Evaluation and Use of Point-of-Care Creatinine for Detection of Acute Kidney Injury in Nigeria

To the Editor: Early detection and management of community-acquired acute kidney injury (CA-AKI) can reduce associated morbidity and mortality in low- and middle-income countries where infrastructure for laboratory tests is limited.[1]

We established a collaborative project between a UK and Nigerian renal center to investigate the use of point-of-care creatinine (POC Cr) for early identification of CA-AKI in Nigeria. Initial evaluation of the POC Cr technology had been conducted at Salford Royal Hospital.[2] Methods are presented in the Supplementary Methods. During the first stage of the study, the accuracy of POC Cr technology compared with standard laboratory assay (Jaffe) was evaluated in 96 concurrent capillary (POC Cr) and venous samples provided by adult patients attending for regular phlebotomy. Pearson correlation was $r = 0.956$ (Supplementary Figure S1), and Bland-Altman plot mean bias was 27.2 μmol/l (Figure 1a). The results of the evaluation phase were reviewed in an AKI workshop including 85 primary and secondary care physicians, and an algorithm was developed for the use of POC Cr, using an adjusted cutoff value for AKI diagnosis in clinically suspected CA-AKI (Figure 1b). The second stage of the study investigated the use of POC Cr in the emergency department in adult patients with clinically suspected CA-AKI based on this algorithm before expanding its use to community centers. Of 53 patients screened with POC Cr, 18 (36%) were diagnosed with having CA-AKI, 6 (11%) afforded blood tests, and 14 (26.4%) were self-discharged owing to lack of affordability. Patient characteristics are presented in Supplementary Table S1. With the emergence of the COVID-19 pandemic, the project was modified to include POC Cr for CA-AKI screening in the regional isolation centers irrespective of symptoms. Of 69 COVID-19–positive patients screened with POC Cr, 8 (11.6%) had AKI, and presence of AKI was associated with low oxygen saturation and history of hypertension. Patient characteristics are presented in Supplementary Table S2.

POC Cr can be used with adjustment as a screening tool for early detection of CA-AKI. However, its cost-effectiveness and clinical impact on outcomes as a triage screening tool in low-resource settings should be

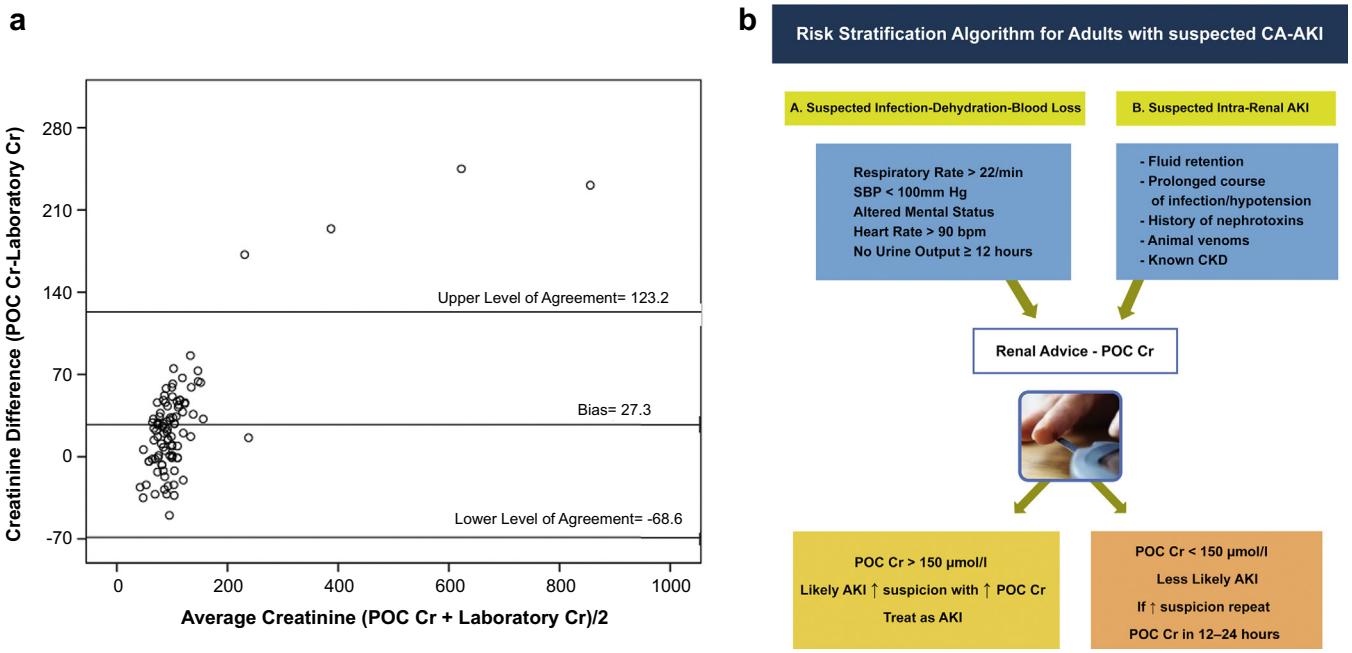

Figure 1. (a) Bland-Altman plot depicting graphical agreement between POC Cr and lab*oratory* Cr. (b) *Risk stratification algorithm for adults with suspected AKI.* Limits of agreement for Bland-Altman plot were set at mean ± 2 SD laboratory Cr-laboratory creatinine. POC Cr > 150 μmol/l was determined by the workshop as a cutoff of likely AKI (in the absence of known CKD) taking into consideration the upper normal limit of the laboratory assay (120 μmol/l) adjusted for the POC Cr mean bias 27.2 ± 47.94. CA-AKI, community-acquired acute kidney injury; CKD, chronic kidney disease; POC Cr, point-of-care creatinine; SBP, systolic blood pressure.

explored in prospective studies incorporating a minimum affordable bundle of AKI care.[3,4]

ACKNOWLEDGMENTS

The project was part of the Sister Center Programme supported by the ISN. Point-of-care creatinine devices were provided by the Salford Renal Department and consumables were provided free of charge by NOVA Biomedical. The Greater Manchester Strategic Clinical Network supported the evaluation of point-of-care creatinine technology at Salford Hospital.

SUPPLEMENTARY MATERIAL

Supplementary File (Word)

Supplementary Methods.

Figure S1. Scatter diagram showing the relationship between point-of-care creatinine and laboratory creatinine (a) for all samples and (b) for samples restricted to laboratory creatinine values $<$ 200 μmol/l.

Table S1. Characteristics of patients presented to the emergency department with clinically suspected community-acquired acute kidney injury by point-of-care creatinine values above and below 150 μmol/l.

Table S2. Characteristics of patients screened in the COVID-19 isolation centers by point-of-care creatinine values above and below 150 μmol/l.

1. Cerdá J, Mohan S, Garcia-Garcia G, et al. Acute kidney injury recognition in low- and middle-income countries. *Kidney Int Rep*. 2017;2:530–543. https://doi.org/10.1016/j.ekir.2017.04.009
2. Simpson S, Storrar J, Ritchie J, et al. Point-of-care creatinine to assist clinical decision making in suspected sepsis in the community. *Point Care J Near Patient Test Technol*. 2019;18:41–45. https://doi.org/10.1097/POC.0000000000000184
3. Mehta RL, Cerdá J, Burdmann EA, et al. International Society of Nephrology's 0by25 initiative for acute kidney injury (zero preventable deaths by 2025): a human rights case for nephrology. *Lancet*. 2015;385:2616–2643. https://doi.org/10.1016/S0140-6736(15)60126-X
4. Drain PK, Hyle EP, Noubary F, et al. Diagnostic point-of-care tests in resource-limited settings. *Lancet Infect Dis*. 2014;14:239–249. https://doi.org/10.1016/S1473-3099(13)70250-0

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Received 16 March 2022; accepted 21 March 2022; published online 26 March 2022

Kidney Int Rep (2022) **7,** 1439–1440; https://doi.org/10.1016/j.ekir.2022.03.022