ESTIMATES OF GLOMERULAR FILTRATION RATE BASED ON CREATININE AND CYSTATIN C EQUATIONS IN CRITICALLY ILL PATIENTS

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ABSTRACT

Introduction and Aim: Accurate assessment of renal function in the critically ill is a complex task. Estimated glomerular filtration rate (eGFR) is the best indicator to help physicians estimate kidney function and determine different stages of kidney disease. eGFR can be calculated using serum Creatinine (S_{Cr}), or serum Cystatin C (S_{CysC}), age, body size, race and gender using different equations. We evaluated eGFR based on S_{Cr} and S_{CysC} equations in critically ill patients to find an accurate, precise, and less biased equation for GFR estimation.

Methods: This is a single cantered, cross-sectional observational study in critically ill patients older than 18 years staying for over 24-hours in intensive care units. Urinary Creatinine, S_{Cr}, and S_{CysC} were measured at 8, 24, and 72-hour intervals. Acute kidney injury (AKI) was defined at admission using the Creatinine definition of the Kidney Disease Improving Global Outcome (KDIGO) guideline. After estimating GFR from Creatinine ($eGFR_{Cr}$), Cystatin C ($eGFR_{CysC}$), and combining Creatinine and Cystatin C ($eGFR_{Cr\text{-}CysC}$), results were compared with measured Creatinine clearance (Cr_{CL}). Cr_{CL} was defined based on urinary Creatinine, S_{Cr}, and urinary volume in a 24-hour period.

Results: Forty-three patients were recruited, of which 6 died and 37 alive. $eGFR_{Cr\text{-}24hrs}$ had the highest correlation to measured $Cr_{CL\text{-}24hrs}$, with correlation coefficient of 0.81 ($p<0.001$). $eGFR_{Cr\text{-}72hrs}$ had the highest accuracy at 30% and 50% of measured Cr_{CL} between 57.69% and 69.23% respectively. However, the $eGFR_{CysC\text{-}24hrs}$ equation was more precise with the lowest bias of 0.94. Logisticregression-analysis reveals that p values for eGFRCr-24hrs, CrCL-24hrs, eGFRCr-CysC-24hrs, eGFRCr-72hrs, $eGFR_{Cr\text{-}CysC\text{-}72hrs}$ equations were ≤ 0.05, which helps diagnose AKI. Logistic regression was >0.05 for in- hospital-mortality prediction, addressing none of the equations led to death prediction.

Conclusions: $eGFR_{Cr\text{-}24hrs}$ had the highest correlation to measured $Cr_{CL\text{-}24hrs}$, with correlation coefficient of 0.81 ($p<0.001$). The most accurate equation was $eGFR_{Cr\text{-}72hrs}$ However, $eGFR_{CysC\text{-}24hrs}$ equation had the lowest bias and was relatively more precise (60.0 ml/min). Using logistic regression, most of the equations contributed to diagnosing AKI. However, none of the equation predicted in-hospital-mortality.

Keywords: eGFR: Estimated Glomerular Filtration Rate, SCr: Serum Creatinine, SCysC: Serum Cystatin C, Critically ill patients, ICU.

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