Utility of SOFA Score to Predict Outcome in Critically Ill Patients in Intensive Care Unit

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Abstract

Background: In intensive care unit (ICU), outcome prediction is essential for better management. The present study assessed utility of SOFA score to predict outcome in critically ill patients in intensive care unit. **Material and Methods:** 120 critically ill patients of both genders were enrolled. SOFA score was noted down at the time of admission and every 48 hours till discharge. The neurological status was assessed using Glasgow Coma Score Scale. The total SOFA score was the sum of all daily SOFA scores during the ICU stay and the mean score was the ratio of total score to the length of stay (LOS) in the ICU. The highest SOFA score was also noted. **Results:** Out of 120 patients, 72 were males and 48 were females. The mean LOS in ICU stay was 7.2 days. In 64 patients, indication for admission was medical and in 56 it was surgical. Mortality was seen in 26 patients. The difference was significant (P< 0.05). The mean SOFA score correlated most closely with mortality followed by the highest score and the initial score (P< 0.01). **Conclusion:** Both the mean and highest SOFA scores are particularly useful predictors of outcome in critically ill patients in intensive care units.

Keywords: Critical ill, intensive care unit, SOFA.

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Introduction

In intensive care unit (ICU), outcome prediction is essential for better management.[1] The performance of an individual ICU should also be the predictor of ICU performance and comparison of ICUs outcome must be done. Outcome prediction can also be useful in furnishing information on the likely patient outcomes to the relatives of critically ill patients and potentially for therapeutic decision making and guiding the allotment of resources.[2]

There are various outcome prediction models such as the Acute Physiology and Chronic Health Evaluation (APACHE), Simplified Acute Physiology Score (SAPS) and Mortality Probability Models (MPM) systems. They calculate a prediction on values taken within the first 24 hours of an ICU stay.[3] Most of the patients in ICU suffer organ dysfunction and hence the associated morbidity and mortality.[4] There is introduction of organ failure scores such as the Sequential Organ Failure Assessment (SOFA) scoring system which prove to be useful in determining an organ dysfunction or failure over time and assess the patient's morbidity.[5] The present study assessed utility of SOFA score in predicting the outcome in critically ill patients in intensive care unit.

Material and Methods

The present study comprised of 120 critically ill patients of both genders. A written consent from family members/relatives was obtained. The duration of the study was 6 months.

Patient particulars along with the clinical and laboratory findings were recorded. SOFA score was noted down at the time of admission and every 48 hours till discharge. In the calculation of the score, the worst values for each parameter in the 24-hour period were used. For a single missing value, a replacement was calculated from the mean of the sum of the results immediately preceding and following the missing value. The neurological status was assessed using Glasgow Coma Score Scale. The total SOFA score was the sum of all daily SOFA scores during the ICU stay and the mean score was the ratio of total score to the length of stay (LOS) in the ICU. The highest SOFA score was also noted. Results were analysed using chi- square test. P value <.05 was considered significant.

Results

Table 1: Demographics characteristics

Characteristics	Variables	Number	P value
Gender	Male	72	0.05

	Female	48	
Length of ICU stay (days)		7.2	
Admission indication	Medical	64	0.12
	Surgical	56	
Mortality	Number	26	-

[Table 1], [Figure 1] shows that out of 120 patients, 72 were males and 48 were females. The mean LOS in ICU stay was 7.2 days. In 64 patients, indication for admission was medical and in 56 it was surgical. The difference was non- significant (P> 0.05).
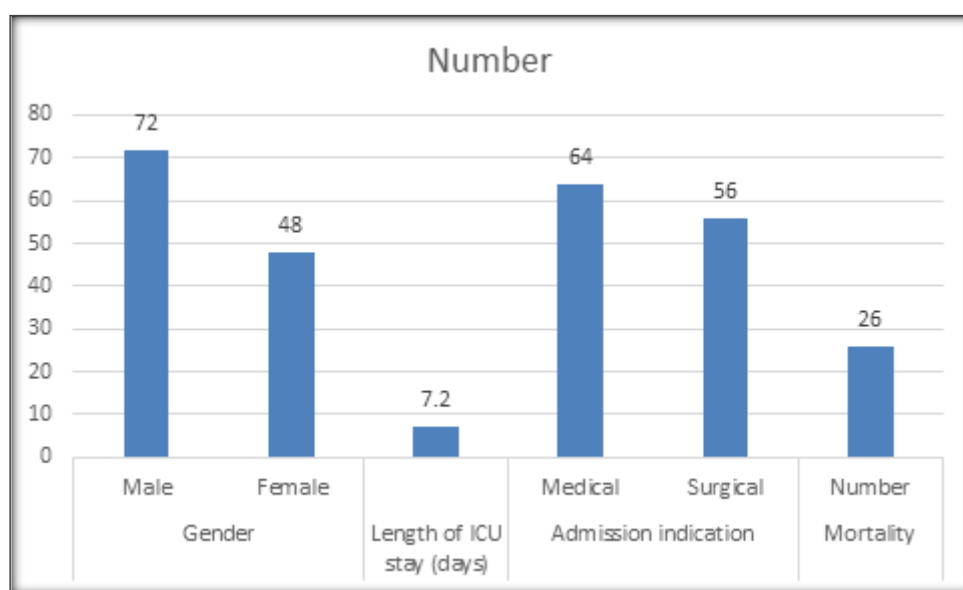

Figure 1: Demographics characteristics

Table 2: Assessment of Sequential Organ Failure Assessment (SOFA) Score

Parameters	SOFA				
	0	1	2	3	4
Respiratory Pao2/FIO2, mm Hg	>400	<400	<300	<200	<100
Liver Bilirubin, mg/dL	<1.2	1.2-2.0	2.0-6.1	6.2- 11.9	>12
Coagulation Platelets $\times 10^3/\mu L$	>150	<150	<100	<50	<20
Central nervous system	15	13-14	10-12	6-9	<6

Glasgow Coma Score Scale					
Renal Creatinine mg/dl	<1.2	1.3- 1.9	2.0-3.4	3.5-4.9	>5.0
Cardiovascular Hypotension	No hypotension	Mean Arterial pressure <70 mm Hg	Dopamine </= 5 or dobutamine (any dose)	Dopamine > 5	Dopamine > 15

[Table 3] shows SOFA scores in patients admitted to intensive care unit (ICU).

Table 3: Univariate Logistic Regression Analysis of Length of Stay and (SOFA) Derived Parameters as Predictors of Mortality

Variables	Coefficient	Odd ratio	P value
Mean SOFA score	0.47	3.08	<0.01
Highest SOFA score	1.14	1.60	<0.01
Initial SOFA score	0.38	1.46	<0.01
SOFA score at 48 hours	0.38	1.46	<0.01
SOFA score at 96 hours	0.34	1.40	<0.01
Length of stay	0.08	1.08	<0.01
Total SOFA score	0.05	1.06	<0.01

[Table 3] shows that the mean SOFA score correlated most closely with mortality followed by the highest score and the initial score (P< 0.01).

Discussion

In developing a scoring system, such as SOFA, for determining and monitoring organ dysfunction, several important features are essential to be addressed.[6,7] Organ failure is not an all-or-none phenomenon; rather, it is a continuum of alterations in organ function from normal function. It is documented that organ dysfunction is not static.[8] It will alter over time, and a scoring system needs to be able to take this time factor into account.[9] In using the SOFA for outcome prediction, the ability to perform serial SOFA scores allow more

effective representation of the dynamics of illness including the effects of therapy compared with traditional outcome prediction models at the time of ICU admission. Although some researchers have used the APACHE II score over time.[10,11] The present study assessed the utility of SOFA score in predicting the outcome in the critically ill patients in intensive care unit.

We found that out of 120 patients, 72 were males and 48 were females. The mean LOS in ICU stay was 7.2 days. In 64 patients, indication for ICU admission was medical and in 56 it was surgical. Ferriera et al,[12] studied three hundred fifty-two consecutive patients admitted to the ICU for more than 24 hours for whom the SOFA score was calculated on admission and every 48 hours until discharge. The initial, highest, and mean SOFA scores correlated well with mortality. Initial and highest scores of more than 11 or mean scores of more than 5 corresponded to mortality of more than 80%. The predictive value of the mean score was inversely proportional to the length of ICU stay. In univariate analysis, mean and highest SOFA scores had the strongest correlation with mortality, followed by Δ-SOFA (it was the difference between 48 hours SOFA score and admission score) and initial SOFA scores. When analyzing trends in the SOFA score during the first 96 hours, regardless of the initial score, the mortality rate was at least 50% when the score increased, 27% to 35% when it remained unchanged, and less than 27% when it decreased. Differences in mortality were better predicted in the first 48 hours than in the subsequent 48 hours. There was no significant difference in the length of stay among these groups. Except for initial scores of more than 11 (mortality rate >90%), a decreasing score during the first 48 hours was associated with a mortality rate of less than 6%, while an unchanged or increasing score was associated with a mortality rate of 37% when the initial score was 2 to 7 and 60% when the initial score was 8 to 11.

In our study mortality was seen in 26 patients. We observed that the mean SOFA score correlated most closely with mortality followed by the highest score and the initial score (P< 0.01). The mean SOFA score indicates the average degree of organ failure over -time and could also is a useful tool for stratifying patients in clinical trials, according to the total score or the scores for individual organs. The highest SOFA score can identify the critical point at which patients exhibit the highest degree of organ dysfunction during their ICU stay.

The SOFA score does not compete with the existing severity indexes, but complements them. Severity indices have been designed primarily to evaluate a risk of death from an initial evaluation, even though there has been a recent tendency to evaluate severity indexes

repeatedly to evaluate the time course of the disease. Most importantly, the existing severity indices do not allow evaluation of the individual organ function separately.[13]

Conclusion

Authors found that both the mean and highest SOFA scores are particularly useful predictors of outcome in critically ill patients in intensive care units.

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