

## Quick Sequential Organ Failure Assessment with Duration Stay for Intensive Care Patients

Galena Devi Prajgayatri<sup>1</sup>, Eveline Margo<sup>2\*</sup>

<sup>1</sup>Faculty of Medicine, Universitas Trisakti

<sup>2</sup>Department of Physiology, Faculty of Medicine, Universitas Trisakti

**Corresponding Author:** Eveline Margo [eveline-margo@trisakti.ac.id](mailto:eveline-margo@trisakti.ac.id)

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### ABSTRACT

An important metric for managing managing patients with serious illnesses is the duration of stay in the intensive care unit (ICU). According to data from Indonesia (2023), 68.2% among patients who were given treatment in the ICU for at least five days. Although research on this topic is still unclear, the quick Sequential Organ Failure Assessment (qSOFA) score is employed to forecast organ failure and the probability of prolonged duration stay. The aim of this study is to ascertain whether ICU patients' duration of stay and their qSOFA score are related. Getting secondary data from ICU patients admitted from the emergency room between January and December 2024, this observational study with a retrospective cohort design was carried out at Rumah Sakit Angkatan Laut Dr. Mintohardjo, Jakarta. 205 participants that met the inclusion criteria were chosen through successive sampling from all patients. For statistical analysis, the chi-square test was used with a significance level of  $p = 0.05$ . 50.2% of the individuals were between the ages of 18 and 59, and 54.1% of them were men, with an average stay of  $4.84 \pm 3.46$  days, the most prevalent qSOFA score was 2 (43.9%). The duration of stay in the ICU did not significantly correlate with the qSOFA score ( $p$  value = 0.326,  $p > 0.05$ ).

## **INTRODUCTION**

The intensive care unit (ICU) was established unit to provide critically ill patients whose lives are in jeopardy and who need observation assisted by a variety of services in order to prolong life throughout periods of organ weakness (Rosidawati & Hodijah, 2019). Instead of directly addressing the fundamental disease etiology, the ICU places a strong focus on controlling organ dysfunction (such as the heart, kidneys, or lungs) brought on by catastrophic illness. Until the underlying disease is being treated with ultimate treatment, the primary objective of ICU care is to either maintain organ function stability or prevent the patient's state from getting worse (Marshall et al., 2017).

Patients in intensive care units are managed using a multidisciplinary approach, with the critical care team, led by a critical care expert, and the initial referring medical team sharing accountability. Consequently, the management of intensive care units (ICUs) needs to be done carefully and cautiously because of the scarcity of medical staff and financial resources (Silaban & Tarigan, 2024; Jackson & Cairns, 2021; Castro et al., 2018).

With an overall death rate of 14%, the majority of frequent ICU diagnoses were sepsis (88%), respiratory failure (88%), and heart failure (55%), with average ICU duration of stay are 5.2 days, according to a 2020 global survey conducted by the Global ICU Needs Assessment Research Group and distributed to ICU mainstay in 34 countries (Nawaz et al., 2022). Compared to other nations, there is currently a scarcity study on the features of patients with serious illnesses in Indonesian's ICU. Septic shock, persistent heart failure, and myocardial infarction (27.6%) are the main causes of Indonesia's ICU patient fatality rates (Silaban & Tarigan, 2024). During the COVID-19 epidemic in 2023, 68% of Indonesians died, and 92% of those victims needed mechanical breathing (Burhan et al., 2023).

Extended stays in the ICU are caused by a lot number of factors, including age, gender, body mass index, food habits, patient's knowledge, organs failure, previous medical interventions (such as pre- and post-operative status), pre-existing chronic disorders, comorbidities, and nosocomial illness (Abqariah et al., 2024; Peres et al., 2020).

ICU duration of stay is a crucial metric to assessing and tracking the effectiveness of ICU healthcare facilities, in accordance with the World Health Organization (WHO). Study said 68.2% of ICU patients in Indonesia in 2023 had stays longer than five days (Samarang et al., 2023). Long stays in intensive care units can put a number of people at risk: 1) Patients: along with hefty costs, patients are susceptible to nosocomial infections; 2) Hospitals: higher length of stay (LOS) lowers bed utilization turnover; 3) The healthcare system: hospital equipment, labor, and resources may be overloaded (Abqariah et al., 2024; Zhang & Kuo, 2024).

## **LITERATURE REVIEW**

The qSOFA, which consists of three indicators to predict organ failure and mortality among patients with suspected infection, is one technique for detecting high-risk patients outside the intensive care unit. Organ dysfunction is indicated by a higher qSOFA score (Marik & Taeb, 2017). Clinicians are encouraged by these criteria to perform additional organ failure assessments,

start or intensify treatment as necessary, and think about referrals to critical care or more frequent monitoring. Additionally, a positive qSOFA may lead doctors to suspect infection in patients who were not previously diagnosed (Singer et al., 2016; Yeh et al., 2020). However, research discovered no meaningful connection among qSOFA score and duration of stay, restricting application as an ICU prediction (Harsini et al., 2024). These inconsistent findings led to the current study's investigation of the relationship between qSOFA score and duration of stay, particularly in Jakarta's ICU patients hospitalized through the emergency room.

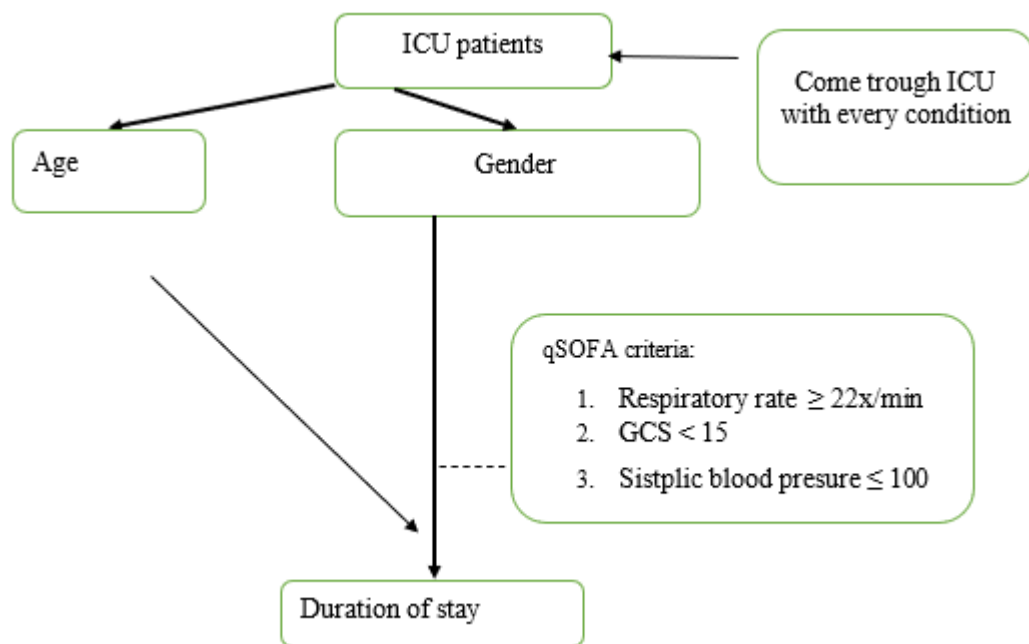


Figure 1. Framework

## METHODOLOGY

Data collecting for this study took place between April and May of 2025 in the intensive care unit of Rumah Sakit Angkatan Laut Dr. Mintohardjo in Bendungan Hilir, Central Jakarta. This observational study included secondary data and a retrospective cohort approach. Considering the frequency of ICU stay duration in Indonesia, which is 68.2% (Samarang et al., 2023), the total number of individuals was calculated using the finite-infinite calculation, yielding a final sample are 205 subjects. All ICU patients who were admitted between January and December of 2024 and who satisfied the following inclusion criteria were chosen using successive sampling as subjects: 1) patients, either male or female, who are older than eighteen; 2) transferred to the intensive care unit on a referral from the emergency room, either from Rumah Sakit Angkatan Laut Dr. Mintohardjo or another hospital. Patients with incomplete medical records and those who were transferred to another institution for whatever reason were the two exclusion criteria. A cutoff value of  $\geq 10$  days was regarded as a prolonged period of stay (Almashrafi et al., 2016; Yenni et al., 2024). The duration of stay was computed from the date of

hospitalization to the date of discharge from the ICU. The systolic blood pressure measured below  $\leq 100$  mmHg, the respiration rate up  $\geq 22$ /min, and Glasgow Coma Scale (GCS) score below  $< 15$  are the qSOFA criteria. Each of these factors is worth one point, with a minimum score of two and a maximum score of three (Yeh et al., 2020; Marik & Taeb, 2017). The data was evaluated using the chi-square test with a threshold of significance of 95% or p value  $< 0.05$ .

The Committee for Ethics Review of Universitas Trisakti, Faculty of Medicine approved this study with the ethical approval number is 026/KER/FK/02/2025.

## RESEARCH RESULT

According to Table 1's subject characteristics, 103 individuals (50.2%) were between the ages of 18 and 59, while 111 subjects (54.1%) were male. The mean GCS was  $11.05 \pm 4.45$ , indicating that the majority of participants were in a moderate state of consciousness; the average respiratory rate was  $26.22 \pm 7.66$  breaths per minute, indicating signs of respiratory distress; and within high-normal range, the mean systolic blood pressure was  $131.48 \pm 37.92$  mmHg. The average duration was  $4.84 \pm 3.46$  days.

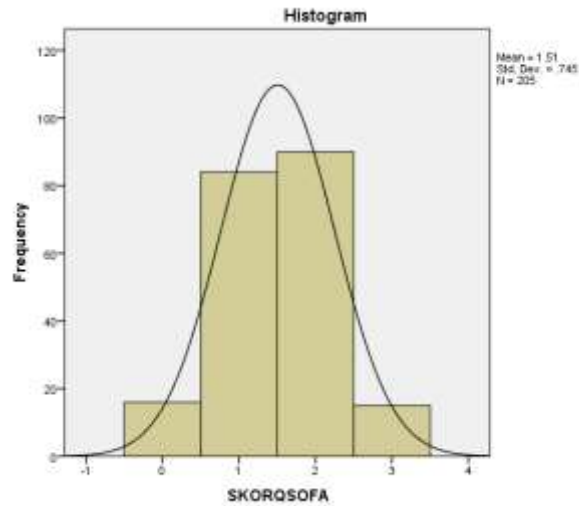
**Table 1. Subject characteristics (n=205)**

Variable	n (%)	Mean $\pm$ SD
Age (years)		
18 - 59	103(50.2)	
$\geq 60$	102(49.8)	
Sex		
Male	111(54.1)	
Female	94(45.9)	
qSOFA Criteria		
Systolic pressure (mmHg)		131.48 $\pm$ 37.92
Respiratory rate (x/minutes)		26.22 $\pm$ 7.66
GCS		11.05 $\pm$ 4.45
Duration of stay (days)		4.84 $\pm$ 3.46

Table 2 shows that the majority of individuals (90 or 43.9%) were at a moderate risk of organ malfunction, with a qSOFA score of 2.

**Table 2. Quick Sequential Organ Failure Assessment Score Distribution**

Variable	<u>n</u> (%)
Score qSOFA	
0	16(7.8)
1	84(41)
2	90(43.9)
3	15(7.3)



**Figure 2. Histogram Score Distribution qSOFA**

There was no correlation among the score of qSOFA and the duration of stay in the ICU according to Table 3 and Chi-square test analysis, with a significance  $p$  value = 0.326 ( $p > 0.05$ ).

**Table 3. Quick Sequential Organ Failure Assessment Score and Length of Stay**

qSoFA Score	Duration of Stay		<i>p</i> value
	$\geq 10$ days	$< 10$ days	
	n (%)	n (%)	
Total score $\geq 2$	14 (60.8)	9 (39.2)	0.326
Total score $< 2$	91(50)	91 (50)	

Chi-square test ( $p < 0.05$ )

## DISCUSSION

In this study, 103 subjects (50.2%) were between the ages of 18 and 59, while 102 subjects (49.8%) were over the age of 60. This suggests that adults make up the majority of patients needing intense care in the critical care unit, despite the modest discrepancy. (Bergeron and others, 2005) There were 111 subjects (54.1%) who were male. This outcome is in line with recent research showing that, while the length of stay is generally comparable for both sexes, men are more likely to need critical care in the intensive care unit. Hormones like estrogen and testosterone are known to influence critical disorders; however, the effects vary based on individual hormonal cycles and underlying medical conditions (Lat et al., 2021; Susanti et al., 2024; Zettersten et al., 2020). Compared to various studies, male ICU patients have greater death rates, which may be caused by a weakened immune system brought on by behaviors like drinking alcohol and smoking (Zirpe and others, 2021). However, a study conducted in Canada, the USA, Switzerland, Italy, Spain, and Australia by Bender et al. (2023) discovered no correlation between sex and duration of stay.

In this study, 90 subjects (43.9%) had a qSOFA score of 2, meaning that a two-point rise in the score is roughly four times more likely to result in a stay longer than nine days. A longer median length of stay (11 days) is associated with a qSOFA score  $\geq 2$  points than with a qSOFA score  $< 2$  points (6 days), according to other research. Therefore, a score of  $\geq 2$  points denotes a longer stay and a higher chance of death (Yeh and others, 2020). In addition to age and sex, other variables that affect the length of time include employment, education, income, comorbidities (diabetes, high blood pressure, heart diseases, COPD, pneumonia, sepsis, stroke, cancer, and etc.), inherited diseases, family assistance, stress, and the availability to healthcare also influence the duration of stay (Bender et al., 2023; Kharbuja et al., 2025; Lestari et al., 2025). Pain patients may be the source of these variables, which can impair the quality of their sleep. In addition to having an influence on physical health, sleep disturbances during ICU treatment can have an impact on psychological well-being, which may impede the healing process (Lestari et al., 2025). Long-term stress causes the hypothalamus, anterior pituitary, and adrenal medulla to become more active. This increases the release of norepinephrine and adrenaline, which raises blood pressure, heart rate, contractility, and venous return. Additionally, persistent anxiety affects melatonin secretion, which controls sleep patterns, and the adrenal cortex, which increases cortisol release. As a result, patients struggle to get a good night's sleep. Additionally, cytokines including TNF- $\alpha$ , IL-1, and IL-6 are released, causing hemodynamic reactions that, when combined, might be harmful. IL-6 may be a prognostic marker, especially in sepsis, and is sensitive during the acute phase of inflammation. Multiple organ dysfunction syndrome (MODS) is predicted by IL-8. The pathophysiology of stress and shock is significantly influenced by nitric oxide (NO), which controls vascular tone. These conditions may impact the length of stay by delaying recovery (Fitri, 2014; Lestari et al., 2025). According to a global assessment carried out by the ICU Needs Assessment Research Group across 34 countries, the most common ICU diagnoses were sepsis (88%), respiratory distress syndrome (88%), and heart failure (55%), with mean duration of stay was 5.2 days and sepsis fatality rate of 21% (Nawaz et al., 2022). These findings are consistent with the study's finding that the average duration of stay was  $4.84 \pm 3.46$  days.

There is no correlation ( $p > 0.05$ ) between qSOFA and ICU duration of stay, according to the chi-square test's significance  $p$  value of 0.326. This conclusion is different from other studies where results may be affected by differences in the time of the qSOFA score measurement. The highest score obtained within three hours prior to and following probable infection onset was typically used to calculate qSOFA in earlier research. Regardless of the original or infectious diagnosis, all ICU admissions were included in this study. Despite these differences, the current results are consistent with other earlier studies that also found no significant link ( $p$  value = 0.479), while a qSOFA score of  $\geq 2$  was still highly correlated with 28-day mortality ( $r=0.175$ ) (Harsini et al., 2024).

In conclusion, MODS, an acute, quickly progressing illness characterized by the failure of two or more organ systems and frequently brought on by

severe infection or trauma, was the primary cause of the majority of study participants' intermediate risk (qSOFA score=2). Surgical and intensive care unit interferences, such as secondary infections, ventilator-induced lung injury, stress, or iatrogenic causes, are contributing variables that might affect patient outcomes and lengthen hospital stays (Arienti et al., 2021; D. F. Lestari et al., 2023).

In order to assess organ failure and the severity of sepsis outside of the ICU, such as in emergency departments or hospital wards, the use of qSOFA as a prognostic indicator in patients with serious illnesses has grown in clinical practice. Initially, qSOFA was developed specifically to detect the possibility of sepsis, so patients without suspected infection will be less appropriate for predicting the duration of hospital stay. One study found that the lower prediction score of qSOFA in non-sepsis (Moss et al., 2016). qSOFA is still a helpful rapid screening tool to assess infection, even with the presence of alternative scoring methods like the New Early Warning Signs (NEWS), Modified Early Warning Score (MEWS), and Sequential Organ Failure Assessment (SOFA), which aid in identifying organ dysfunction through become potentially fatal infections (Harsini et al., 2024).

## CONCLUSIONS AND RECOMMENDATIONS

The duration of stay in the ICU did not significantly correlate with the qSOFA score ( $p$  value = 0.326). The qSOFA score is insufficient as a single predictor for determining ICU's duration of stay, even though it can still be utilized as an initial screening tool.

## ADVANCED RESEARCH

In order to support the prediction of ICU's duration, the evaluation of hospitals should take into account baseline medical conditions and additional co-factors, instance like secondary infections, ventilator-induced lung injury, stress, iatrogenic factors, and comorbidities.

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