Original Research Article

SOFA scoring system in assessing prognosis of critically ill surgical and trauma patients: a prospective study

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ABSTRACT

Background: Major trauma, major surgery or sepsis include the bulk of Surgical patients who become critically ill. This relates to significant injury of a single organ system or anatomical part, or multiple injuries, often of varying severity, of different body parts good scoring or predicting system essentially clears this confusion. Predicting the patients' outcome depends on good scoring system. Scoring systems are composed of degrees of organ dysfunction, organ failure or multiple organ failures, and anatomical derangements which eventually contribute to morbidity and mortality. With the help of such evaluation system. A well-performing ICU prognostic model helps to make meaningful comparison of the hospital's current performance with the past. But present study focuses on mainly on SOFA score. Sequential organ failure assessment score.

Methods: Scoring systems in assessing prognosis of critically ill surgical and trauma patients - a prospective study was undertaken at MVJ Medical Hospital and Research Hospital, Bangalore after the approval from Ethics Committee. The study was carried out in the period of November 2016 to September 2017 and 50 patients were included in the study.

Results: Studies have shown that in the SOFA scores; cardiovascular, neurological, and respiratory, renal, haematological and hepatic dysfunctions were independent risk factors for mortality.

Conclusions: In this study, extensive study of SOFA score was done from day 1 to the last day. The SOFA score on day 1 was high among non-survivors and survivors which was statistically significant (9.33 v/s 6.62, p<0.001). Also, SOFA score showed significant increasing trend in the first week, especially on first 3 days, which signifies progressive organ dysfunction among non-survivors.

Keywords: Mortality, Scoring systems, SOFA score

INTRODUCTION

Major trauma, major surgery or sepsis include the bulk of Surgical patients who become critically ill. This relates to significant injury of a single organ system or anatomical part, or multiple injuries, often of varying severity, of different body parts.[1] cellular injury and organ dysfunction are almost similar in all three patient categories the pathophysiological processes are same and therefore the way that patients need support of critical organ function are same. Various clinical, biochemical and hematological parameters in these critically ill surgical patients serve as indicators of organ dysfunction and hence can be used to define the prognosis in a patient with sepsis. Patients admitted to the ICU need aggressive supportive management as well as detailed investigations to reverse the cause.[2] Early initiation of appropriate effective anti-microbial therapy is essential for a favorable outcome in the patient with sepsis.[3,4] There is evidence that failure to initiate appropriate therapy correlates with increased morbidity and mortality. Cultures and serology are available only after 24 to 48

hours. Clinical picture and investigations become the main crux of patient management in initial period of patient care.[2]

Good scoring or predicting system essentially clears this confusion. Predicting the patients' outcome depends on good scoring system.[5] Scoring systems are composed of degrees of organ dysfunction, organ failure or multiple organ failures, and anatomical derangements which eventually contribute to morbidity and mortality. With the help of such evaluation system, we will be able to distribute the limited resources to more suitable patients. There are many scorings widely used in the field of critical care medicine.[6,7] They allow a quantification of the severity of illness and a probability of in-hospital mortality. A well performing ICU prognostic model helps to make meaningful comparison of the hospital's current performance with the past. But present study focuses on mainly on SOFA score. Sequential organ failure assessment.

The aim of the present investigation was to determine the validity of the SOFA score (sequential organ failure assessment score) in predicting mortality in critically ill surgical and trauma patients treated in ICU.

METHODS

Application of SOFA (sequential organ failure assessment score) in was undertaken at MVJ Medical and Research Hospital, Bangalore after the approval from Ethics Committee. The study was carried out in the period of November 2016 to September 2017 and 50 patients were included in the study.

Inclusion criteria

- Patients who are critically ill including operated, non-operated and trauma cases admitted in ICU
- Informed written consent
- Age between 15 to 70 years
- Patients with critical surgical problems that includes operative, non-operative, surgical sepsis and with severe trauma.

Exclusion criteria

- Patients aged below 15 years and above 70 years
- Non-surgical patients, that is patients admitted in other departments
- Patients outside the ICU. Patients with stay less than 48 hours in ICU. Moribound and terminally ill patients with impending mortality within hours

The detailed history, clinical examination and all the relevant laboratory investigations were done including blood culture. In the present study, the conditions were defined according to standard practice and based on relevant literature.

All the surgical patients of who are critically ill admitted to ICU/ emergency ward are being prognosticated on the basis of SOFA score

SOFA (sequential organ failure assessment score) score is calculated on the day of admission. The predicted mortality rate was calculated on the basis of this score.

RESULTS

The study was carried out in the period of November 2016 to September 2017 and 50 patients were included in the study. In present study, subjects were in the age group of 15 to 70 years.

In present study, out of 50 cases of critically ill surgical patients, 28 were male and 22 were females. Co-morbidities observed were diabetes and hypertension.

Highest numbers of cases were seen in the age group of 61 to 70 years (26% of patients) fallowed by age group of 51 to 60 years (20 % of patients). Youngest patient in the study is 18 years old. Oldest patient is 70 years old. There were similar number of patients in 16%. 8 patients each in age group of 21-30 and 31-40. The mean age of the group was 48 years (Table 1).

Table 1: Age distribution among studied patients.

Age in years	Number of patients	%
15-20	02	4.0
21-30	08	16.0
31-40	08	16.0
41-50	09	18.0
51-60	10	20.0
61-70	13	26.0
Total	50	100.0

Mean ±SD:48.38±15.05

Table 2: Gender distribution of patients studied.

Gender	Number of patients	%
Male	28	56.0
Female	22	44.0
Total	50	100.0

In present study majority were males when compared to females. Male preponderance was found. Almost 56% amounting to 28 patients were males (Table 2).

Present study majority of patients were found to have hollow viscus perforation (18%), at the next being blunt trauma and diabetic foot with sepsis being 16%.

There were four patients each in obstructed umblicial hernia and acute pancreatitis amounting to 8 percent. 10% of patients had ileocecal tuberculosis. 3 patients reported with superior mesenteric artery thrombosis (Table 3).

27 patients amounting to 54% had no co morbidity and out of the patients who had morbidity 16 had diabetes mellitus which is 32% and 4 % had both diabetes and hypertension (Table 4).

Table 3: Distribution of diagnosis of patients studied.

Diagnosis	No. of patients (n=50)	%
Hollow viscous perforation	9	18.0
Appendicular abscess	3	6.0
Ileo caecal tuberculosis	5	10.0
Superior mesenteric artery thrombosis	3	6.0
Obstructed umbilical hernia	4	8.0
Acute pancreatitis	4	8.0
Ruptured liver abscess	3	6.0
Blunt trauma	8	16.0
Penetrating abdominal injury	3	6.0
Diabetic foot with sepsis	8	16.0

30 patients (60%) of them were operated where remaining 40 percent which is 20 patients were not operated (Table 5).

Table 4: Distribution of unknown co-morbidities.

Comorbidities	No. of patients (n=50)	%
Nil	27	54.0
Present	23	46.0
Diabetes	16	32.0
Hypertension	05	10.0
Both diabetes and hypertension	02	4.0

Table 5: Distribution of operated and non-operated patients in study group.

	No. of patients	%
Operated	30	60.0
Non-perated	20	40.0

Out of 50 patients, 4 patients (8%) had hypothermia and 34 patients (68%) had hyperthermia. 41 patients (82%) had tachycardia and 49 patients (98%) had Mean arterial pressure less than 70 mmhg. Among patients studied, 47 patients (94%) had tachypnoea (Table 6).

Out of 50 patients studied, 24 patients (48%) had hemoglobin less than 10gm/dl and 20 patients (40%) had hematocrit less than 30. 45 patients (90%) had total leukocyte count of more than 11,000 and 21 patients (42%) had platelet count less than 1.5 lakh (Table 7).

Out of 50 patients studied, 45 patients (90%) had hyponatrimia. 43 patients (86%) of patients had hypokalemia and 4 patients (8%) had hypokalemia.

Out of 50 patients studied, 36 patients (72%) had pH acedaemia (blood pH less than 7.35. Out of 50 patients studied, 44 patients (88%) had deranged renal function on admission.

Glasgow coma scale score was initially similar in both survivor and non-survivor group, but as day progressed, the GCS score among non-survivors declined significantly.

High APACHE II score among patients studied on admission to ICU, is significantly associated with high mortality rate (p<0.001**).

Table 6: Distribution of vital parameters.

	No. of patients (n=50)	%
Temperature (^{0} C)		
< 36	4	8.0
36 - 38	8	16.0
38 - 39	13	26.0
39 - 40	21	42.0
> 40	4	8.0
Pulse rate (bpm)		
<60	-	-
60-80	-	-
80-100	9	18.0
>100	41	82.0
Mean arterial pressure (mmHg)		
< 70	49	98.0
> 70	1	2.0
Respiratory rate (cpm)		
<20	3	6.0
20-40	47	94.0
>40	-	-

Table 7: Distribution of haematological parameters.

Haematological parameters	No. of patients (n=50)	%
Hemoglobin %		
<10	24	48.0
10 - 12	09	18.0
>12	17	34.0
Haematocrit		
<25	05	10.0
25 - 30	15	30.0
30 - 45	30	60.0
>45	00	00.0
TLC (/mm^3)		
<4000	00	00.0
4000 - 11000	05	10.0
>11000	45	90.0
Platelet count (L)		
<1.0	02	4.0
1.0- 1.5	19	38.0
>1.5	29	58.0

DISCUSSION

The clinical profile of 50 patients with critical surgical problems was studied. There were 28 males and 22 females in this cohort. The age of patients varied from 15 years to 70 years. The mean age was 48.38 years. Similar studies in India have shown male preponderance with most patients in the fourth to fifth decade. Even in present study, most patients were in fourth to fifth decade Among patients studied highest number of cases seen were trauma patients (including blunt and penetrating injuries) fallowed by hollow viscous perforation and diabetic foot with sepsis. Out of 50 patients studied, 30 patients required surgical intervention. Co morbidities were present in 23 patients. Among the several organ disorders encountered, acute kidney injury (AKI) is one of the most important because it is a life-threatening condition, increases the complexity and cost of care, and is an independent risk factor for mortality.[7,8]

The mean APACHE II score on the day of admission was 20.20 suggesting there was significant organ dysfunction in all patients. The mortality recorded in this study is 36%. In large clinical trials, the mortality associated with severe sepsis and septic shock ranges between 13% and 50%. Studies have shown that the Glasgow coma scale at admission is an independent predictor of mortality.[9,10] In present study, the mean GCS among survivors and non-survivors was statistically similar on day 1 (day 1, 14.06 v/s 14.59, p=0.710). However, GCS among non-survivors was significantly declined as day progressed.

In present study, mean serum creatinine was significantly high in non-survivor group as compared to survivor group (day 1, 3.97 v/s 2.57, p<0.001). Even mean serum bilirubin was significantly higher in non-survivor group as compared to survivor group (day 1, 3.49 v/s 2.07. p< 0.001), showing their significant association with mortality rate.

SOFA score has been validated extensively for prognostication. In present study, extensive study of SOFA score was done in first 24 hours of admission and every 48 hours. The SOFA score on day 1 was high among non-survivors and low among survivors which was statistically significant (9.33v/s 6.62, p<0.001). Also, SOFA score showed significant increasing trend in the first week, especially on first 3 days, which signifies progressive organ dysfunction among non-survivors.

This was similar to many studies that have been done. Vosylius et al in their study on 117 ICU patients with sepsis showed that the changes in the severity of organ dysfunction were closely related to the outcome of the patients admitted to ICU.[10] The SOFA score on day 3 was better compared with SOFA score on day 1 as the tool for outcome prediction.[10] Vincent et al in their study in 40 ICU's in 16 countries showed that the total SOFA score increased in 44% of the non- survivors but in only 20% of the survivors. Vosylius et al in Vilnius, Lithuania

observed that SOFA score on day 1 and day 3 was significantly higher in non-survivors than those in survivors.[10] Fereria et al in Belgium found initial SOFA score up to 9 predicted mortality of less than 33% while an initial SOFA score of greater than 11 predicted a mortality rate of 95%.[11]

Halim et al did a study to determine and compare the validity of the SOFA and MSOFA scores with the Acute Physiology and Chronic Health Evaluation II (APACHE II) score for predicting mortality in surgical patients treated in ICU.[8] This was a prospective observational cohort study involving consecutively 144 surgical patients (from January 2008 to December 2008). They concluded that SOFA and MSOFA scoring systems are better than APACHE II system in predicting mortality in ICU surgical patients. Serial measurements of SOFA and MSOFA score significantly improve their predictive accuracy.[11] Present study also showed, SOFA score is better than APACHE II score in predicting mortality rates among critical surgical patients, as it shows trend in progression of organ dysfunction.

Studies have shown that in the SOFA scores; cardiovascular, neurological, and respiratory, renal, haematological and hepatic dysfunctions were independent risk factors for mortality.[10] In present study, also the same have been observed.

Limitations of this study were a sample size of 50 patients this model requires external validation, the time of admission to ICU for each patient is different. Lead time bias is possible. Nosocomial complications and socio-economic constraints are difficult to model in studies. History of prior antibiotic usage could not be ascertained by history.

CONCLUSION

In this study, extensive study of SOFA score was done from day 1 to the last day. The SOFA score on day 1 was high among non-survivors and survivors which was statistically significant (9.33 v/s 6.62, p<0.001). Also, SOFA score showed significant increasing trend in the first week, especially on first 3 days, which signifies progressive organ dysfunction among non-survivors.

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