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ORIGINAL RESEARCH

Comparison of outcomes in sepsis cases by latest scoring systems (SOFA &qSOFA) for critically ill patients

[1]Dr. Pushpendra Singh Sengar, [2]Dr. Devpriya Shukla, [3]Dr. Ritesh Chauhan

[1]Senior Resident, [2]Assistant Professor, Department of Medicine, Bundelkhand Medical College, Sagar, M.P., India
[3]Ex PG student, Department of Medicine, Sri Aurobindo Institute of Medical Sciences, Indore, M.P., India

Correspondence:
Dr. Devpriya Shukla
Assistant Professor, Department of Medicine, Bundelkhand Medical College, Sagar, M.P., India
Email: devpriyashukla27@gmail.com

Abstract
Introduction: Hippocrates (460-370 BCE) originated the term sepsis, which is a Greek word. Sepsis was originally studied in contemporary times by IgnazSemmelwe is (1818-1865), a medical doctor from Austria-Hungary. The mortality of women in childbed due to puerperal fever was a regular complication during his time as an obstetrician at the Vienna General Hospital. He discovered that his department had the highest death rate, at roughly 18 percent.
Aims and objectives: To compare of outcomes in sepsis cases by latest scoring systems (SOFA &qSOFA) for critically ill patients.
Materials and methods: This was a prospective observational study conducted at Sri Aurobindo Institute of Medical Sciences and PGI, Indore on 100 patients.
RESULTS:-We also compared qSOFA score parameters between admission and 48 hours. At admission, RR was found higher in expired patients (29.63) compared to discharged patients (26.43). At 48 hours, same trend was seen. At admission, SBP was found higher in discharged patients (120.74) compared to expired patients (113.75). At 48 hours, same trend in SBP was noted. GCS was noted higher in discharged patients (11.78) compared to expired patients (9.78) at admission. Same trend at 48 hours was noted in GCS also.
Conclusion: At admission, it was found that patients who expired were having higher SOFA score compared to discharge. At admission, GCS in the expired patients found lesser compared to discharged patient. No significant difference was noted in bilirubin level at admission in discharged and expired patients .At admission, RR was found higher in expired patients compared to discharged patients. Majority of the patients did not require ventilator
Keywords: SOFA, qSOFA, sepsis

Introduction

Hippocrates(460-370BCE)originatedthetermsepsis,whichisaGreekword. Sepsis was originally studied in contemporary times by Ignaz Semmelwe is(1818-1865), a medical doctor from Austria-Hungary. The mortality of womenin childbed due to puerperal fever was a regular complication during his time as an obstetrician at the Vienna General Hospital. He discovered that his department had the highest death rate, at roughly 18 percent. Pregnant women were frequently examined immediately after a postmortem, as Semmelweis observed. Hand washing or the use of medical gloves were not common hygienic practises back then. "Decomposed animal materials that entered the circulatory system, "according to Semmelwe

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is, caused child bed fever[1].

During a consensus meeting in 1991, the then-prevailing idea that sepsis was caused by a host's Systemic inflammatory response syndrome(SIRS) to infection was the foundation for the first set of consensus definitions. The condition known as severe sepsis, which can lead to septic shock if organ dysfunction complicates sepsis, is also known as sepsis-induced hypotension that persists despite sufficient fluid replacement. Although a 2001 task force recognised the limits of these definitions, it did not propose any modificationsdue to a lack of evidence-based support. More than two decades later, the termssepsis, septicshock, and organ failure are still being used inter changeably.

Fig 1: SIRS(Systemic Inflammatory Response Syndrome)

The task team agreed that using two or more SIRS criteria to identify sepsis is ineffective. When the WBC count, temperature, and heart rate change, it signifies inflammation, which is the host body's response to "risk" such as infection or other trauma. If you meet the SIRS requirements, it doesn't necessarily indicate that your immune system is out of control and causing you harm. Many hospitalized patients meet the SIRS criteria, even if they never getsick or have any negative effects (poor discriminantvalidity). One in eight Australian and New Zealand patients admitted to intensive care units with infection and new organ failure lacked the required minimum of two SIRScriteria to meet the precise definition of sepsis (poor concurrent validity), yettheir illnesses lasted for an extended period of time and were accompanied with significant morbidity and mortality. The construct validity domains are discriminant validity and convergent validity, and the SIRS criteria fall short onboth counts[2,3].

Organ Dysfunction or organ Failure

Various scoring methods have been used to measure abnormalities based onclinical findings, test data, or treatment interventions to determine the gravity of organ malfunction. Inconsistency in reporting has resulted from the use of several grading systems. The Sequential Organ Failure Assessment (SOFA) isthe most often used score right now. Having a greater SOFA score is linked to agreater mortality rate. Each organ system is assigned a score that differentiates between normal and pathological conditions. However, for acomplete calculation, laboratory data such as PaO2, platelet count, creatinine level, andbilirubinlevelarerequired.Additionally,variablesandcutoffvalueswerechosenbyconsensus,andSOFAisalittle-knownacronymoutsideofthecritical care community. Other methods of assessing organ failure exist, such asthosebasedonstatisticalmodels, althoughnoneare widelyusedtoday.Nevertheless, his co-workers turned a blind eye to his hygiene efforts, and theytormented him until he fled the city. After around 15 years of research, hepublishedhisfindingsin1863underthetitle"Etiology,terminal,andprophylaxisofpuerperalfever".Later,Semmelweissuccumbedtoaninfectioninhiswound.Itwasveryunfortunatethathesuccumbedtothecondition he was researching. "Except on some occasions, majority of the timespatient appears to die from the body's response to infection rather than from it,"said

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William Osler, considered the father of modern American medicine in histreatise[4-6].
The qSOFA score, i.e., altered mental status, 100 mm Hg systolic blood pressure, or 22/min respiratory rate, can quickly identify patients with a suspected sepsis who will probably stay in the ICU for a long time or die in the hospital.Septic shock is a severe form of sepsis in which the circulatory and cellular/metabolic abnormalities are so severe that it significantly raises fatality rates.If a patient is in septic shock, they will have persistent hypotension, a sr. lactate level more than two millimol/L (18 milligrams/dL), require vasopressors to keep their blood pressure at 65 millimetres Hg, and a persistent clinical presentation of sepsis. Hospital mortality exceeds 40% when measured by these standards[7].

Aims and objectives

To identify and compare SOFA&qSOFA at baseline and after intervention at 48hours for critically ill patients.

Materials and methods

This was a prospective observational study conducted at Sri Aurobindo Institute of Medical Sciences and PGI, Indore on 100 patients with following inclusion and exclusion criteria:

Inclusion criteria

1. Patients above 18 years of age admitted to the ICU suspected to have sepsis.
2. Patients with SOFA score more than 2

Exclusion criteria

1. Patients who do not give consent
2. Age less than 18 years
3. Need for immediate surgery in critically ill patient.
4. Patients who have already received treatment for more than 48 hours in other center.

Statistical analysis

All the data analysis were performed using IBM SPSS ver. 20 software. Frequency distribution and cross tabulation was performed to prepare the tables. Quantitative data is expressed as mean and standard deviation whereas categorical data is expressed as percentage. Paired sample t test was used to compare the means. Chi Square test was used to compare the categorical data. ROC analysis for SOFA and qSOFA score also performed to obtain the area under the curve. P value of <0.05 is considered as significant.

Results

In the present study, we compared SOFA score between admission and at 48 hours and its association with outcome. At admission, it was found that patients who were expired (6.91) were having higher SOFA score compared to discharge (5.25). At 48 hours, same trend was seen in which higher SOFA score was noted in expired patients (10.91) compared to discharged patients (3.81). This difference was statistically significant (p<0.001).In discharged patients, lower SOFA score was seen at 48 hours (3.81) compared to admission (5.25). In expired patients, higher SOFA score was seen at 48 hours (10.91) compared to admission (6.91). This difference was statistically significant (p<0.001)as shown in **table-1**.

Table1: Comparing SOFA score between admission and 48hours

SOFA score	Outcome		Total	P value
	Discharged	Expired		
Admission	5.25	6.91	5.78	<0.001
48hours	3.81	10.91	6.08	
P value	<0.001	<0.001		

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We also compared qSOFA score between admission and at 48 hours and its association with outcome. At admission, it was found that patients who were expired (2.28) were having higher SOFA score compared to discharge (1.91). At 48 hours, same trend was seen in which higher qSOFA score was noted in expired patients (2.47) compared to discharged patients (1.28). This difference was statistically significant (p<0.001). In discharged patients, lower qSOFA score was seen at 48 hours (1.28) compared to admission (1.91). In expiredpatients, higher qSOFA score was seen at 48 hours (2.47) compared to admission (2.28). This difference was statistically significant (p<0.001)as shown in **table-2**.

Table 2: Comparing qSOFA score between admission and 48hours

qSOFA score	Outcome		Total	P value
	Discharged	Expired		
Admission	1.91±0.69	2.28±0.52	2.03±0.66	0.002
48Hours	1.28±0.84	2.47±0.67	1.66±0.97	<0.001
P value	0.001	<0.001		

We compared SOFA score parameters between admission and 48 hours. At admission, GCS in the expired patients (9.81) found lesser compared to discharged patient (11.81). At 48 hours, GCS was noted higher (13.22) in discharged patients compared to expired patients (6.47). At admission, MAP was found > 70 in the majority of discharged patients (55) compared to expired patients (22). At 48 hours, MAP was found >70 in the majority of discharged patients (61) compared to expired patients (9). At 48 hours, higher creatinine was noted in expired patients (2.40) compared to discharged patients (1.41). No significant difference was noted in bilirubin level at admission in discharged and expired patientsas shown in **table-3**.

We also compared qSOFA score parameters between admission and 48 hours. At admission, RR was found higher in expired patients (29.63) compared to discharged patients (26.43). At 48 hours, same trend was seen. At admission, SBP was found higher in discharged patients (120.74) compared to expired patients (113.75). At 48 hours, same trend in SBP was noted. GCS was noted higher in discharged patients (11.78) compared to expired patients (9.78) at admission. Same trend at 48 hours was noted in GCS also as shown in **table-4**.

Table3: Comparing SOFA score parameters between admission and 48hours

Parameters			Discharged	Expired	P value
GCS	Admission		11.81±2.66	9.81±1.96	0.001
	48Hours		13.22±2.34	6.47±2.85	<0.001
MAP	Admission	<70	2	3	0.032
		>70	55	22	
		N	11	7	
	48Hours	<70	1	0	0.022
		>70	61	9	
		N	6	23	
Platelet	Admission		2.58±1.45	2.82±1.74	0.482
	48Hours		2.97±1.59	2.92±1.52	0.566
Bilirubin	Admission		1.38±1.48	1.35±1.67	0.832
	48Hours		1.46±1.38	1.39±1.67	0.021
Creatinine	Admission		9.18±2.45	2.31±4.04	<0.001
	48Hours		1.41±1.56	2.40±2.67	<0.001
PAO2/FiO2	Admission		368.33	320.00	0.001
	48Hours		386.44	272.55	0.001

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Table4: Comparing qSOFA score parameters between admission and 48hours

Parameters		Outcome		P value
		Discharged	Expired	
RR ≥22	Admission	26.43±6.00	29.63±5.22	0.001
	48Hours	23.32±3.25	28.69±6.14	<0.001
SBP≤100mmHg	Admission	120.74±21.32	113.75±27.21	0.001
	48Hours	123.24±14.91	94.68±30.97	<0.001
GCS ≤15	Admission	11.78±2.61	9.78±1.98	0.001
	48Hours	13.22±2.34	6.47±2.85	<0.001

We compared requirement of ventilator among patients. Majority of the patients (68%) did not require ventilatoras shown in **table-5**.

Table5: Requirement of ventilator

Ventilator required	No. of patients	Percentage	P value
Yes	32	32	<0.001
No	68	68	

Discussion

Between admission and 48 hours, we compared SOFA score parameters. GCS (9.81) was lower in expired patients than in released patients when patients were admitted (11.81). GCS in released patients was found to be higher (13.22 points) than in expired patients after 48 hours (6.47). When compared to expired patients, the majority of discharged patients (55) had MAP levels more than 70mmHg at admission (22). Most released patients (61 of them) had MAP levels greater than 70 at 48 hours, whereas expired patients had MAP levels less than 50. (9). Patients who had passed away had a higher creatinine level (2.40) than those who had been discharged after 48 hours (1.41). The bilirubin levels in discharged and expired patients did not differ significantly at the time of admission[8,9].

Between the time of admission and 48 hours later, we compared the qSOFA score parameters again. Patients who had passed away had a greater RR (29.63) than those who had been released (26.43). The similar pattern persisted after 48 hours. Compared to expired patients, released patients had higher SBP (120.74) upon admission (113.75). SBP continued to rise after 48 hours in the same manner. At entrance, GCS was found to be higher in released patients (11.78) than expired patients (9.78). GCS showed the same pattern after 48 hours. We looked at how many people needed a ventilator and how much they needed it. The majority of patients (68 percent) didn't require the use of a ventilator during their hospital stay[10-12].

Over 1 million patients from 85 hospitals were studied by Anand et al., who used clinical and administrative patient data sets including microbiological lab results, medication information, and more. Patients with and without suspected sepsis were screened and prognosticated using qSOFA to better characterise the efficacy of qSOFA in identifying the presence of infection and sepsis. According to the research, the qSOFA sensitivity and positive predictive valueswere 41% and 31% for suspected infections, and 63% and 17% for sepsis, respectively.. Another third of sepsis patients had a negative qSOFA, as did one-quarter of all hospitalised patients[13,14].

There were 38 studies who had 385,000 participants included in Fernando et al's analysis of qSOFA's mortality accuracy. Additionally, they discovered that SIRS was more sensitive and specific than qSOFA, whereas SIRS was more sensitive and specific than qSOFA. Since qSOFA may function differently in the emergency department than the ICU, these studies combined and separated results based on hospital setting[15].

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All of the evidence from the Anand et al data analysis, numerous cohort studies, and large sample size meta-analyses shows that qSOFA is a poor prognostic tool and an ineffective and harmful screening tool: it can increase the number of patients who are mislabeled as "without sepsis"—despite the fact that they do have sepsis—and delay the initiation of antibiotics (the best available therapy to save patients with sepsis from dying); and it can leadThough qSOFA's discriminative ability has been previously reported to be better than SIRS's (0.81 for the qSOFA, and 0.76 for SIRS'), a recentretrospective study in multicenter ICUs has shown that the qSOFA score has a lower predictive ability for determining mortality than the SOFA score, with AUROCs of 0.75 and 0.60, respectively. It was shown by Baig MA et al that qSOFA score has superior discriminative capacity than SOFA score in determining mortality in our ED septic patients. If the patient has severe sepsis, then the accuracy of the cutoff AUROC for death prediction was greater for the qSOFA score (AUROC cutoff = 0.92) than for the SOFA score (AUROC cutoff= 0.63 with a 95% CI; 0.55-0.70, Sensitivity = 71%, Specificity= 57%). Patients with septic shock had a higher AUROC for mortality prediction when their QSOFA score was used (AUROC cutoff = 0.89 with a 95% CI; 0.85–0.92, Sensitivity: 92%, Specificity: 85%) rather than their SOFA score (AUROC cutoff = 0.63 with 95% CI; 0.55–0.70, Sensitivity: 70%, Specificity: 59%)[16].

Retrospective data study of 380,920 patients by Lo et al. revealed an AUCROC of 0.68 for the qSOFA score as a predictor of in-hospital mortality.In one study, Kovach et al. looked at hospital mortality in a retrospective data set of 3749 surgical and medical ICU patients with suspected infections, while Zhang et al. looked at 5109 cardiac surgical patients retrospectively, with both studies resulting in AUCROC > 0.8 for the prediction of mortality using SOFA and qSOFA ratings. In contrast to our strategy, Kovach's analysis included patients who were adjusted for a baseline risk factor for death, which improvedthe SOFA score's prognostic value, whereas Zhang et al. included only cardiac surgery patients[17].

Septic patients can be identified using well known techniques like qSOFA and SOFA scores, but in our study they failed to do so for every single group of patients. As previously mentioned, Krebs et al. found that the qSOFA and SOFA scores, along with the SIRS criteria, failed to accurately predict the emergence of new infections in a group of surgical trauma ICU patients. There has already been one case when the qSOFA score (and SIRS criteria) failed in a group of patients who visited the emergency room (n = 1045) outside of the ICU. The qSOFA score and the SIRS criterion did not have a high predictive potential in patients admitted to the emergency room, according to yet another large retrospective investigation[18].

Seymour, et al in Pittsburg, USA in 2016 conducted a study that found that SOFA was more accurate than qSOFA at predicting hospital mortality in critically ill patients, with an AUROC of 0.74 (95% CI 0.73-0.76) (95 percent CI, 064-0.68). A SOFA was shown to be superior to the QSOFA in another high-income country, Australia and New Zealand, where Raith, et al found that the AUROC for a SOFA was 0.753 (95 percent confidence interval, 0.750- 0.757), whereas the AUROC for the QSOFA was just 0.603-0.611[19].

Conclusion

At admission, it was found that patients who expired were having higher SOFA score compared to discharged. At 48 hours, same trend was seen in which higher SOFA score was noted in expired patients compared to discharged patients. This difference was statistically significant.

At admission, it was found that patients who expired were having higher SOFA score compared to discharge. At admission, GCS in the expired patients found lesser compared to discharged patient. No significant difference was noted in bilirubin level at admission in discharged and expired patients.At admission, RR was found higher in expired patients compared to discharged patients. Majority of the patients did not require ventilator.

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