MO381   ESTIMATING GFR IN RENAL TRANSPLANTED PATIENTS WITH EQUATIONS BASED ON CREATININE (WITH OR WITHOUT RACE VARIABLE) AND/OR CYSTATIN C

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BACKGROUND AND AIMS: Current Glomerular filtration rate (GFR) estimating equations based on serum creatinine are facing increased criticism due to the inclusion of a race correction in black Americans with the CKD-EPI equation (CKD-EPI$_{ASR}$, A = Age, S = Sex, R = Race). New equations without race (CKD-EPI$_{AS}$) has been proposed with creatinine and/or cystatin C. These equations were developed mainly from US cohorts with few renal transplanted patients. In the current analysis, we compared these new equations, notably with the new European Kidney Function Consortium (EKFC) equation.

METHOD: In this retrospective analysis, 489 transplanted patients from the University Hospital of Saint-Etienne were included. All subjects were white. GFR was measured with inulin or iohexol clearances. IDMS creatinine and standardized cystatin C results were available. Median bias (eGFR—mGFR), imprecision (interquartile range: IQR), and P30 accuracy (percentage of eGFR-values within ± 30% of mGFR) were calculated.

RESULTS: Among creatinine-based equations, the bias were 2.3, 5.5 and 2.2 mL/min/1.73 m² for the CKD-EPI$_{ASR}$, CKD-EPI$_{AS}$ and EKFC, respectively. IQRs were 16.1, 16.2 and 15.3 mL/min/1.73 m², respectively. P30 were 74.2, 68.3 and 75.3%, respectively. Among cystatin C-based equations, the bias were −3.1 and 0.8 mL/min/1.73 m² for the CKD-EPI$_{CC}$ and the EKFC$_{CC}$, respectively. IQRs were 13.7 and 13.4 mL/min/1.73 m², respectively. P30 were 78.5 and 81.4%, respectively. Among equations combining creatinine and CC, the bias were −1.3, 0.5 and 1.6 mL/min/1.73 m² for the CKD-EPI$_{ASR-CC}$, CKD-EPI$_{AS-CC}$ and EKFC$_{creatCC}$, respectively. IQRs were 12.7, 12.4 and 12.1 mL/min/1.73 m², respectively. P30 were 84.5, 82.6 and 80.6%, respectively.

CONCLUSION: In our cohort of European transplanted patients, both the EKFC$_{creat}$ and CKD-EPI$_{ASR}$ equations performed better than the new CKD_EPI$_{AS.}$ Compared with creatinine-based equations, the new EKFC$_{CC}$ equation and all combined equations performed better. Cystatin C-based equations have the advantage to be accurate without any race variable.

MO382   VALIDATION OF A HANDHELD POINT-OF-CARE CREATININE/EGFR METER FOR EVALUATING RENAL FUNCTION

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BACKGROUND AND AIMS: Measurement of glomerular filtration rate (GFR) is a cumbersome, time consuming, and expensive process, thus estimated GFR (eGFR) has become a commonly accepted surrogate or screening tool for individuals suspected to have kidney disease. Until recently this required testing through phlebotomy and a large laboratory analyzer. Nova Biomedical (Waltham, MA, USA) has developed a point-of-care (POC) handheld device, the NovaMax Cr/eGFR System that is able to measure creatinine (Cr) and calculate an eGFR using a fingerstick (1.2 μL) of whole blood.

METHOD: A group of 517 subjects (48% male) were recruited for study at three different Clinical Research Organizations (CRO's). The patient population was from both healthy cohorts and those known to have CKD. Creatinine and eGFR was tested on all subjects using a finger stick sample with the NovaMax System and compared with venous blood on a Siemens RXL (Siemens Medical Solutions, Malvern, PA, USA). The CKD-EPI formula was used to calculate eGFR.

RESULTS: The average age was 61.1 years (range 18–91). The range of Cr in the groups were as follows: NovaMax 0.57—>7 mg/dL (7 is the maximum reading), and for the Siemens 0.36–16.79 mg/dL. The range of eGFR was <7–127 mL/min/1.73 m² on the NovaMax, and 4.3–137 mL/min/1.73 m² on the Siemens.
See Table 1 for sensitivity and specificity results.

CONCLUSION: The NovaMax Cr/eGFR System is an acceptable alternative for eGFR measurement in patients with a wide range of renal function. Its ability to measure renal function in a variety of settings make it a very useful device for several patient populations: screening patients at risk for CKD or AKI, telenephrology, population screening in low- and middle-income countries, following patients post kidney transplant, and evaluating patients prior to and after contrast imaging studies, among other indications.

Table 1. Sensitivity and specificity of the NovaMax Cr/eGFR System compared with the Siemens RXL Analyzer in 517 subjects

eGFR	Sensitivity (%)	Specificity (%)
<60 mL/min/1.73 m²	98.9	85.3
<45 mL/min/1.73 m²	99.1	95.6
<30 mL/min/1.73 m²	96.7	96.2

MO383   STRUCTURAL EQUATION MODELLING TO IMPROVE KIDNEY FUNCTION ASSESSMENT IN THE GENERAL POPULATION

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BACKGROUND AND AIMS: In order to identify behavioral, environmental, biological or genetic determinants of kidney function, population-based epidemiological studies rely on approximate estimates of the glomerular filtration rate (eGFR) based on measured markers such as serum creatinine, cystatin C, and a few other [1,2]. Since none of these markers is the exclusive reflection of the kidney function, results should always be interpreted with caution to disentangle determinants of kidney function from those that are specific to the marker metabolism. A structural equation modelling (SEM) approach could overcome these limitations allowing to estimate the unobservable kidney function based on a larger number of markers, improving the possibilities of conducting more specific inferential studies [3]. We implemented SEM to identify a latent kidney function trait in a general population sample and validated this derived biomarker against 10-year incidence of kidney disease using an independent dataset.

METHOD: In the population-based MICROS study (South Tyrol, Italy) [4], we measured serum creatinine (SCr), uric acid (UA), blood urea nitrogen (BUN), cystatin C (CysC), and serum albumin in 1317 study participants. We split the sample into a model-building (n = 647) and a validation set (n = 670). The model-building set was used for SEM analysis and estimation of factor loadings for each biomarker, using the R package 'lavaan'. Participants in the validation set were submitted a 10-year follow-up interview on kidney disease within the Cooperative Health Research In South Tyrol (CHRIS) study [5]. We fitted logistic regression models to assess the predictivity of the estimated latent kidney function trait versus each individual marker, CKD-EPI eGFR estimates based on serum creatinine and cystatin C (CKD-EPI 2009; CKD-EPI 2021; CKD-EPI Cys; and CKD-EPI CreCys), as well as MDRD-4 and MDRD-6. We estimated odds ratios (ORs) for 10-year kidney disease incidence per standard deviation (SD) change in each marker.

RESULTS: In the model-building set (mean age 49 years, SD = 19; 58% females; mean eGFR$_{CKD-EPI\ 2021}$ = 85.9, SD = 20.9), we identified factor loadings for SCr, UA, BUN, and CysC (Figure 1) achieving acceptable goodness of fit (Chi-square = 14.7; CFI = 0.98; TLI = 0.93; and RMSEA = 0.099). The validation set (baseline mean age = 40 years, SD = 13; 55% females; mean eGFR$_{CKD-EPI\ 2021}$ = 100.8, SD = 16.1) had a 10-year kidney disease incidence of 7.8%. For the latent kidney function trait, we observed an OR of 2.1 (95% CI: 1.4–3.2) for incidence per each SD change. This was lower than the ORs (95% CI) associated with the eGFR$_{MDRD4}$ (2.3, 1.4–4.1) and eGFR$_{MDRD6}$ (2.5, 1.5–4.2), but larger than the ORs (95% CI) observed for all other markers (SCr: 1.8, 1.3–2.6; UA: 1.2, 0.9–1.8; BUN: 1.3, 0.9–1.8; and CysC: 1.3, 1.0–1.7) or eGFR estimates (eGFR$_{CKD-EPI2009}$: 1.8, 1.2–2.7; eGFR$_{CKD-EPI2021}$: 1.7, 1.2–2.5; eGFR$_{CKD-EPI\ Cys}$: 1.4, 1.0–1.9; and eGFR$_{CKD-EPI\ CreCys}$: 1.8, 1.2–2.6).

CONCLUSION: A latent kidney function trait derived from SEM performed similarly and often better than conventional eGFR estimates in a 10-year kidney disease incidence prediction. The method warrants validation in independent general population samples with large sample size.

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