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Original Article

Accuracy of SOFA score in prediction of 30-day outcome of critically ill patients



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ABSTRACT

Objectives: Researchers have attempted to design various scoring systems to determine the severity and predict the outcome of critically ill patients. The present study aimed to evaluate the accuracy of SOFA score in predicting 1-month outcome of these patients in emergency department.

Methods: The present study is a prospective cross-sectional study of >18 year old non-trauma critically ill patients presented to EDs of 3 hospitals, Tehran, Iran, during October 2014 to October 2015. Baseline characteristics, SOFA score variables, and 1-month outcome of patients were recorded and screening performance characteristics of the score were calculated using STATA 11 software.

Results: 140 patients with the mean age of 68.36 ± 18.62 years (18–95) were included (53.5% male). The most common complaints were decrease in level of consciousness (76.43%) and sepsis (60.0%), were the most frequent final diagnoses. Mean SOFA score of the patients was 7.13 ± 2.36 (minimum 2 and maximum 16). 72 (51.43%) patients died during the following 30 days and 16 (11.43%) patients were affected with multiple organ failure. Area under the ROC curve of SOFA score in predicting mortality of studied patients was 0.73 (95%CI: 0.65–0.81) (Fig. 2). Table 2 depicts screening performance characteristics of this scale in prediction of 1-month mortality in the best cut-off point of ≥ 7 . At this cut-off point, sensitivity and specificity of SOFA in predicting 1-month mortality were 75% and 63.23%, respectively.

Conclusion: Findings of the present study showed that SOFA scoring system has fair accuracy in predicting 1-month mortality of critically ill patients. However, until a more reliable scoring system is developed, SOFA might be useful for narrative prediction of patient outcome considering its acceptable likelihood ratios.

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1. Introduction

Emergency department (ED) is one of the most important hospital departments and the frontline of facing critically ill patients.¹ Emergency physicians constantly have to choose the most accurate therapeutic plan for the patients based on the severity and prognosis of the disease and deal with the worries of the patients'

relatives.² Therefore, having a correct criteria for prioritizing patients is of great importance for providing special care for critically ill patients and help reducing health and financial burdens of diseases.^{3,4} Since years ago, researchers have attempted to design various scoring systems to determine the severity of the disease and predict the outcome of patients.^{5–7} These systems have been successful in evaluating the efficacy of the diagnostic methods, pre and in-hospital triage, and finally improving the quality of therapeutic and preventive measures.^{8,9} In addition, scoring systems are capable of converting the severity of patient's disease to a number, which leads to a common understanding between the physicians and making the same decision. Sequential Organ Failure Assessment (SOFA) is one of the scoring systems used for assessing the

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severity of disease in critically ill patients and predicting their outcome.^{10,11} This system was introduced in 1996 and it performs based on evaluating the function of 6 vital organs of respiratory, coagulation, cardiovascular and circulatory, liver, central nervous system and renal. This tool is easy to use and evaluates the status of the mentioned organs systematically and continuously during hospitalization.¹² Studies have shown that SOFA score is able to provide valuable prognostic data regarding in-hospital mortality of septic patients.^{10,13} In addition, SOFA has been an acceptable and appropriate tool for classifying risk and predicting 14-day prognosis of cancer patients presented to ED.¹⁴ In Iran, due to shortage of intensive care unit (ICU) beds, a significant number of critically ill patients spend a portion of their hospitalization in ED. Responding to the patients' relatives regarding their outcome and choosing the best diagnostic and therapeutic plan for better outcome are common challenges of in charge emergency physicians. Therefore, taking the afore-mentioned points into account, the present study was designed aiming to evaluate the accuracy of SOFA scoring system in predicting 1-month outcome of non-trauma critically ill patients presented to ED.

2. Material and methods

2.1. Study design and setting

The present study is a prospective cross-sectional study, evaluating the diagnostic accuracy of SOFA scoring system in prediction of 30-day outcome of non-trauma critically ill patients presented to EDs of ... Hospitals, ... during 1 year from October 2014 to October 2015. The protocol of the study was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences. The patients were included in the study voluntarily and informed consent was obtained from them or their relatives. The researchers adhered to the principles of Helsinki Declaration throughout the study period.

2.2. Participants

Non-trauma critically ill patients over 18 years of age, who were willing to participate in the study were included, regardless of the cause. Patients referred from other hospitals or those whose clinical or laboratory data were not available were excluded.

2.3. Data gathering

Non-random convenience sampling was used. A checklist consisting of 3 parts: baseline characteristics (age, sex, chief complaint, symptoms on presentation, final diagnosis), data needed for calculation of SOFA score, and 1-month outcome of the patients was used for data gathering. Before data gathering, the senior emergency medicine resident performing the research was trained on filling the checklist and calculating SOFA score.

2.4. Calculation of SOFA score

The severity of the disorder in any of the 6 vital organs of respiratory, coagulation, cardiovascular and circulatory, liver, central nervous system and renal, were scored on a 0–4 scale based on definitions of SOFA scoring system. Calculation of the score for each organ has been summarized in [Appendix 1](#).¹² SOFA score was calculated based on data recorded in the initial 24 h of admission to ED.

2.5. Outcome

The final outcome of the patient included multiple organ failure or mortality, which were evaluated and recorded a month after hospitalization by calling patients or their relatives (in cases that were discharged) or visiting the department (in cases of remaining hospitalized). Finally, to calculate the predictive value of SOFA model for 1-month outcome of critically ill patients, the relationship between patients' SOFA score and final outcome was assessed.

2.6. Statistical analysis

Considering the 21% prevalence of mortality in critically ill patients¹⁰ and 95% confidence interval (CI) ($\alpha = 0.05$), sample size needed for the present study was estimated to be 131 patients. Finally, data were analyzed using STATA 11.0. Quantitative data were reported as mean \pm standard deviation (SD), and qualitative ones as frequency and percentage. To calculate the predictive value of SOFA scoring model in predicting 1-month outcome of critically ill patients, sensitivity, specificity, positive and negative predictive values, positive and negative likelihood ratios, and area under the receiver operating characteristic (ROC) curve were calculated with 95% CI.

3. Results

140 patients with the mean age of 68.36 ± 18.62 years (18–95) were entered (53.5% male). [Fig. 1](#) shows the final diagnosis of the patients. The most common complaints were drop in level of consciousness (76.43%), severe weakness (14.29%), and dyspnea (2.86%), respectively. Sepsis (60.0%), upper gastrointestinal bleeding (12.14%) and chronic obstructive pulmonary disease (6.43%) were the most frequent final diagnoses among patients, respectively. Mean and SD of the patients' SOFA score was 1.96 ± 1.0 for the respiratory system, 0.27 ± 0.64 for coagulation system, 1.01 ± 0.92 for cardiovascular system, 0.73 ± 0.86 for the hepatic system, 2.09 ± 0.84 for the central nervous system, and 1.07 ± 1.14 for renal system ([Table 1](#)). Mean overall SOFA score of the patients was 7.13 ± 2.36 (minimum 2 and maximum 16). 84.12% (117) of the patients had a score between 4 and 10. Finally, 72 (51.43%) patients died during 30 days and 16 (11.43%) patients were affected with multiple organ failure. These failures included 6 (4.29%) cases of renal failure, 1 (0.71%) case of cardiovascular failure and 9 (6.43%) cases of neurological impairment. Area under the ROC curve of SOFA score in predicting mortality of studied patients was 0.73 (95% CI: 0.65–0.81) ([Fig. 2](#)). [Table 2](#) depicts screening performance characteristics of this scale in prediction of 1-month mortality in the best cut-off point of ≥ 7 . As can be seen, at this cut-off point, sensitivity and specificity of SOFA in predicting 1-month mortality were 75% and 63.23%, respectively.

4. Discussion

The findings of the present study showed that SOFA scoring system has fair accuracy in predicting 1-month mortality of critically ill patients presenting to ED (area under the curve 0.73). On the best cut-off point, score ≥ 7 , sensitivity and specificity of this scale in predicting 1-month mortality were 75% and 63.23%, respectively.

SOFA scoring scale was designed aiming to develop an objective tool to evaluate single and multiple organ failure.¹² Functionality of this model for critically ill patients has been confirmed through cohort studies.^{15,16} Of course, these studies have been carried out on patients admitted to ICU. This scale has various characteristics that makes it applicable in ED as it is easy to calculate and can be easily

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