Md Ralib, A., Ramly, N., Nanyan, S., Mat Nor, M.

The utility of the creatinine excretion to production ratio and the plasma creatinine and cystatin C based kinetic estimates of glomerular filtration rates in critically ill patients with sepsis (2022) Indian Journal of Nephrology, 32 (6), pp. 600-605.

DOI: 10.4103/ijn.jn_519_21

Department of Anaesthesiology and Critical Care, Kulliyyah of Medicine, International Islamic University Malaysia, Kuantan, Pahang, 25200, Malaysia

Abstract
Introduction: Creatinine kinetics denotes that under steady-state conditions, creatinine production (G) will equal creatinine excretion rate (E). The glomerular filtration (GFR) is impaired when excretion is less than production. The kinetic estimate of GFR (keGFR) and E/G ratio were proposed as a more accurate estimate of GFR in acute settings with rapidly changing kidney function. We evaluated keGFR and E/G to diagnose AKI, predict recovery, death or dialysis. Methods: This is a prospective observational study of critically ill patients. Inclusion criteria were patients >18 years old with sepsis, defined as clinical infection with an increase in SOFA score >2, and plasma procalcitonin >0.5 ng/mL. Plasma creatinine and Cystatin C were measured on ICU admission and 4 h later, and their keGFR was calculated. Urine creatinine and urine output were measured over 4 h to calculate the E/G ratio. Results: A total of 70 patients were recruited, of which 49 (70%) had AKI. Of these, 33 recovered within 3 days, and 15 had a composite outcome of death or dialysis. Day 1 keGFR Cr and keGFR CysC discriminated AKI from non-AKI with AUCs of 0.85 (95% Confidence interval: 0.74-0.96), and 0.86 (0.76-0.97), respectively. The E/G ratio predicted AKI recovery (AUC: 0.81 (0.69-0.97)). The keGFRs were not predictive of death or dialysis, whereas E/G was predictive (AUC: 0.76 (0.63-0.89). Conclusion: keGFR was strongly diagnostic of AKI. The E/G ratio predicted AKI recovery and a composite outcome of death and dialysis. © 2022 Wolters Kluwer Medknow Publications. All rights reserved.

Author Keywords
Creatinine; critical illness; Cystatin C; glomerular filtration rate; sepsis

Index Keywords
biological marker, creatinine, cystatin C, kinetic estimated glomerular filtration rate, procalcitonin, unclassified drug; acute kidney failure, adult, area under the curve, Article, controlled study, creatinine blood level, creatinine clearance, creatinine urine level, critically ill patient, death, diagnostic test accuracy study, dialysis, estimated glomerular filtration rate, female, human, intensive care unit, kidney disease, major clinical study, male, observational study, polymerase chain reaction, predictive value, prospective study, sepsis, Sequential Organ Failure Assessment Score, urine volume

Chemicals/CAS
creatinine, 19230-81-0, 60-27-5; procalcitonin, 56645-65-9

Tradenames
Olympus AU2700, Olympus, United States

Manufacturers
Olympus, United States

References
- Ralib, A, Nanyan, S, Ramly, N, Har, L, Cheng, T, Mat Nor, M.
- Md Ralib, A, Mat Nor, MB.
- Khwaja, A.
Chen, S.
Retooling the creatinine clearance equation to estimate kinetic GFR when the plasma creatinine is changing acutely

Endre, ZH, Pianta, TJ, Pickering, JW.
Timely diagnosis of acute kidney injury using kinetic eGFR and the creatinine excretion to production ratio, E/eG-Creatinine can be useful!

Pianta, TJ, Endre, ZH, Pickering, JW, Buckley, NA, Peake, PW.
Kinetic estimation of GFR improves prediction of dialysis and recovery after kidney transplantation

Khayat, MI, Deeth, JM, Sosnov, JA.
A bedside clinical tool using creatinine kinetics to predict worsening renal injury and early recovery

O'Sullivan, ED, Doyle, A.
The clinical utility of kinetic glomerular filtration rate

Kwong, YD, Chen, S, Bouajram, R, Li, F, Matthay, MA, Mehta, KM
The value of kinetic glomerular filtration rate estimation on medication dosing in acute kidney injury

Seelhammer, TG, Engoren, M, Maile, M, Jewell, E, Heung, M, Haft, J.
Estimated GFR and AKI outcome prediction model for post cardiac surgery patients

Pickering, JW, Mellas, J.
A simple method to detect recovery of glomerular filtration rate following acute kidney injury

Singer, M, Deutschman, CS, Seymour, C, Shankar-Hari, M, Annane, D, Bauer, M
The third international consensus definitions for sepsis and septic shock (sepsis-3)

Pickering, JW, Frampton, CM, Walker, RJ, Shaw, GM, Endre, ZH.
Four hour creatinine clearance is better than plasma creatinine for monitoring renal function in critically ill patients

Levey, AS.
A more accurate method to estimate glomerular filtration rate from serum creatinine: A new prediction equation

Pickering, JW, Endre, ZH.
Back-calculating baseline creatinine with MDRD misclassifies acute kidney injury in the intensive care unit

Kinetic eGFR and novel AKI biomarkers to predict renal recovery
Cockcroft, DW, Gault, H.  
**Prediction of creatinine clearance from serum creatinine**  
(1976) *Nephron*, 16, pp. 31-41.

Levey, AS, Stevens, LA, Schmid, CH, Zhang, YL, Castro, AF, Feldman, HI  
**A new equation to estimate glomerular filtration rate**  

Seelhammer, TG, Maile, MD, Heung, M, Haft, JW, Jewell, ES, Engoren, M.  
**Kinetic estimated glomerular filtration rate and acute kidney injury in cardiac surgery patients**  

**Reduced production of creatinine limits its use as marker of kidney injury in sepsis**  

**Correspondence Address**  
Md Ralib A.; Department of Anaesthesiology and Critical Care, Kuantan, Malaysia; email: azrinar@iium.edu.my

**Publisher:** Wolters Kluwer Medknow Publications

**ISSN:** 09714065  
**Language of Original Document:** English  
**Abbreviated Source Title:** Indian J. Nephrol.

**Document Type:** Article  
**Publication Stage:** Final  
**Source:** Scopus