Comparison of Severity Score Models Based on Different Sepsis Definitions to Predict In-hospital Mortality of Sepsis/septic Shock Patients in Medical Intensive Care Unit: A Retrospective Study

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Background: There are three generations of sepsis definition concepts: 1) Systemic Inflammatory Response Syndrome (SIRS), 2) Predisposition, Insult, Response, Organ dysfunction (PIRO), and 3) Sequential Organ Failure Assessment (SOFA). Nonetheless, performance between these concepts has never been compared.

Objective: To evaluate and compare performance between severity score models based on different sepsis definitions to predict in-hospital mortality among sepsis/septic shock patients admitted to a medical intensive care unit (ICU).

Methods: The electronic database of Songklanagarind Hospital’s medical ICU was reviewed over a 10-year period. Six different models (SIRS, 3 PIRO-based scores, SOFA, and qSOFA) were compared using receiver operating characteristics (ROC) curves for in-hospital mortality (a primary outcome) and death and ICU stay more than 72 hours (a composite secondary outcome). Subgroup analysis was also conducted to evaluate serum lactate’s effect to the performance of some scores.

Results: A total of 2,152 entries were identified. Hospital mortality was 45.9%. Mean APACHE-II score was 23.94 (S.D. 9.79). The Moreno’s PIRO and SOFA had the highest performance (AUC 0.835 and 0.828, respectively, p=0.426), and greater than other scores significantly (p<0.001 for all other comparisons), followed by qSOFA (AUC 0.792), Rubulotta’s PIRO (AUC 0.708), Howell’s PIRO (AUC 0.706), and SIRS (AUC 0.578). There was no difference between Moreno’s PIRO, SOFA, and qSOFA in secondary outcome analysis (AUC 0.775, 0.765, 0.760, respectively). In subgroup analysis (n=1,239), serum lactate value (more than 2 mmol/L) indicated the improvement of qSOFA specificity from 32.4% to 54.1% with comparable sensitivity (96.9% and 94.7%, respectively). Howell’s PIRO performance was not significantly changed. Variables associated with mortality were hematologic or solid malignancy, cirrhosis, hospital/ICU-acquired infection, and primary bacteremia.

Conclusion: Moreno’s PIRO and SOFA scores yield the best performance for the prediction of in-hospital mortality among ICU sepsis patients. Serum lactate > 2 mmol/L might improve qSOFA diagnostic specificity. Our findings support for Sepsis-3 using SOFA in ICU setting.

Keywords: Sepsis, Septic shock, Severity score in sepsis, SIRS, PIRO, SOFA, qSOFA