VOLUME - 10, ISSUE - 08, AUGUST- 2021 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Anaesthesiology

EVALUATION OF QUICK SEQUENTIAL ORGAN FAILURE ASSESSMENT (QSOFA) IN PREDICTING MORTALITY IN INTENSIVE CARE UNIT

Dr. Sharon Linnet	MD Senior resident, Department of Anaesthesiology and Critical care Sri Venkateswara Institute of Medical Sciences Tirupati: 517507.Andhra Pradesh. India.
Dr. Shameem Sunkesula	MD PDF Critical Care Assistant Professor Department of Anaesthesiology and Critical care Sri Venkateswara Institute of Medical Sciences Tirupati: 517507.Andhra Pradesh. INDIA.
Dr. Aloka Samantaray*	MD PDCC, Professor and Head Department of Anaesthesiology and Critical care Sri Venkateswara Institute of Medical Sciences Tirupati: 517507. Andhra Pradesh. INDIA.*Corresponding Author
Dr. M.Hanumantha Rao	MD FICA, Former Senior Professor Department of Anaesthesiology and Critical care Sri Venkateswara Institute of Medical Sciences Tirupati: 517507.Andhra Pradesh. INDIA.

ABSTRACT

Background and objectives : Quick Sequential Organ Faiure Assessment(qSOFA) score, is a cost effective tool for bedside prognoses. Any change in qSOFA scores after an initial resuscitative phase may point towards improvement or deterioration in patient prognosis. This study was conducted to evaluate the effect of difference in qSOFA scores (deltaqSOFA) on patient outcome in terms of mortality and length of Intensive Care Unit (ICU) stay

Methods: Our study is a single centre, prospective, observational study. qSOFA score was noted within 24 hrs of admission to ICU and subsequently 48 hrs later. The difference between these two values was taken as deltaqSOFA. Patients were followed till death or discharge or transfer from the ICU to other ward. The outcomes measured include mortality and duration of ICU stay.

Results: Of the 114 patients included in our study 89 survived and 25 expired . The mean age of the patients was 41 years. The duration of ICU stay was comparable between survivors and nonsurvivors .The day 1 and day 3 q SOFA for survivors were significantly less compared to nonsurvivors. The mean deltaqSOFA score among survivors (0.4) was also lower than that among the nonsurvivors (0.5) but did not reach any statistical significance (p=0.400).The Receiver Operating Characteristic curves (ROCcurve) shows highest discriminatory power for mortality prediction with initial qSOFA and least with delta qSOFA.

Conclusions: The delta qSOFA is not superior to initial qSOFA in predicting the mortality in ICU.

KEYWORDS : Intensive care unit , in -hospital mortality, Quick Sequential Organ Faiure Assessment

INTRODUCTION

Quick Sequential Organ Faiure Assessment(qSOFA),was presented in the Sepsis3 as a new cost effective tool for bedside prognoses[1] . The parameters included in qSOFA score like Glasgow Coma Scale score(GCS),Respiratory rate, SystolicBP have been shown to be useful in predicting mortality as individual variables.The most widely used neurological score to predict mortality is GCS ,assessing eye movements, verbal response, motor response [2] .When mortality and morbidity from cardiovascular diseases are considered, SBP becomes the prime risk factor [3] Persistent tachypnea is associated with an increased risk of mortality in patients admitted in hospital [4]

The qSOFA score at admission was not superior in predicting in-hospital mortality [5] .It was observed by Kievlan et al that patients with high qSOFA score at the end of 48 hrs after admission had high in-hospital mortality rate compared to the patients without an increase in their qSOFA scores. [6]

It would be logical to assume that any change in qSOFA scores after an initial resuscitative phase may point towards improvement or detorioration in patient prognosis. In the current study we presume that re-evaluation of qSOFA after 48hrs of planned management protocol will alter the patient outcome . Hence we have undertaken this study to determine the effect of difference in qSOFA on patient outcome in terms of mortality and length of ICU stay.

MATERIALS AND METHODS

This single centre prospective observational study was approved by the Institutional Ethical Committee . A written informed consent was obtained from all study participants.

All patients of age more than 18 years of either gender presenting to emergency department and subsequently admitted in ICU were screened for participation in the study. The only exclusion criteria applied was patient or patient attendants not willing for the study. Patients who did not survive beyond 24 hours were also excluded from the study analysis.

Sample size was estimated with an aim to detect a 50% change in mortality outcome for the mean change in day1 and day 3 qSOFA score (delta qSOFA) . Cohens'd method was used where a moderate effect was indicated by d= 0.5(approximately), whereas low effect was indexed by d= 0.2 and high effect with d= 0.8.The minimum sample size required for one sample paired comparison is found by using d= 0.5, power= 80% and alpha = 0.05 for two tailed comparison, this gives n=51.

A thorough detailed history including current medications and allergies were obtained from the study participants. The subsequent treatment plan was laid out based on available history clinical examination and relevant laboratory investigation reports.

The qSOFA score ranges from zero to three points ,given zero or one for each of the clinical variables, respiratory rate (RR) >22 breaths/min, Glasgow Coma Scale (GCS) < 15 and systolic blood pressure <100 mm Hg. In all study participants a baseline qSOFA score was obtained in first 6 hrs after

admission to ICU and subsequently 48 hrs after obtaining the first qSOFA score. Patients were followed till discharge or death or transfer from the ICU to other ward after stabilization.

The primary outcome of the study was patient outcome in terms of mortality and the duration of ICU stay. The duration of ICU stay is defined as number of days from the date of admission to date of discharge to home or transfer to secondary level care or death of the patient in ICU. The difference between the first and second qSOFA scores were recorded to correlate with the patient outcome. All patients were given standard care as appropriate for the diagnosed disease as per currently recommended clinical studies.

STATISTICAL ANALYSIS

All categorical variables were summarized as number and percent. All continuous variables were summarized as mean and standard deviation. Comparison between mean values was done by paired students t test or Wilcoxon test according as data follows normal distribution or not. Comparison between categorical variables was done by Chi square test or Fisher's exact test .Results were displayed by suitable graphs and results having $p < 0.05$ was considered as significant. All calculations were performed using Excel, SPSS 20.0 and Med Cal

RESULTS

Total of 116 patients were included in the study ,of which two patients were excluded because they died within 24 hours of their admission in the intensive care unit and it was not possible to obtain the second qSOFA score value to find out the delta qSOFA score required for our study. Therefore data of 114 patients were analysed and results were interpreted

Our study cohort has a male preponderance (71 males and 43 were females).The majority of the admissions to our ICU were because of medical illness and only four patients in each group admitted for surgical reason or as a result of peripartum complication. The mean age of the patients was 41 year and the mean duration of ICU stay was 12 days among survivors and 15 days among nonsurvivors. In total 63% cases needed invasive mechanical ventilation (n=73) of which 52 patients survived to discharge. The duration of ICU stay was comparable between survivors and nonsurvivors (12.49 ±9.9 versus 16.4 ±14.9; p=0.390).The overall mortality rate was 22 %.(Table 1)

Table 1 : Patient characteristics stratified by survivability

Patient variable	Survivors	Nonsurvivors	p value
Age (years)	42.28	38.4	0.202
Gender Male/female (n)	56/33	15/10	0.480
Mechanical ventilation yes/no(n)	52/37	20/5	0.610
Length of icu stay (days)	12.49 (9.92)	14.64(14.91)	0.390
Indication for admission medical/surgical/obstetrics	85/2/2	21/2/2	0.240

The day1 and day3 qSOFA for survivors are significantly less compared to non survivors. The mean delta qSOFA score among survivors (0.4) is also lesser than that among the nonsurvivors (0.5) but did not reach any statistical significance (p value 0.40).(Table 2)

Table 2: comparison of mean D1 qSOFA mean D3 qSOFA score and Delta qSOFA between survivors and non survivors

Outcome parameter	Mean ± SD		p value
	Survivors	Non-survivors	
Mean D1 qSOFA	1.0 ±0.75	1.4± 0.70	0.005
Mean D3 qSOFA	0.8± 0.69	1.1± 0.52	0.020
Mean Delta qSOFA	0.4 ±0.53	0.5± 0.58	0.400

The Receiver Operating Characteristic curves (ROC curve) shows highest discriminatory power for mortality prediction with area under the curve 0.676 (95% Confidence intervals=0.553-0.799) for day1 followed by day2 and least with delta qSOFA. (AUROC: 0.546;95% Confidence intervals=0.416-0.675(Table 3).

Table3 : Discriminatory power of scores

	AUC	SE	95%CI	p value
D1 qSOFA	0.676	0.063	0.553-0.799	0.007
D3 qSOFA	0.641	0.057	0.530-0.752	0.032
Delta qSOFA	0.546	0.066	0.416-0.675	0.485

AUC : area under curve , SE: standard error, CI : confidence interval.

DISCUSSION

Investigators across the world use SOFA score to determine the level of organ dysfunction and mortality risk in ICU patients. Ever since the introduction of qSOFA score in The Third Surving Sepsis Campaign, numerous attempts were made to assess the performance of q SOFA as a prognostic tool.[7] The ICU care in India is going through rapid transformation with addition of new equipments and laboratory investigations. Thus it appears reasonably logical to assess and reassess the ICU scoring systems periodically to validate the previous findings in different diseases and ICU setup.

The major observations made in our study was delta qSOFA is not superior to day 1 qSOFA in predicting the mortality.

In a study conducted by Seymour et al [1] they found that a qSOFA score of more than or equal to 2 had same predictive capability as that of a complete SOFA score which is time consuming and requires resource utilisation in contrast to the q SOFA score which is a clinical assessment score

Ferreira et al [8] did serial estimation of SOFA in 252 consecutive patients in ICU and observed a 50% increase in SOFA score over 48hrs and this was independent of the initial score

Renata García-Gigorro and collegues took the difference of SOFA between ICU admission and EMD admission and concluded that delta SOFA are potentially useful tools for risk stratification [9] . A similar finding made by other investigators is any increase in in-hospital qSOFA over pre hospital qSOFA increase the mortality risk by 2-4 folds.[10]

In contrast we have over simplified the original SOFA score (0-24) based on evaluation of six organ function to a score of 0-3 based on evaluation of only three components; systolic blood pressure, Glasgow coma scale (GCS) and respiratory rate. Our result did not find delta qSOFA (differences between day1 and day3 qSOFA score) as good predictor of mortality.

The reason for the difference in result could be many. The organ systems failures that might contribute to mortality such as renal failure, liver failure ,coagulopathy were not assessed while calculating qSOFA score. When patients present with failure of above mentioned systems their qSOFA score might be normal but their prognosis may be poor. Therefore this reduces the predictive capability of the score for mortality. Also other metabolic derangements that the patient undergoes during the ICU stay are not picked up effectively.

In one of the largest conducted trial Mathew M Churpke et al [11] not only concluded that qSOFA is inferior to general early warning to predict mortality but also opined that one need to repeat qSOFA estimation after initiation of targeted therapy for early detection of disease progress.

Our study is in line with a single-centre study from Japan where mean Day1 and Day3 qSOFA are significantly different between survivors and nonsurvivors (Table2)[12]

While looking into the individual components of qSOFA we observed that the admission SBP but not the day3 SBP is significantly lower among nonsurvivors compared to survivors, a finding similar to the Japaneese study[12] The admission RR among survivors is significantly lower than among nonsurvivors the same is observed in a Chinese study [13]However the mean GCS was significantly less on both day1 and day3 among nonsurvivors compared to survivors in our study which implies that the intended intervention was not sufficient to bring any improvement in GCS over 48hrs which was also observed by a Japanese study [14]

Though the mean delta qSOFA score among survivors is lower than that among non survivors, there was no statistical significance between the two.

Our study is in accordance with other investigators who have reported a highest discrminatory power for day1 qSOFA [10] and lower discrminatory power for day3 qSOFA [15]

CONCLUSIONS

Based on our observations we conclude that the delta qSOFA is not superior to initial qSOFA in predicting the mortality in ICU.

REFERENCES

1. Seymour, C. W., Liu, V. X., Iwashyna, T. J., Brunkhorst, F. M., Rea, T. D., Scherag, A., ... & Angus, D. C. (2016). Assessment of clinical criteria for sepsis: for the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). Jama, 315(8), 762-774.
2. Teasdale, G., & Jennett, B. (1974). Assessment of coma and impaired consciousness: a practical scale. The Lancet, 304(7872), 81-84
3. Dyer, A. R. (1975). An analysis of the relationship of systolic blood pressure, serum cholesterol, and smoking to 14-year mortality in the Chicago Peoples Gas Company Study—II. Coronary and cardiovascular-renal mortality in two competing risk models. Journal of chronic diseases, 28(11-12), 571-578.
4. Puskarich, M. A., Nandi, U., Long, B. G., & Jones, A. E. (2017). Association between persistent tachycardia and tachypnea and in-hospital mortality among non-hypotensive emergency department patients admitted to the hospital. Clinical and experimental emergency medicine, 4(1), 2.
5. Kelly, B., Patlak, J., Shaefi, S., Boone, D., Mueller, A., & Talmor, D. (2020). Evaluation of qSOFA as a Predictor of Mortality Among ICU Patients With Positive Clinical Cultures—A Retrospective Cohort Study. Journal of intensive care medicine, 35(11), 1278-1284.
6. Kievlan, D. R., Zhang, L. A., Chang, C. C. H., Angus, D. C., & Seymour, C. W. (2018). Evaluation of repeated qSOFA measurements among patients with suspected infection. Critical care medicine, 46(12), 1906.,
7. Baig MA, Sheikh S, Hussain E, et al. Comparison of qSOFA and SOFA score for predicting mortality in severe sepsis and septic shock patients in the emergency department of a low middle income country. Turk J Emerg Med. 2018;18(4):148-151.
8. Ferreira, F. L., Bota, D. P., Bross, A., Mélot, C., & Vincent, J. L. (2001). Serial evaluation of the SOFA score to predict outcome in critically ill patients. Jama, 286(14), 1754-1758.
9. García-Gigorro, R., Sáez-de la Fuente, I., Marín Mateos, H., Andrés-Esteban, E. M., Sanchez-Izquierdo, J. A., & Montejo-González, J. C. (2018). Utility of SOFA and -SOFA scores for predicting outcome in critically ill patients from the emergency department. European Journal of Emergency Medicine, 25(6), 387-393.
10. Miyamoto, K., Shibata, N., Ogawa, A., Nakashima, T., & Kato, S. (2020). Prehospital and in‐hospital quick Sequential Organ Failure Assessment (qSOFA) scores to predict in‐hospital mortality among trauma patients: an analysis of nationwide registry data. Acute Medicine & Surgery, 7(1), e532.
11. Churpek, M. M., Snyder, A., Han, X., Sokol, S., Pettit, N., Howell, M. D., & Edelson, D. P. (2017). Quick sepsis-related organ failure assessment, systemic inflammatory response syndrome, and early warning scores for detecting clinical deterioration in infected patients outside the intensive care unit. American journal of respiratory and critical care medicine, 195(7), 906-911.
12. Van der Woude, S. W., van Doormaal, F. F., Hutten, B. A., Nellen, F. J., & Holleman, F. (2018). Classifying sepsis patients in the emergency department using SIRS, qSOFA or MEWS. Neth J Med, 76(4), 158-166.
13. Liu, S., Yao, N., Qiu, Y., & He, C. (2020). Predictive performance of SOFA and qSOFA for in-hospital mortality in severe novel coronavirus disease. The American Journal of Emergency Medicine, 38(10), 2074-2080.
14. Raith, E. P., Udy, A. A., Bailey, M., McGloughlin, S., MacIsaac, C., Bellomo, R., & Pilcher, D. V. (2017). Prognostic accuracy of the SOFA score, SIRS criteria, and qSOFA score for in-hospital mortality among adults with suspected infection admitted to the intensive care unit. Jama, 317(3), 290-300.
15. Hwang, S. Y., Jo, I. J., Lee, S. U., Lee, T. R., Yoon, H., Cha, W. C., ... & Shin, T. G. (2018). Low accuracy of positive qSOFA criteria for predicting 28-day mortality in critically ill septic patients during the early period after emergency department presentation. Annals of emergency medicine, 71(1), 1-9.