THE NEPHROLOGIST IN THE MIST. LIVING WITH THE ERROR OF ESTIMATED GFR IN RENAL TRANSPLANTATION.

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INTRODUCTION AND AIMS: Formulas that estimating GFR have a mean error of 30% when compared with a gold standard. This is not acceptable in kidney transplant patients. We aimed to analyze the performance of 30 formulas (creatinine-based and/or cystatine-c based) and of 24h urinary creatinine clearance (24h CrCl) with the plasma clearance of iohexol.

METHODS: We analyzed 191 renal transplant recipients. We evaluated the agreement between plasma clearance of iohexol (mGFR) and estimated GFR (eGFR) by total deviation index (TDI) and concordance correlation coefficient (CCC). TDI is a measure that captures a large proportion of data within a boundary for allowed differences between measurements. The CCC is a statistic that combines meaningful components of accuracy and precision. Finally, we analyzed the misclassification of CKD stages by eGFR and 24h CrCl.

RESULTS: All formulas and 24h CrCl have a very low agreement with mGFR (Table 1). None of the 30 formulas neither 24h CrCl correctly classified by CKD stages (table 2). Thus, eGFR and 24h CrCl do not properly categorize CKD stages, with at least one in three patients were incorrectly classified. Many formulas showed about 50% of patients misclassified. Of note, the error was mainly an overestimation of eGFR and the CKD stage.

Conclusions: In kidney transplant recipients, a CKD population at risk for accelerated renal function decline, 24h CrCl and formulas developed to estimate GFR do not properly reflect true renal function and CDK stages. Further research should investigate the consequences of this bias in clinical practice.

TABLE 1 : Agreement analysis between eGFR and mGFR

CREATININE-BASED FORMULAS			CYSTATINE-C BASED FORMULAS		
	TDI	CCC		TDI	CCC
Cockcroft-Gault	81.15(89.15)	0.70(0.65)	CKD_EPI	46.66(51.62)	0.87(0.85)
aMDRD	53.12(58.82)	0.82(0.78)	Rule	65.67(71.86)	0.79(0.75)
CKD-EPI	72.10(79.24)	0.75(0.70)	Grubb	72.06(80.32)	0.81(0.77)
Rule	101.0(111.05)	0.66(0.61)	Hoek	34.07(37.58)	0.91(0.88)
Björnsson	92.73(101.39)	0.66(0.60)	Larsson	40.77(45.06)	0.89(0.86)
Davis–Chandler	74.04(82.19)	0.71(0.65)	LeBricon	48.96(53.78)	0.81(0.77)
Edward White	86.13(95.02)	0.63(0.56)	Perkins	82.86(89.21)	0.67(0.62)
Effersøe	60.83(67.29)	0.77(0.72)	MacIsaac	38.63(42.61)	0.88(0.86)
Gates	68.09(75.05)	0.76(0.71)	ArnalDade	50.24(55.50)	0.86(0.82)
Hull	90.02(98.67)	0.68(0.63)	Tan	35.69(39.39)	0.90(0.88)
Jelliffe-1	81.60(90.06)	0.70(0.65)	Jonsson	53.33(59.08)	0.85(0.82)
Jelliffe-2	52.04(57.70)	0.82(0.78)	**CREATININE + CYSTATINE-C**		
Mawer	87.64(96.12)	0.69(0.63)	CKD_EPI	46.75(51.78)	0.87(0.84)
Salazar-Corcoran	73.94(81.23)	0.73(0.67)	Stevens	36.91(40.75)	0.90(0.88)
Sobh	101(120.25)	0.59(0.53)	Ma	49.31(54.14)	0.85(0.82)
Walser	65.40(72.11)	0.76(0.71)	**24h CrCl**	83.69(94.75)	0.73(0.66)

TABLE 2: Percentage of patients misclassified in each CKD group.

CREATININE-BASED FORMULAS						CYSTATINE-C BASED FORMULAS					
CKD stage	≥90	60-89	30-59	15-29	<15		≥90	60-89	30-59	15-29	<15
n	5	57	106	20	3	*n*	5	57	106	20	3
Cockcroft-Gault	20	56	47	65	100	CKD-EPI	40	47	28	5	0
aMDRD	40	46	31	45	100	Rule-cc	40	60	33	20	0
CKD-EPI-cre	20	56	43	50	100	Grubb	0	61	44	25	0
Rule-cre	0	67	62	55	100	Hoek	60	30	21	25	33
Björnsson	20	61	53	85	100	Larsson	60	40	20	15	0
Davis–Chandler	60	54	48	55	100	LeBricon	40	21	32	75	100
Edward-White	40	37	59	80	100	Perkins	0	45	58	90	100
Effersøe	40	33	33	65	100	MacIsaac	40	23	26	35	33
Gates	20	44	43	60	100	ArnalDade	60	51	25	10	0
Hull	0	61	52	65	100	Tan	60	32	23	30	0
Jelliffe-1	40	47	52	75	100	Jonsson	60	47	29	15	0
Jelliffe-2	60	53	33	35	100	**CREATININE + CYSTATINE-C**					
Mawer	0	61	52	60	100	CKD-EPI	60	61	26	15	0
Salazar-Corcoran	0	49	44	55	100	Stevens	40	32	24	25	34
Sobh	0	56	58	85	100	Ma	0	44	34	40	67
Walser	40	39	38	60	100	**24h CrCl**	0	54	47	55	100

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