

A Simple Method to Remove Timing Bias From the Kidney Disease: Improving Global Outcomes Definition and Classification of Acute Kidney Injury



To the Editor: The 2012 Kidney Disease: Improving Global Outcomes acute kidney injury (AKI) definition and classification criteria¹ have been widely adopted. The creatinine-based definition rests on changes of serum creatinine within 7 days and 48 hours. Because creatinine concentrations continue to rise for a considerable time after acute impairment of kidney function,² AKI stages commonly increase over time, even if there is no further change in kidney function.

We suggest calculating standard “7-day creatinine” and “48-hour creatinine” values to avoid shifts in AKI classification caused solely by different time points of assessment.

To do so, we determine the non-steady-state creatinine clearance from 2 creatinine measurements; the

time between them; and, if applicable, simultaneous changes of total body water.³ We then calculate the expected creatinine values after 7 days and 48 hours, respectively (Supplementary Item S1).

The creatinine generation rate and total body water are important individual determinants of creatinine concentration in non-steady-state conditions and necessary components of the pharmacokinetic model used for our calculations.³ Because the Kidney Disease: Improving Global Outcomes AKI criteria do not consider their impact, we are replicating this indifference by using population mean levels. These were derived from the 2015 to 2018 National Health and Nutrition Examination Survey cohort as described previously⁴ (Supplementary Table S1).

We have created an online calculator available at <https://www.wolframcloud.com/obj/5d8dc12d-8d52-43e3-a648-ac0b0dcf5a3b> that provides the standard 7-day and 48-hour creatinine concentrations along with the resulting KDIGO AKI stage (Figure 1).

We expect that removing the timing bias from the Kidney Disease: Improving Global Outcomes AKI definition and classification criteria will increase their accuracy, especially in the early phases of AKI.

SUPPLEMENTARY MATERIAL

Supplementary File (PDF)

Item S1. Formulas.

Table S1. Creatinine generation rate and total body water.

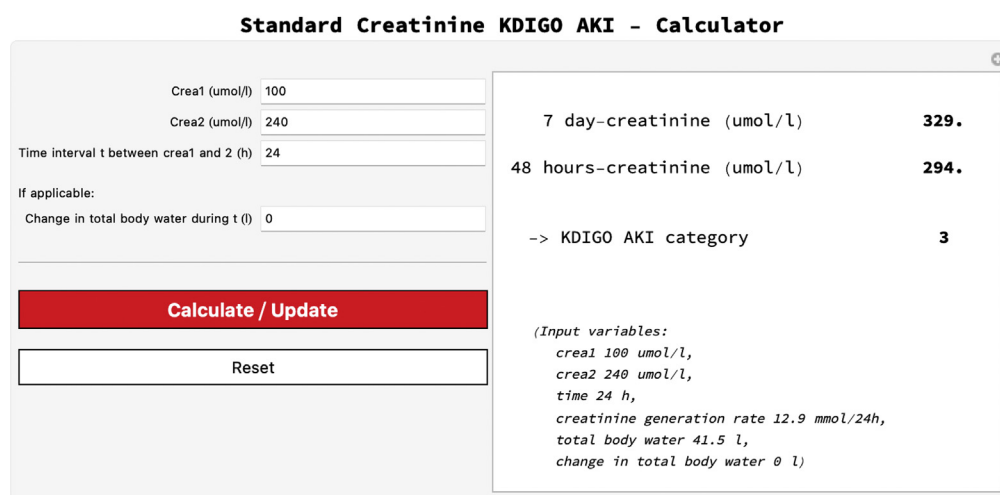


Figure 1. A screenshot of the calculator. A patient with a baseline creatinine value of 100 $\mu\text{mol/l}$ is categorized as having AKI stage 2 according to the creatinine of 240 $\mu\text{mol/l}$ measured at 24 hours. The predicted 7-day creatinine value of 329 $\mu\text{mol/l}$ reclassifies this patient as having AKI stage 3.

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3. Buchkremer F, Bock A, Segerer S. The non-steady state CKD-EPI calculator. *Clin Kidney J.* 2021.
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Received 28 March 2021; accepted 29 March 2021; published online 11 April 2021

Kidney Int Rep (2021) **6**, 1747–1748; <https://doi.org/10.1016/j.ekir.2021.03.896>

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