CRITICAL CARE

LETTER

Comparison of RIFLE with and without urine output criteria for acute kidney injury in critically ill patients: a task still not concluded!

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See related research by Wlodzimirow *et al.*, http://ccforum.com/content/16/5/R200

In a recent issue of *Critical Care*, we read with interest the article by Wlodzimirow and colleagues [1], who prospectively studied the Risk Injury Failure Loss End-stage renal disease (RIFLE) [2] classification with serum creatinine (SCr) and urine output (UO) ($RIFLE_{SCr+UO}$) and without UO criteria ($RIFLE_{SCr}$) for acute kidney injury (AKI) in 260 critically ill patients. $RIFLE_{SCr}$ significantly underestimated the presence of AKI on admission and during the first week in the intensive care unit and significantly delayed AKI diagnosis. Those are important findings that corroborate the utility of simultaneously using both criteria as proposed by the Acute Dialysis Quality Initiative workgroup [2]. The authors also found that $RIFLE_{SCr}$ was associated with higher mortality than $RIFLE_{SCr+UO}$. This observation should be interpreted with extreme caution, as this association has not been tested by multivariate analysis. Data regarding the impact on mortality of RIFLE defined by SCr and UO or by SCr are not conclusive. For example, in a systematic review, the relative risk for death among studies that used $RIFLE_{SCr+UO}$ was lower than in those using $RIFLE_{SCr}$ [3]. Previously, however, we did not find any difference in terms of mortality for $RIFLE_{SCr+UO}$ (Risk, odds ratio (OR) 2.69; Injury, OR 2.01; Failure, OR 3.59; AKI of any category, 2.78; area under the receiver operator characteristic (AUROC), 0.733) or for $RIFLE_{SCr}$ (Risk, OR 2.63; Injury, OR 2.12; Failure, OR 3.2; AKI of any category, 2.68; AUROC, 0.729) [4]. Therefore, prospective studies with a large number of patients are still needed to better determine the impact on mortality of RIFLE defined by SCr+UO criteria or by SCr criteria.

Authors' response

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We agree with Lopes and Jorge that multivariate analysis should be attempted when testing whether $RIFLE_{SCr}$ is associated with higher mortality than $RIFLE_{SCr+UO}$. Essentially the question is whether the group (hereafter G_1) of patients with AKI based on the $RIFLE_{SCr}$ criteria (regardless of UO) is at higher risk of death than the group (hereafter G_2) classified as having AKI based on the UO criteria only. Additional analysis, not reported in [1], shows that out of admission type, age, gender, weight, Acute Physiology and Chronic Health Evaluation (APACHE) score, Simplified Acute Physiology Score (SAPS), cardiopulmonary resuscitation, and length of stay, only SAPS was a confounder. Before adjustment for SAPS, patients in G_1 had 1.64 times the odds of dying than those in G_2. After adjustment for SAPS, the OR was reduced to 1.45 ($P = 0.0004$), still confirming our findings, which are in agreement with those of the other study [3].

The seeming contradiction between our findings and those of Lopes and colleagues [4] is easily explained by the significant differences in case mix. In our study, 48.6% of the $RIFLE_{SCr+UO}$ AKI patients were classified as having AKI on the basis of the UO criteria only [1] versus 5.6% in the study by Lopes and colleagues [4]. Differences in case mix may be attributable to the different inclusion criteria, the Modification of Diet in Renal Disease (MDRD)-based estimation of baseline SCr in all patients in the previous study [4], which may overestimate AKI based on SCr [5], and the outcome definition. All of these are important factors to consider when comparing studies.

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Abbreviations
AKI, acute kidney injury; AUROC, area under the receiver operator characteristic; OR, odds ratio; RIFLE, Risk Injury Failure Loss End-stage renal disease; $RIFLE_{SCr}$, RIFLE criteria based on the serum creatinine criteria only; $RIFLE_{SCr+OU}$, RIFLE criteria based on serum creatinine and urine output criteria; SAPS, Simplified Acute Physiology Score; SCr, serum creatinine; UO, urine output.

Competing interests
The authors declare that they have no competing interests.

Authors' contributions
JAL and SJ drafted the letter, revised it critically for important intellectual content, and gave final approval of the version to be published.

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