogenous filtration marker and is routinely assessed by serum creatinine (S_{Cr}) for assessment of eGFR.[4] Equations utilize age, sex, and self-reported race to model eGFR.[5-9] The role of race in the equation was developed due to early studies demonstrating that Black individuals possessed higher levels of creatinine than white patients.[10] More recently, race has been called into question for its ambiguous role in medicine and potential to bias the eGFR, subsequently affecting treatment.[11,12]

Multiple race-based equations have come into practice in calculating eGFR using S_{Cr}. The Modification of Diet in Renal Disease (MDRD) as well as the Chronic Kidney Disease Epidemiology Collaboration 2009 (CKD-EPI 2009) equations have been most commonly utilized.[8,9] CKD-EPI 2009 has shown the highest accuracy in calculating eGFR and has been the standard for preoperative assessment of renal tumors.[1,9,13,14] More recently, the National Kidney Foundation and the American Society of Nephrology developed CKD-EPI 2021 with the removal of the race multiplier (RM) for the purpose of eliminating bias of self-identified race in treatment algorithms.[7]

Studies have shown that removal of the RM may increase CKD prevalence among Black adults, and those already classified with CKD may be revised to more severe disease stages.[15] eGFR equations have previously been reviewed in a variety of medical settings and specialties, including in patients with myocardial infarction and heart failure.[16,17] More recently, as shown by Antony *et al*., race-neutral eGFR calculators perform equivalently to prior eGFR equations while mitigating racial bias in nephrectomy decision-making.[18] In eGFR equations, the RM yields greater eGFR values and may assign less severe CKD stages to Black individuals. When deciding on appropriateness for partial nephrectomy (PN), patients with CKD are often considered a relative or absolute indication. This study aims to evaluate the impact of the RM on eGFR and how that may influence subsequent clinical decision-making. We hypothesize that the eGFR RM may have potential ramifications for patients being counseled for radical nephrectomy (RN) versus PN to manage their renal tumor.

METHODS

This study utilized prospective and retrospective, IRB-approved single-center databases to select patients who underwent nephrectomy between 2016 and 2022. Demographics, preoperative risk factors, and laboratory values including S_{Cr} were collected within 1 week of surgery during preadmission testing. eGFR was calculated utilizing S_{Cr} according to the following equations:

1. CKD-EPI 2009:
   - $eGFR = 141 \times \min(S_{Cr}/\kappa, 1)^{\alpha} \times \max(S_{Cr}/\kappa, 1)^{-1.209} \times 0.993^{Age} \times 1.018$ (if female) $\times 1.159$ (if Black)

where:
- S_{Cr} = serum creatinine in mg/dL
- $\kappa = 0.7$ for females and 0.9 for males
- $\alpha = -0.329$ for females and -0.411 for males
- Min indicates the minimum of S_{Cr}/κ or 1 and max indicates the maximum of S_{Cr}/κ or 1.

2. CKD-EPI 2021:
   - $eGFR = 142 \times \min(S_{Cr}/\kappa, 1)^{\alpha} \times \max(S_{Cr}/\kappa, 1)^{-1.200} \times 0.9938^{Age} \times 1.012$ (if female)

where:
- S_{Cr} = standardized serum creatinine in mg/dL
- $\kappa = 0.7$ for females or 0.9 for males
- $\alpha = -0.241$ for females or -0.302 for males
- $\min(S_{Cr}/\kappa, 1)$ is the minimum of S_{Cr}/κ or 1.0
- $\max(S_{Cr}/\kappa, 1)$ is the maximum of S_{Cr}/κ or 1.0
- Age (years).

3. MDRD equation:
   - $eGFR\ (mL/min/1.73\ m^2) = 175 \times (S_{Cr})^{-1.154} \times (Age)^{-0.203} \times (0.742$ if female) $\times (1.212$ if Black).

Patients were assigned to CKD stages based on eGFR using KDIGO guidelines, with Stage 1, 2, 3a, 3b, 4, and 5 defined by eGFR ≥90, 60–89, 45–59, 30–44, 15–29, and <15 mL/min/1.73 m^2, respectively.[13] Assignment of race categories was on the basis of self-report.

Statistical analysis

Categorical variables were expressed as counts and percentages, and continuous variables were expressed as mean and standard deviation. Descriptive statistics and two-tailed difference of proportion tests were used to compare the percentage of patients with CKD who underwent nephrectomy. Two-sided $P < 0.05$ were considered statistically significant. All data transformation, graphical representation, and statistical analyses were performed using R version 4.1.1 (R Foundation for Statistical Computing, Vienna, Austria).

RESULTS

Study population

Over the period between 2016 and 2022, 1137 patients received either an RN or PN with complete laboratory data for specific comparisons. The cohort was 65.0% male, with a median age of 63 (IQR 55–71) as shown in Table 1. The most common procedure performed was a PN, of which 71.3% of patients underwent, followed by RN with 28.7% of patients. In this cohort, 56.2% were never smokers, and patients had comorbidities including 21.5% with DM, 63.9% with HTN, 8.9% with CVD, 2.1% with CHF, and 9.1% with COPD. The cohort included 6.5% ($n = 74$) Black patients, and 93.5% ($n = 1063$) non-Black patients.

Table 1: Baseline characteristics of the patient cohort, including Black and non-Black patients

	Participants by race		Total
	Black	Non-Black	
Total (*n*)	74	1063	1063
Age	62 (56–69)	63 (55–71)	63 (55–71)
Sex			
Female	33 (44.6)	365 (34.3)	398 (35.0)
Male	41 (55.4)	698 (65.7)	739 (65.0)
BMI	30.2 (6.8)	29.5 (6.0)	29.5 (6.1)
Smoking status			
Never	41 (55.4)	598 (56.3)	639 (56.2)
Former	25 (33.8)	351 (33.0)	376 (33.1)
Active	7 (9.5)	106 (10.0)	113 (9.9)
Other	1 (1.4)	8 (0.8)	9 (0.8)
Surgery			
Radical	22 (29.7)	304 (28.6)	326 (28.7)
Partial	52 (70.3)	759 (71.4)	811 (71.3)
Comorbidities			
DM	30 (40.5)	214 (20.1)	244 (21.5)
HTN	56 (75.7)	670 (63.0)	726 (63.9)
CVD	5 (6.8)	96 (9.0)	101 (8.9)
CHF	3 (4.1)	21 (2.0)	24 (2.1)
COPD	6 (8.1)	97 (9.1)	103 (9.1)

Data are expressed as number of patients (%) or median (IQR).
BMI: Body mass index, IQR: Interquartile range, DM: Diabetes mellitus, HTN: Hypertension, CVD: Cardiovascular disease, CHF: Congestive heart failure, COPD: Chronic obstructive pulmonary disease

Evaluation of glomerular filtration rate equations

Black and non-Black patient eGFRs were compared using the classic MDRD equation as well as the CKD-EPI 2009 and CKD-EPI 2021 equations. There was no statistically significant difference between the eGFR of Black and non-Black individuals using the MDRD equation ($P = 0.24$) or CKD-EPI 2009 ($P = 0.45$) as shown in Table 2; however, there were found to be statistically significant differences in eGFR between the sample populations when using CKD-EPI 2021 ($P = 0.0055$).

Table 2: Comparison of estimate glomerular filtrate rate equations between Black and non-Black patient cohorts evaluating difference in the mean using two-sided *t*-tests

	eGFR (mL/min/1.73 m^2), mean±SD		*P*
	Black	Non-Black	
MDRD	79.9±28.3	76.0±23.0	0.24
CKD 2009	80.6±28.2	77.9±21.9	0.45
CKD 2021	73.3±25.7	82.0±22.1	0.0055

SD: Standard deviation, CKD: Chronic kidney disease, MDRD: Modification of diet in renal disease, eGFR: Estimate glomerular filtrate rate

Assigned patient CKD categories were compared using the CKD-EPI 2009 and CKD-EPI 2021 equations [Table 3]. Of the Black patient cohort, 16.2% of patients were reclassified to a worse class of CKD using the new CKD-EPI 2021 equation, including 9.5% of Black patients reclassified to CKD3a or worse. The non-Black patient cohort included 14.5% of patients reclassified to a better class of CKD using the new CKD EPI 2021 equation, and 14.6% of all patients (Black and non-Black) were reclassified to a different CKD class under the CKD EPI 2021 equation. A visual summary of patient reclassifications can be seen in Figure 1.

DISCUSSION

This study examined a large retrospective and prospective database of patients undergoing nephrectomy and compared multiple equations used in the evaluation of eGFR. For this study cohort, there was no statistically significant difference between Black and non-Black cohorts using the MDRD and CKD-EPI 2009 equations, both of which utilize an RM, but there was found to be statistically significant difference between groups when utilizing the newer CKD-EPI 2021 equation, which has dropped an RM from the equation. This difference may more appropriately reflect renal function when examining the patient groups' comorbidities, with DM present in 40.5% of Black patients compared to 20.1% of non-Black patients and HTN present in 75.7% of Black patients versus 63.1% of non-Black patients.

The mean eGFR of Black patients was found to be greater than non-Black patients utilizing both the CKD-EPI

Table 3: CKD distributions for Black, non Black, and all patients using Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) 2009 and CKD-EPI 2021

CKD-EPI 2009		CKD-EPI 2021						Percentage reclassified
Staging	*n* (%)	CKD 1	CKD 2	CKD 3a	CKD 3b	CKD 4	CKD 5	
Black patients								
CKD 1	30 (40.5)	25	5	0	0	0	0	20.0
CKD 2	28 (37.8)	0	23	5	0	0	0	17.8
CKD 3a	10 (13.5)	0	0	8	2	0	0	20.0
CKD 3b	2 (2.7)	0	0	0	2	0	0	0.0
CKD 4	0 (0.0)	0	0	0	0	0	0	0.0
CKD 5	4 (5.4)	0	0	0	0	0	4	0.0
Total, *n* (%)	74 (100.0)	25 (33.8)	28 (37.8)	13 (17.6)	4 (5.4)	0	4 (5.4)	16.20
Non-Black patients								
CKD 1	350 (32.9)	350	0	0	0	0	0	0.00
CKD 2	502 (47.2)	103	399	0	0	0	0	20.5
CKD 3a	133 (12.5)	0	38	95	0	0	0	28.6
CKD 3b	52 (4.9)	0	0	9	43	0	0	17.3
CKD 4	14 (1.3)	0	0	0	4	10	0	28.6
CKD 5	12 (1.1)	0	0	0	0	0	12	0.0
Total, *n* (%)	1063	453 (42.6)	437 (41.1)	104 (9.8)	47 (4.4)	10 (0.9)	12 (1.1)	14.5
All patients								
CKD 1	380 (33.4)	375	5	0	0	0	0	1.3
CKD 2	530 (46.6)	103	422	5	0	0	0	20.4
CKD 3a	143 (12.6)	0	38	103	2	0	0	28.0
CKD 3b	54 (4.7)	0	0	9	45	0	0	16.7
CKD 4	14 (1.2)	0	0	0	4	10	0	28.6
CKD 5	16 (1.4)	0	0	0	0	0	16	0.0
Total, *n* (%)	1137	478 (42.0)	465 (40.9)	117 (10.3)	51 (4.5)	10 (0.9)	16 (1.4)	13.5

CKD: Chronic kidney disease, EPI: Epidemiology collaboration, Patients highlighted pink have increased CKD staging from CKD-EPI 2009 with CKD-EPI 2021, and patients highlighted green have decreased CKD staging from CKD-EPI 2009 with CKD-EPI 2021

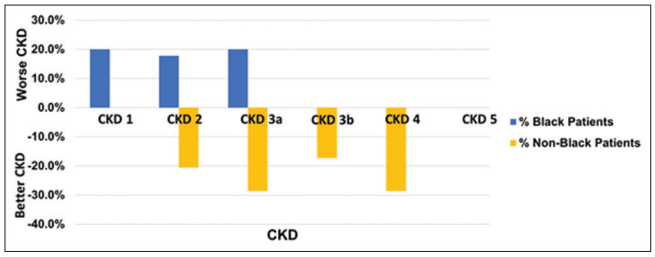

Figure 1: Differences in chronic kidney disease reclassifications of Black and non-Black patients based on glomerular filtration rate equations calculation using Chronic Kidney Disease Epidemiology Collaboration 2009 (CKD-EPI 2009) to CKD-EPI 2021. CKD: Chronic kidney disease

2009 and MDRD formulas; however, the mean eGFR of Black was calculated as less than the mean eGFR of the non-Black cohort when utilizing the CKD-EPI 2021 formula, which lacks an RM. This change can be seen in the reclassification of 16.2% of Black patients into worse CKD classes and reclassification of 14.5% of non-Black patients into better CKD classes. These results are similar to those found by Abdallah *et al*., who recognized a shift to worse CKD stages in 27% of Black patients undergoing nephrectomy when utilizing the CKD-EPI 2021 equation from the CKD-EPI 2009 equation.[19]

The concept of removing the RM lowering eGFR for Black and increasing the eGFR for non-Black is not a novel concept and can be observed by studying the equations. Buchkremer and Segerer graphically demonstrated the absolute and relative differences for Black and non-Black in eGFR between the 2009 and 2021 CKD equations, in which the most significant change is the removal of the RM.[20] We present in this study that these reclassifications in CKD can have significant implications in surgical planning. Patients who were reclassified into a worse CKD category should have a higher threshold to attempt a PN.

When comparing the CKD-EPI 2009, MDRD, and CKD-EPI 2021 equations, the removal of the RM suggested a relative decrease in the eGFR of Black compared to non-Black. These findings have potential ramifications for the use of eGFR in nephrectomy surgical planning based on the presence of CKD and may contribute to health-care inequalities. It should also be noted that changes in CKD of Black patients by alteration in eGFR equation and removal of an RM have multifaceted effects. Certain studies have demonstrated unintended consequences of attributing worse eGFR to Black patients such as in the setting of kidney donation, where worse eGFR may limit kidney donation in Black patients and possibly affect the ability of Black patients to receive a match due to common racial concordance between donors and recipients.[21,22] Non-Black patients also received substantial elevation in eGFR [Table 2] and were frequently reclassified into a different CKD class [Figure 1].

Limitations of this study include combined retrospective and prospective design. This limited some aspects of data collection and prediction of postoperative outcomes and mortality. Although this study included a sizable number of patients, when further dividing the cohort into procedure or racial groups the power of statistical comparisons was reduced. Our institution performs partial nephrectomies at a significantly higher volume than radical nephrectomies [Table 1], which could influence clinical conclusions. It is possible that with a larger cohort, and particularly a larger Black patient cohort as Black individuals constitute a minority of patients, stronger comparisons between groups could be drawn involving renal function, comorbidities, and outcomes.

Differences in comorbidities between patient groups may contribute to changes in kidney function and eGFR. The prevalence of these comorbidities such as DM have been found to differ across racial groups, have increased over time, and may further complicate evaluation of kidney function.[23] In addition, the evaluation of proteinuria was not conducted in this study, which may account for additional risk not estimated by eGFR.[24]

Although this study utilized S_{Cr}, laboratory values on 24-h urine creatinine clearance were not obtained. Additional reference standards including iothalamate infusion could be considered for further evaluation of kidney filtration and function. Cystatin C has also been utilized as an alternative biomarker to creatinine for the assessment of renal function. It is important to clarify that equations purposed for eGFR only provide a convenient estimation of renal function, and although certain equations may broadly have an increased likelihood of matching a patient's actual GFR, each individual patient's renal function might be more accurately determined by a different equation or standard of evaluation.

Further, Black patients only comprised 6.5% (n = 74) of this dataset of 1137 patients. This discrepancy from population levels may be attributable to individual and systemic barriers of minority groups, in addition to racial biases that may contribute to health disparities in clinical nephrectomy decision-making.[25] In addition, health-care inequities may have been exacerbated by the COVID-19 pandemic and subsequent logistical challenges.[26] A larger scale, more racially diverse population should be studied to further evaluate the race-specific effect of eGFR in clinical and surgical decision-making.

CONCLUSIONS

Our study suggests that there are quantitative differences in the evaluation of eGFR when utilizing different equations that may impact clinical considerations for nephrectomy across racial groups. Removal of the RM from eGFR equations creates a relative downward shift in mean eGFR of Black and upward shift of non-Black patients. These findings have potential ramifications for the use of eGFR in nephrectomy surgical planning based on the presence of CKD and may help address health disparities aiming toward increased rates of Black patients receiving PN over RN in the setting of lower eGFR.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. Campbell SC, Clark PE, Chang SS, Karam JA, Souter L, Uzzo RG. Renal mass and localized renal cancer: Evaluation, management, and follow-up: AUA guideline: Part I. J Urol 2021;206:199-208.
2. Levey AS, Powe NR. eGFR and chemotherapy: Will removing race create disparities? Lancet Oncol 2021;22:1208-9.
3. Chan CT, Blankestijn PJ, Dember LM, Gallieni M, Harris DC, Lok CE, *et al*. Dialysis initiation, modality choice, access, and prescription: Conclusions from a Kidney Disease: Improving Global Outcomes (KDIGO) controversies conference. Kidney Int 2019;96:37-47.
4. Levey AS, Becker C, Inker LA. Glomerular filtration rate and albuminuria for detection and staging of acute and chronic kidney disease in adults: A systematic review. JAMA 2015;313:837-46.
5. Ghiraldi EM, Braitman LE, Friedlander JI. Factors associated with compliance with 24-hour urine collection. Urology 2020;142:65-9.
6. Kumar BV, Mohan T. Retrospective comparison of estimated GFR using 2006 MDRD, 2009 CKD-EPI and cockcroft-gault with 24 hour urine creatinine clearance. J Clin Diagn Res 2017;11:C09-12.
7. Inker LA, Eneanya ND, Coresh J, Tighiouart H, Wang D, Sang Y, *et al*. New creatinine- and cystatin C-based equations to estimate GFR without race. N Engl J Med 2021;385:1737-49.
8. Levey AS, Bosch JP, Lewis JB, Greene T, Rogers N, Roth D. A more accurate method to estimate glomerular filtration rate from serum creatinine: A new prediction equation. Modification of diet in renal disease study group. Ann Intern Med 1999;130:461-70.
9. Levey AS, Stevens LA, Schmid CH, Zhang YL, Castro AF 3rd, Feldman HI, *et al*. A new equation to estimate glomerular filtration rate. Ann Intern Med 2009;150:604-12.
10. Jones CA, McQuillan GM, Kusek JW, Eberhardt MS, Herman WH, Coresh J, *et al*. Serum creatinine levels in the US population: Third national health and nutrition examination survey. Am J Kidney Dis 1998;32:992-9.
11. Powe NR. Black kidney function matters: Use or misuse of race? JAMA 2020;324:737-8.
12. Vyas DA, Eisenstein LG, Jones DS. Hidden in plain sight – Reconsidering the use of race correction in clinical algorithms. N Engl J Med 2020;383:874-82.
13. Khwaja A. KDIGO clinical practice guidelines for acute kidney injury. Nephron Clin Pract 2012;120:c179-84.
14. Levin A, Stevens PE. Summary of KDIGO 2012 CKD guideline: Behind the scenes, need for guidance, and a framework for moving forward. Kidney Int 2014;85:49-61.
15. Diao JA, Wu GJ, Taylor HA, Tucker JK, Powe NR, Kohane IS, *et al*. Clinical implications of removing race from estimates of kidney

function. JAMA 2021;325:184-6.
16. Jo JY, Ryu SA, Kim JI, Lee EH, Choi IC. Comparison of five glomerular filtration rate estimating equations as predictors of acute kidney injury after cardiovascular surgery. Sci Rep 2019;9:11072.
17. Gelsomino S, Bonacchi M, Lucà F, Barili F, Del Pace S, Parise O, *et al*. Comparison between three different equations for the estimation of glomerular filtration rate in predicting mortality after coronary artery bypass. BMC Nephrol 2019;20:371.
18. Antony MB, Gopal N, Kozel Z, Gurram S, Linehan WM, Ball MW. Comparison of race-based and non-race-based glomerular filtration rate equations for the assessment of renal functional risk before nephrectomy. Urology 2023;172:144-8.
19. Abdallah N, Benidir T, Hofmann M, Haile E, Palacios DA, Corrigan D, *et al*. Race modified equations estimating renal function and the disparity in partial nephrectomy use in black patients. JU Open Plus 2023;1:e00014.
20. Buchkremer F, Segerer S. The 2009 and 2021 CKD-EPI equations: A graphical analysis of the effect of refitting GFR estimating equations without a race coefficient. Kidney Med 2022;4:100448.
21. Orandi BJ, Kumar V, Reed RD, MacLennan PA, Shelton BA, McLeod C, *et al*. Reclassification of CKD in living kidney donors with the refitted race-free eGFR formula. Am J Surg 2023;225:425-8.
22. Lv K, Wu Y, Lai W, Hao X, Xia X, Huang S, *et al*. Simpson's paradox and the impact of donor-recipient race-matching on outcomes post living or deceased donor kidney transplantation in the United States. Front Surg 2022;9:1050416.
23. Johansen KL, Chertow GM, Gilbertson DT, Ishani A, Israni A, Ku E, *et al*. US renal data system 2022 annual data report: Epidemiology of kidney disease in the United States. Am J Kidney Dis 2023;81:A8-11.
24. Zhang Z, Zhao J, Zabell J, Remer E, Li J, Campbell J, *et al*. Proteinuria in patients undergoing renal cancer surgery: Impact on overall survival and stability of renal function. Eur Urol Focus 2016;2:616-22.
25. Kiechle JE, Abouassaly R, Gross CP, Dong S, Cherullo EE, Zhu H, *et al*. Racial disparities in partial nephrectomy persist across hospital types: Results from a population-based cohort. Urology 2016;90:69-74.
26. Llanos AA, Fong AJ, Ghosh N, Devine KA, O'Malley D, Paddock LE, *et al*. COVID-19 perceptions, impacts, and experiences: A cross-sectional analysis among New Jersey cancer survivors. J Cancer Surviv 2024;18:439-49.