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The predictive value of small short-term creatinine increases detected by arterial blood gases in critically ill patients

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Aim
New Arterial Blood Gas (ABG) technology provides accurate and validated point-of-care creatinine measurement. Such technology makes it possible to detect small, short-term increases in creatinine levels. We aimed to determine the predictive value of small, short-term creatinine increases for the development of Acute Kidney Injury (AKI) in critically ill patients.

Methods
In this prospective cohort study, we assessed all the creatinine values from ABGs and laboratory biochemistry results in critically ill patients. We calculated the small, short-term creatinine increases between creatinine values during the patient's Intensive Care Unit (ICU) admission until the development of KDIGO-defined AKI or ICU discharge or death, whichever occurred first. We evaluated the predictive value of these creatinine increases over varying time periods for AKI development in multivariable analysis with known risk factors such as age and co-morbidities.

Results
We screened a convenience sample of 830 patients and excluded 443 (53.4%) patients [AKI on admission (208; 47%), weekend admission (91; 21%) and other pre-defined exclusion criteria (144; 32%)]. The 387 (46.6%) eligible patients had 3,974 creatinine measurements on ABGs and biochemistry results, which generated 71,499 creatinine change episodes, excluding creatinine measurements after AKI development. In multivariable modelling, creatinine increases of ≥1 µmol/L/h over 6 to 7 hours had an odds ratio of 3.14 (95% CI 1.82 – 5.43) for the development of AKI in 8 to 16 hours after the creatinine increase. The multivariable model with these creatinine increases had an 81.5% sensitivity, 74.2% specificity and 0.85 area under the curve for AKI development in 8 to 16 hours.

Conclusion
In combination with known risk factors, frequent creatinine assessment to detect small, short-term creatinine increases provides a robust, novel and rapid method of predicting AKI in critically ill patients.