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Early prediction of sepsis-induced acute kidney injury

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Re: Song J, et al. Value of the combination of renal resistance index and central venous pressure in the early prediction of sepsis-induced acute kidney injury. ***J Crit Care*** 2018; 45:204-8.

Keywords: Sepsis; Acute kidney injury; Prediction

To the Editor

The recent article by Song and colleagues [1] assess the values of renal resistive index (RI), central venous pressure (CVP), and their combination in the early prediction of sepsis-induced acute kidney injury (AKI) in septic patients was of great interested. By the area under receiver operating characteristic curve (AUROC) analysis, they showed that the AUROC value for prediction of AKI incidence was bigger with a combination of RI and CVP (0.858) than that of either RI (0.811) or CVP (0.780). Thus, they conclude that a combination of RI and CVP is more valuable than either of the two parameters for early prediction for sepsis-induced AKI. The valuable research has been conducted, but some issues in their methodology seem important to avoid any optimistic interpretation or misinterpretation of their findings.

First, the multivariate analysis showed that a high CVP, a low diastolic perfusion pressure (DPP), a high renal RI, and septic shock at admission were the independent risk factors for sepsis-induced AKI. The odds ratio of septic shock at admission for sepsis-induced AKI was bigger than those of CVP, DPP and renal RI, but its predictive ability was not determined by the AUROC analysis. Furthermore, the readers were not provided the Harrell's concordance index (C-index) of each independent risk factor. The C-index is the number of patients who experience events within a classification threshold when compared to the number of patients who do not experience events within the same classification threshold. The predictive value of a risk factor is considered adequate when the C-index exceeds 0.7 and strong when the C-index exceeds 0.8 [2]. Because of these limitations, it was unclear whether septic shock at admission was more valuable than combination of RI and CVP for prediction of sepsis-induced AKI.

Second, by the AUROC analysis, the authors provided the AUROC values, optimal cut-off values, sensitivity and specificity of DPP, RI and CVP, but not their positive and negative predictive values. Thus, the readers cannot determine whether there are good overall agreements between predicted probabilities and observed frequencies in the development and

the validation sets when using these risk factors to predict the sepsis-induced AKI [3].

Third, in statistical analysis of method section, the authors described that the optimal cutoff values of each risk factor was calculated using the Youden index. In result section, however, the Youden index of each risk factor was not provided. It must be pointed that both AUROC and Youden index are the important diagnostic measures describing different aspects of a risk factor. A risk factor with large AUROC might have unsatisfactory overall correct classification rate at the optimal cut-off value, and vice versa. Youden index is very important not only because it provides the optimal cut-off value but also because it is a direct measure of the diagnostic accuracy at the optimal cut-off value, i.e., the maximum overall correct classification rate a risk factor can achieve [4].

Finally, as pathogenesis of sepsis-induced AKI is multiple factors [5], one single parameter predicting AKI is not accurate enough. However, the likelihood of sepsis-induced AKI will increase, if more risk factors are found in the same patient. Just like this study had shown, a combination of two risk factors provided an improved predictive value than alone use of them. A limitation of this study design is the lack of assessment on the predictive value a combination of more independent risk factors obtained in this study. As a result, an important question that remains unanswered is whether a combination of more risk factors can further improve predictive value for sepsis-induced AKI.

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Authors' Contributions

Hai-Jun Hou: This author had carefully read the manuscript of ***Song et al***, analyzed their methods and data, suggested comment points and drafted this manuscript. **Hai-Jun Hou** had seen and approved the final manuscript.

Fu-Shan Xue: This author had carefully read the manuscript of ***Song et al***, analyzed their methods and data, revised comment points and this manuscript, and is the author responsible for this manuscript. **Fu-Shan Xue** had seen and approved the final manuscript.

Rui-Juan Guo: This author had read the manuscript of ***Song et al***, and helped to analyze their methods and data, and revised the comment points and helped to write this manuscript. **Rui-Juan Guo** had seen and approved the final manuscript.

Li Zhang: This author had read the manuscript of ***Song et al***, and helped to analyze their methods and data, and reviewed this manuscript. **Li Zhang** had seen and approved the final manuscript.

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