

# Comparison of APACHE IV and SAPS II in Severe Sepsis and Septic Shock Patients

Vinod Raghavan<sup>1</sup>

<sup>1</sup>Assistant Professor, Department of Medicine, PK Das Institute of Medical Sciences, Vaniamkulam, Ottapalam, Kerala, India.

Received: November 2020

Accepted: December 2020

## ABSTRACT

**Background:** Severe sepsis and septic shock are major reasons for Intensive Care Unit (ICU) admissions and the leading causes of mortality in non-coronary ICUs. The present study was conducted to compare APACHE IV and SAPS II in severe sepsis and septic shock patients. **Methods:** 76 patients of both genders admitted to the ICU with severe sepsis and septic shock were recruited. Scoring system used was APACHE IV and SAPS II. **Results:** 61% of cases of CKD were in the age group between 20-79 years with approximately 63% being males. The most common Out of 76 patients, males were 46 and females were 30. Common conditions leading to sepsis were pneumonia in 14, tuberculosis in 7, COPD in 9, restrictive lung disease in 4, ARDS in 3, congestive cardiac failure in 2, rheumatic heart disease in 3, tetanus in 7, meningitis in 6, CNS sepsis in 6, hepatic sepsis-cirrhosis of liver in 5 and malignancy in 3 cases. The mean APACHE IV score was 96.4 and SAPS II was 67.2, predicted mortality rate with APACHE IV was 37.2%, actual mortality rate was 60.5% and standardised mortality rate was 1.54 and with SAPS II was 74.6%, 60.5 and 0.86 respectively. **Conclusion:** Both systems were comparable in assessing mortality rate in patients with severe sepsis.

**Keywords:** APACHE IV, SAPS II, Sepsis.

## INTRODUCTION

Severe sepsis and septic shock are major reasons for Intensive Care Unit (ICU) admissions and the leading causes of mortality in non-coronary ICUs. It is a systemic deleterious host response to infection. Sepsis can progress to severe sepsis and septic shock in no time with septic shock being the presence of hypotension in the setting of severe sepsis which is not corrected by fluid resuscitation.<sup>[1]</sup>

There is a lack of an agreed severity of illness scoring system for patients with sepsis. In the absence of such a system, it is difficult to interpret sepsis outcome studies. Mortality Prediction Systems have been introduced as tools for assessing the performance of ICUs.<sup>[2]</sup> Prognostic scoring systems have a number of applications. They help in individual patient outcome prediction by reducing uncertainty and provide an opportunity for improved decision making. Prognostic scoring systems can facilitate quality assessment of an individual ICU by allowing comparison of its overall performance to a large scale representative database.<sup>[3]</sup>

There are various scoring systems available for predicting the mortality and morbidity of patients. Acute Physiology and Chronic Health Evaluation (APACHE) IV and Simplified Acute Physiology Score (SAPS) II are among the frequently used

scores.<sup>[4]</sup> There have been very few studies in Indian ICUs over comparison of scoring systems. Being a resource-limited nation, it becomes imperative for us to know where to apply or resources to generate good outcomes.<sup>[5]</sup> The present study was conducted to compare APACHE IV and SAPS II in severe sepsis and septic shock patients.

## MATERIALS AND METHODS

The present study was conducted among 76 patients of both genders admitted to the ICU with severe sepsis and septic shock.

Demographic profile such as name, age, gender etc. was recorded. Parameters such as temperature, pulse rate, blood pressure, respiratory rate, haematocrit, total leucocyte count, serum blood urea nitrogen (BUN), serum creatinine, serum sodium etc. was estimated. Scoring system used was APACHE IV and SAPS II. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

## RESULTS

**Table 1: Distribution of patients**

Total- 76		
Gender	Males	Females
Number	46	30

[Table 1] shows that out of 76 patients, males were 46 and females were 30.

[Table 2 & Figure 1] shows that common conditions leading to sepsis were pneumonia in 14, tuberculosis in 7, COPD in 9, restrictive lung disease in 4, ARDS

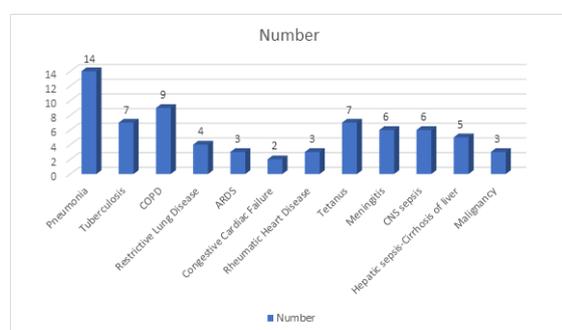
### Name & Address of Corresponding Author

Dr. Vinod Raghavan,  
Assistant Professor,  
Department of Medicine,  
PK Das Institute of Medical Sciences,  
Vaniamkulam, Ottapalam,  
Kerala, India.

in 3, congestive cardiac failure in 2, rheumatic heart disease in 3, tetanus in 7, meningitis in 6, CNS sepsis in 6, hepatic sepsis-cirrhosis of liver in 5 and malignancy in 3 cases. The difference was significant ( $P < 0.05$ ).

**Table 2: Diagnosis on admission**

Diagnosis	Number	P value
Pneumonia	14	0.04
Tuberculosis	7	
COPD	9	
Restrictive Lung Disease	4	
ARDS	3	
Congestive Cardiac Failure	2	
Rheumatic Heart Disease	3	
Tetanus	7	
Meningitis	6	
CNS sepsis	6	
Hepatic sepsis-Cirrhosis of liver	5	
Malignancy	3	



**Figure 1: Diagnosis on admission**

**Table 3: Comparison of mortality**

Variables	Mean score	Predicted Mortality Rate %	Actual Mortality Rate %	Standardised Mortality Rate
APACHE IV	96.4	37.2	60.5	1.54
SAPS II	67.2	74.6	60.5	0.86

[Table 3] shows that mean APACHE IV score was 96.4 and SAPS II was 67.2, predicted mortality rate with APACHE IV was 37.2%, actual mortality rate was 60.5% and standardised mortality rate was 1.54 and with SAPS II was 74.6%, 60.5 and 0.86 respectively.

## DISCUSSION

Sepsis is one of the leading causes of mortality among the patients admitted to the Intensive Care Unit (ICU).<sup>[6]</sup> Severe sepsis and septic shock are major health-care problems around the world killing one in four patients and increasing in the incidence every year. The reason for this may include an increase in elderly population, recognition of disease, performance of invasive procedures, immunosuppressive agents, and chronic diseases

such as end-stage renal disease. It has a major impact on health-care resources and expenditure.<sup>[7]</sup> Hence, the need arises for correct stratification and assessment of the risks, morbidity and mortality of the patients. This requirement has led to the development of scoring systems for predicting the mortality of patients admitted to ICU. The concept of scoring systems in ICU has been in practice for long.<sup>[8]</sup> They were introduced and brought into practice for stratification of the patients and correct allocation of resources. These scoring systems used the physiological variables of the patient to predict the requirement for ICU admission and also to predict the outcome.<sup>[9]</sup> The present study was conducted to compare APACHE IV and SAPS II in severe sepsis and septic shock patients.

In present study, out of 76 patients, males were 46 and females were 30. Singh et al.<sup>[10]</sup> compared the predictability of outcome with APACHE III and SAPS II score in ICU patients of sepsis, severe sepsis, and septic shock and the 28-day mortality. The mean APACHE III score in the survivor group was  $66.49 \pm 18.56$  as opposed to  $80.67 \pm 19.03$  for nonsurvivors. The mean SAPS II score for the survivor group was  $43.32 \pm 13.02$  as against the nonsurvivor group at  $51.92 \pm 12.34$ . The area under the ROC curve for APACHE III was 0.711 with 95% confidence interval as against 0.686 for SAPS II. The best cutoff value obtained for mortality prediction using the ROC curve was 69 for APACHE III while that for SAPS II was 49.

We found that common conditions leading to sepsis were pneumonia in 14, tuberculosis in 7, COPD in 9, restrictive lung disease in 4, ARDS in 3, congestive cardiac failure in 2, rheumatic heart disease in 3, tetanus in 7, meningitis in 6, CNS sepsis in 6, hepatic sepsis-cirrhosis of liver in 5 and malignancy in 3 cases. Dabhi et al.<sup>[11]</sup> calculated and compare APACHE-IV and SAPS-II Scoring Systems along with calculation of Standardised Mortality Rate (SMR) in patients of severe sepsis and septic shock in the ICU on 84 patients. Mean of Predicted Mortality Rate (PMR) for APACHE-IV was 37.85% and for SAPS-II, it was 72.36% which shows that APACHE-IV had under-predicted overall mortality while SAPS-II had over-predicted overall mortality of patients with severe sepsis and septic shock. Standardised Mortality Rate for APACHE-IV was 1.60 and for SAPS-II, it was 0.83.

We observed that mean APACHE IV score was 96.4 and SAPS II was 67.2, predicted mortality rate with APACHE IV was 37.2%, actual mortality rate was 60.5% and standardised mortality rate was 1.54 and with SAPS II was 74.6%, 60.5 and 0.86 respectively. Arabi et al.<sup>[12]</sup> conducted a study in a tertiary care medical/surgical Intensive Care Unit in Saudi Arabia to assess the validity of mortality prediction systems in patients admitted to the ICU with severe sepsis and septic shock. APACHE II and SAPS II scores were included in the study. Predicted and actual

mortality rates along with standardised mortality ratio were calculated. The study concluded that though general ICU mortality system models had accurate mortality prediction, they had poor calibration. However, customization of SAPS II improved calibration. The customized model may be a useful tool when evaluating outcomes in patients with sepsis.

## CONCLUSION

Authors found that both systems were comparable in assessing mortality rate in patients with severe sepsis.

## REFERENCES

1. Angus DC, Linde-Zwirble WT, Lidicker J, Clermont G, Carcillo J, Pinsky MR. Epidemiology of severe sepsis in the United States: analysis of incidence, outcome and associated costs of care. *Crit Care Med.* 2001;29:1303-10.
2. Angus DC, Wax RS. Epidemiology of sepsis: an update. *Crit Care Med.* 2001;29 (Suppl 7):S109-16.
3. Friedman G, Silva E, Vincent JL. Has the mortality of septic shock changed with time? *Crit Care Med.* 1998;26:2078-86.
4. Lemeshow S, Le Gall Jr. Modelling the severity of illness of ICU patients. *JAMA* 1994;272:1049-55.
5. Lemeshow S, Teres D, Klar J, Avrunin JS, Gehlbach SH, Rapoport J. Mortality Probability Models (MPM II) based on an international cohort of ICU patients. *JAMA.* 1993;270:2478-86.
6. Arabi Y, Haddad S, Goraj R, Al-Shimemeri A, Al-Malik S. Assessment of performance of four mortality prediction systems in a Saudi Arabian intensive care unit. *Crit Care.* 2002;6(2):166-74.
7. Robert S Munford. Severe Sepsis and Septic Shock. In: Kasper DL, Eugene Braunwald, Fauci AS, Hauser SL, Longo DL, Jameson JL, editors. *Harrison's Principles of Internal Medicine.* 16th Ed. New York: McGraw-Hill; 2005. p.1606-12.
8. Goldhill DR, Sumner A. Outcome of intensive care patients in a group of British Intensive Care Units. *Crit Care Med.* 1998;26:1337-45.
9. Moreno R, Morais P. Outcome prediction in intensive care: Results of a prospective, multicentre, Portuguese study. *Intensive Care Med.* 1997;23:177-86.
10. Singh P, Pathak S, Sharma RM. A comparison of acute physiology and chronic health evaluation III and simplified acute physiology score II in predicting sepsis outcome in Intensive Care Unit. *Anesth Essays Res* 2018;12:592-7.
11. Dabhi AS, Khedekar SS, Mehalingam V. A prospective study of comparison of APACHE-IV & SAPS-II scoring systems and calculation of standardised mortality rate in severe sepsis and septic shock patients. *Journal of clinical and diagnostic research: JCDR.* 2014 Oct;8(10):MC09.
12. Arabi Y, Al-Shirawi N, Memish Z, Venkatesh S, Al-Shimemeri A. Assessment of six mortality prediction models in patients admitted with severe sepsis and septic shock to the intensive care unit: a prospective cohort study. *Crit Care.* 2003;7(5):R116-22.

**Copyright:** © the author(s), 2020. It is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits authors to retain ownership of the copyright for their content, and allow anyone to download, reuse, reprint, modify, distribute and/or copy the content as long as the original authors and source are cited.

**How to cite this article:** Raghavan V. Comparison of APACHE IV and SAPS II in Severe Sepsis and Septic Shock Patients. *Ann. Int. Med. Den. Res.* 2021; 7(2):ME23-ME25.

**Source of Support:** Nil, **Conflict of Interest:** None declared