

Sepsis in Intensive Care Unit: Which Score Predicts Better about Outcome?

Anuj M Clerk¹

Received on: 15 September 2022; Accepted on: 15 September 2022; Published on: 30 September 2022

Keywords: Acute physiology and chronic health evaluation score, Mortality prediction, Sepsis, Sequential organ failure assessment score.
Indian Journal of Critical Care Medicine (2022): 10.5005/jp-journals-10071-24337

Sepsis and septic shock remain deadly diseases despite a better understanding of their pathogenesis. Virulence of micro-organisms and host response varies so widely that the septic patient population remains heterogeneous. This makes the development, application, and checking of the validity of any risk stratification scores in this population difficult and less than perfect at its best.

Severity scores are developed basically to evaluate the severity of illness in a group of patients so as to predict mortality and thus compare the delivery of care over a period of time in the same unit or between units. This provides an objective basis to note the change in outcome due to the new regime of treatment and proved very helpful in clinical trials and quality of care assessment cells of institutes. However, word of caution is advised as each score was developed in a subset of patients for example septic patients excluding cardiovascular surgery. The addition of new treatments such as ECMO, organ transplant, chemotherapy, and immunosuppressive therapy of connective tissue diseases puts additional challenge in risk stratification in the modern era. "How applicable a scoring system is" depends on whether these wide varieties of patient groups are represented well in the study population on which the score was developed. The exclusion of a type of patient, for example, tropical diseases, from this study population makes it less accurate for that subgroup of patients. Therefore, clinicians are advised to use any score-based mortality estimates in major clinical decisions for the individual patient, such as operate or not, intubate or not, end of life decisions, etc., with extreme caution.

As the understanding of sepsis improved and more biomarkers are developed, for example, biomarkers for AKI, heart failure, and ischemic brain injury, it made diagnosis and estimation of the progress of organ dysfunction more objective. This calls for a relook at the validity of pre-existing risk stratification scores in the estimation of mortality in septic patients. Acute physiology and chronic health evaluation (APACHE) is the oldest scoring system developed way back in 1981, which was based on 34 parameters that were further divided into scores for acute physiology and scores for pre-existing chronic health. The APACHE II score developed in 1985¹ reduced the total parameters to 12 but included AGE. The APACHE II score was measured at a fixed time frame (worst parameters of first 24 hours of hospital admission) with the worst value at 72. A score of 25 was equated with a mortality of 50% and a score of 50 with a mortality of

Department of Intensive Care, Sunshine Global Hospitals, Surat, Gujarat, India

Corresponding Author: Anuj M Clerk, Department of Intensive Care, Sunshine Global Hospitals, Surat, Gujarat, India, Phone: +91 7574851424, e-mail: anujmclerk@hotmail.com

How to cite this article: Clerk AM. Sepsis in Intensive Care Unit: Which Score Predicts Better about Outcome? *Indian J Crit Care Med* 2022;26(10):1072–1073.

Source of support: Nil

Conflict of interest: None

80%. This was the most popular one in those days and was widely used in a large number of clinical trials. The APACHE IV score is more exhaustive and uses 129 data points. This makes its use cumbersome unless data is extracted by software from electronic medical records. The APACHE IV score is more robust than its prior versions. The sequential organ failure assessment score (SOFA) score was developed originally only in a small cohort of 1449 patients admitted to 40 intensive care units (ICUs) in 16 countries for sequential organ failures in septic patients. Although it is endorsed by international societies such as SCCM and ESICM for risk stratification but experts caution clinicians for its use in diagnosis of sepsis, and treatment decisions in individual patients. The SOFA score does not bring out whether organ dysfunction is due to sepsis or other cause. Many more scores were introduced after that, namely, SOFA, SAPS, MODS, MPM, predisposition, insult, response, organ dysfunction (PIRO), etc., but the quest for a simple but comprehensive score for risk stratification continued.

Various scores were compared in a study by Dronamraju et al.² in this issue of *The Indian Journal of Critical Care Medicine* as a 2-year cross-sectional study at a rural teaching hospital in India. Scores used in this study for estimation of outcome in septic patients were SOFA, developed by Vincent et al.³ in 1996, APACHE IV by Zimmerman et al.⁴ in 2006, and PIRO by Rubulotta et al.⁵ in 2009. A total of 280 medical ICU patients were included over a period of 2 year and the scores were calculated in the first 24 hours of ICU admission and on day 3 with the primary aim to compare the PIRO score with the other two scores in predicting mortality in a prospective manner. The study population was skewed as 71% were male with an average age of 60 years. As a predictor of mortality on admission sensitivity and specificities of PIRO above 14 (98.3%; 78.4%) were found better than SOFA score above 9 (84.3%; 81.1%) and APACHE IV above 126

(82.6%; 77.4%) when compared on ROC curve. On day 3, PIRO score above 16 (Sn-94.4%; Sp-89.9%) was better predictor of mortality than SOFA score above 10 (Sn-84.3%; Sp-89.3%) and APACHE IV score above 132 (Sn-91.0%; Sp-84.3%). While we must appreciate the study group for compiling a large number of data points in a rural medical college setup but study over a short time frame of 2 years, on a small sample of only medical ICU patients is a limitation. Prior studies showed mixed results on the superiority of PIRO over other scores⁶⁻¹⁰ but the ease of calculation and inclusion of sound pathophysiologic points of the PIRO concept makes PIRO a strong contestant among other modern scores.

We need more studies like this from our country from various patient populations like all types of ICUs, rural and urban, government and private as sepsis is prevalent in all. The inclusion of our tropical sepsis in these data sets also needs emphasis due to its unique pathophysiology and higher prevalence in resource-limited settings. This, by no means, takes credit away from authors Dronamraju et al. for good methodical work to contribute to the body of literature on risk stratification of sepsis in Indian ICUs. In the end, I would repeat the word of caution to emphasize on avoiding the use of the mortality predicted from any of these scores in day-to-day clinical decisions and avoid using these numbers in counseling sessions as they are still far from perfect. These scores are for research purposes which indirectly guide the clinician in decision making at the bedside.

ORCID

Anuj M Clerk  <https://orcid.org/0000-0001-8944-0077>

REFERENCES

1. Knaus WA, Draper EA, Wagner DP, Zimmerman JE. APACHE II: A severity of disease classification system. *Crit Care Med* 1985;13: 818–829. PMID: 3928249.
2. Dronamraju S, Agrawal S, Kumar S, Acharya S, Gaidhane S, Wanjari A, et al. Comparison of PIRO, APACHE IV, and SOFA scores in predicting outcome in pPatients with sepsis admitted to intensive care unit: A two-year cross-sectional study at rural teaching hospital. *Indian J Crit Care Med* 2022;26(10):1099–1105.
3. Vincent JL, Moreno R, Takala J, Willatts S, de Mendonça A, Bruining H, et al. The SOFA (Sepsis-related Organ Failure Assessment) score to describe organ dysfunction/failure. On behalf of the Working Group on Sepsis-related Problems of the European Society of Intensive Care Medicine. *Intensive Care Med* 1996;22(7):707–710. DOI: 10.1007/BF01709751.
4. Zimmerman JE, Kramer AA, McNair DS, Malila FM. Acute physiology and chronic health evaluation (APACHE) IV: Hospital mortality assessment for today's critically ill patients. *Crit Care Med* 2006;34(5):1297–1310. DOI: 10.1097/01.CCM.0000215112.84523.F0.
5. Rubulotta F, Marshall JC, Ramsay G, Nelson D, Levy M, Williams M. Predisposition, insult/infection, response, and organ dysfunction: A new model for staging severe sepsis. *Crit Care Med* 2009;37(4): 1329–1335. DOI: 10.1097/CCM.0b013e31819d5db1.
6. Posadas-Calleja J, Stelfox H, Ferland A, Zuege D, Niven D, Berthiaume L, et al. Derivation of a PIRO score for prediction of mortality in surgical patients with intra-abdominal sepsis. *Am J Crit Care* 2018;27(4):287–294. DOI: 10.4037/ajcc2018576.
7. Macdonald SP, Arendts G, Fatovich DM, Brown SG. Comparison of PIRO, SOFA, and MEDS scores for predicting mortality in emergency department patients with severe sepsis and septic shock. *Acad Emerg Med* 2014;21(11):1257–1263. DOI: 10.1111/acem.12515.
8. Rathour S, Kumar S, Hadda V, Bhalla A, Sharma N, Varma S. PIRO concept: Staging of sepsis. *J Postgrad Med* 2015;61(4):235–242. DOI: 10.4103/0022-3859.166511.
9. Badrinath K, Shekhar M, Sreelakshmi M, Srinivasan M, Thunga G, Nair S, et al. Comparison of various severity assessment scoring systems in patients with sepsis in a tertiary care teaching hospital. *Indian J Crit Care Med* 2018;22(12):842–845. DOI: 10.4103/ijccm.IJCCM_322_18.
10. Vafaei A, Heydari K, Hashemi-Nazari SS, Izadi N, Zadeh HH. PIRO, SOFA and MEDS scores in predicting one-month mortality of sepsis patients: A diagnostic accuracy study. *Arch Acad Emerg Med* 2019;7(1):e59. PMID: 31875213.