

Test Code: LAB383

Test Name: Creatinine, Plasma (includes eGFR)

Changes Needed:		
Include all changes needed	Current:	Change to:
Methodology	Colormetric-Jaffe / IDMS calibration	Enzymatic / CKD-EPI 2021 equation

Result Interval:

Creatinine, Plasma:

Age	Female	Male
0 up to 15 days ¹	0.4 - 1.0 mg/dL	0.4 - 1.0 mg/dL
15 days up to 2 years ¹	0.2 - 0.4 mg/dL	0.2 - 0.4 mg/dL
2 years up to 5 years ¹	0.3 - 0.5 mg/dL	0.3 - 0.5 mg/dL
5 years up to 10 years ²	0.3 - 0.6 mg/dL	0.3 - 0.6 mg/dL
10 years up to 15 years ²	0.4 - 0.9 mg/dL	0.4 - 0.9 mg/dL
15 years up to 19 years ²	0.5 - 0.9 mg/dL	0.5 - 0.9 mg/dL
19 years up to 90 years ³	0.6 - 1.1 mg/dL	0.8 - 1.3 mg/dL
90 years up to 150 years ³	0.6 - 1.3 mg/dL	1.0 - 1.7 mg/dL

1. Caliper - <https://caliper.research.sickkids.ca/#/search> Literature reference: Soldin SJ, Wong EC

2. Wong et al. Pediatric Reference Intervals, 8th ed. 2021

3. University of Kentucky Reference Interval Study 2012

4. Literature reference: Wu A (Ed). Tietz Clinical Guide to Laboratory Tests, 4th edition, 2005.

5. ARUP Laboratory Test Dictionary, Salt Lake City, UT, 2014

eGFR – Calculated utilizing CKD-EPI 2021 Equation:

eGFR_{cr} (calculated using only creatinine) in mL/min/1.73m²

Normal Range (≥ 18 years): >60mL/min/1.73m²

eGFR_{cr} is not calculated for pediatric patients.

Interpretative Data:

Effective July 27, 2022 our laboratory is changing the creatinine methodology and the calculation of estimated glomerular filtration rate (eGFR) from the MDRD equation to the new CKD-EPI 2021 equation that does not include a race coefficient. The new equation is recommended by the National Kidney Foundation and the American Society of Nephrology’s Task Force on Reassessing the Inclusion of Race in Diagnosing Kidney Disease. The new eGFR_{cr} equation has similar overall performance characteristics to the older equations and has been assessed to not have potential consequences that disproportionately affect any one group of individuals. For most patients the eGFR_{cr} result will be similar, however, for some, the values may differ by more than 10% particularly at higher values of eGFR_{cr} and for younger adult ages. Comparisons of the new CKD-EPI 2021 eGFR_{cr} result with a previously calculated eGFR based on the MDRD equation is below in Figure 1.

The eGFR values using the new equations will only report one value and will use nomenclature to distinguish results from the older equations. Results will not trend with those using the older equations. The new report names are:

- eGFR_{cr} (calculated using only creatinine) in mL/min/1.73m²

The NKF also recommends ordering creatinine with calculated eGFR_{cr} and urine albumin-creatinine ratio. Clinical practice recommendations suggest ordering the Albumin-Creatinine ratio, Ur with serum creatinine to facilitate appropriate classification of patients with chronic kidney disease, to assess risk for progression and to monitor patients at risk to develop CKD.

When evaluating a patient’s GFR, it is important to remember that eGFR is an estimate of the patient’s GFR. For eGFR_{cr} 80-90% of values are within 30% of measured GFR. eGFR_{cr} values need to be interpreted based on clinical context. Clinical practice recommendations suggest ordering cystatin C as a confirmatory test for patients with eGFR_{cr} of 45-59 mL/min/1.73m² with Albumin-Creatinine ratio <30 mg/g, and in patients for whom the creatinine may be a less reliable indicator of GFR near decision points. Situations in which non-GFR factors may have a large effect on serum creatinine include alterations in creatinine generation (muscle wasting diseases, amputees, body builders, vegan diet), drugs that affect tubular secretion of creatinine (cimetidine, cobicistat, dolutegravir, fenofibrate, ritonavir, trimethoprim and others), and conditions with extra-renal elimination of creatinine (gastrointestinal and “third-space” losses). Clinicians must also consider non-GFR factors affecting cystatin C, including smoking, obesity, inflammation and disorders of thyroid or adrenal hormones. For more information on the NKF GFR calculator using both creatinine and cystatin C, please consult the NKF calculator page https://www.kidney.org/professionals/kdoqi/gfr_calculator

Please note that while still an evolving field, experts recommend that clinicians evaluate transgender, non-binary, and intersex patients by considering both the male and female eGFR in the context of patient history and clinical picture. In order to do so, please use calculator link above.

Figure 1: Comparison of GFR results at various creatinine concentrations by sex and race. A patient’s true GFR has not changed even though the new eGFR values may differ. The expected magnitude of differences at UKMC with the creatinine assay and eGFR equation change:

RACE	SEX	AGE	45 YEARS OLD				70 YEARS OLD			
		CREATININE	0.60	1.00	1.50	2.00	0.60	1.00	1.50	2.00
Black or African American	M	MDRD*	177	98	61	36	161	90	56	40
		CKD-EPI 2021 [#]	126	98	57	39	108	84	49	34
		Difference	-51	0	-4	3	-53	-6	-7	-6
	F	MDRD	131	73	46	33	120	66	42	30
		CKD-EPI 2021	116	73	43	29	99	63	37	25
		Difference	-15	0	-3	-4	-21	-3	-5	-5
Non-Black or African American	M	MDRD	146	81	51	36	133	74	46	33
		CKD-EPI 2021	126	98	57	39	108	84	49	34
		Difference	-20	17	6	3	-25	10	3	1
	F	MDRD	108	60	38	27	99	55	34	25
		CKD-EPI 2021	116	73	43	29	99	63	37	25
		Difference	8	13	5	2	0	8	3	0

*MDRD equation only developed for GFR < 60 mL/min/1.73 m²

[#]Estimated GFR utilizing CKD-EPI 2021 equation results are reported as eGFR_{cr} in mL/min/1.73 m²

References:

Delgado C, Baweja M, Crews DC, et al. A Unifying Approach for GFR Estimation: Recommendations of the NKF-ASN Task Force on Reassessing the Inclusion of Race in Diagnosing Kidney Disease. *Am J Kidney Dis.* 2021 DOI: 10.1053/j.ajkd.2021.08.003

Inker LA, Eneanya ND, McCorsh J, et al. New Creatinine- and Cystatin C–Based Equations to Estimate GFR without Race. *New England J Med.* 2021: DOI: 10.1056/NEJMoa2102953

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