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Yoğun Bakım Ünitesindeki Ağır Sepsis veya Septik Şoklu Hastalarda Artmış Mortalite Riski ile İlişkili Bağımsız Parametreler Nelerdir?

What Are the Independent Parameters Associated with Increased Mortality Risk in Patients with Severe Sepsis or Septic Shock in the Intensive Care Unit?

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Öz

Giriş ve Amaç: Uluslararası kılavuzlara göre tedavi edilen yoğun bakım ünitesinde yatan sepsisli hastalarda prognozu etkileyen faktörlerin belirlenmesi. Hastalar tedavi sonuçları, morbidite ve mortalite oranları, enfeksiyon odakları ve patojenler açısından değerlendirilmiştir.

Gereç ve Yöntemler: Bu prospektif gözlemsel çalışmaya Trakya Üniversitesi Tıp Fakültesi Tıbbi Yoğun Bakım Anabilim Dalı'nda Temmuz 2009 ile Aralık 2009 tarihleri arasında tedavi edilen ağır sepsisli toplam 43 hasta alınmıştır. Hastalar hayatta kalanlar ve ex olanlar olarak gruplandırılmıştır. Klinik özellikler ve APACHE II, SAPS II, SOFA skorları kaydedilmiştir. Mortalite ile ilişkili faktörler Cox regresyonu ile analiz edilmiştir.

Bulgular: Genel mortalite %23,2'dir. Üç veya daha fazla organ yetmezliği olan hastalarda mortalite daha yüksek bulunmuştur ($p = 0.001$). Ayrıca ilk gün kardiyovasküler, renal, hematolojik ve nörolojik yetmezliği olan hastalarda mortalite oranları daha yüksek olarak tespit edilmiştir (sırasıyla $p = 0,002$, $p = 0,011$, $p = 0,020$, $p = 0,019$). 24. ve 72. saatteki tüm skorlar, hayatta kalanlara kıyasla ex olan grupta anlamlı olarak daha yüksektir (tümü için $p < 0.05$). Başlangıç SOFA ve APACHE II değerleri hayatta kalmayanlarda hayatta kalanlara göre daha yüksek bulunmuşken (sırasıyla $p = 0,013$ ve $p = 0,017$), başlangıç SAPS II skorları benzer tespit edilmiştir ($p = 0,107$). Septik şok tanısı (HR: 0.080, %95 GA: 0.007-0.961), kronik kalp yetmezliği (HR: 0.133, %95 GA: 0.032-0.558), uygunsuz ampirik antibiyotik kullanımı (HR: 0.106, %95 GA: 0.034-0.326), başvurunun ilk gününde organ yetmezliği sayısı (HR: 17.091, %95 GA: 2.877-101.529), kardiyovasküler yetmezlik (HR: 0.427, %95 GA: 0.201-0.906) ve böbrek yetmezliğinin (HR: 0.075, %95 GA: 0.016-0.348) mortalite ile ilişkili olduğu tespit edilmiştir.

Sonuç: Kronik kalp yetmezliği, uygunsuz ampirik antibiyoterapi uygulanması, ilk gün böbrek ve kalp yetmezliği olması ağır sepsis ve septik şoklu hastalarda mortalite riskini artıran önemli bağımsız faktörler olarak bulunmuştur. İlaveten, ölen sepsis hastalarında SOFA, APACHE II ve SAPS II skorları daha yüksektir. Ağır sepsisli olgularda erken dönemde doğru antibiyotik tedavisine başlanması ve organ yetmezliğine karşı uygun önlemlerin alınması sağkalımı artırabilir.

Anahtar kelimeler: Ağır sepsis, Mortalite, Septik Şok, Yoğun bakım.

Abstract

Objective: Determining the factors associated with prognosis in patients with sepsis admitted to the intensive care unit who were treated according to international guidelines. Patients were evaluated with respect to treatment results, morbidity and mortality rates, infection foci and pathogens.

Materials and Methods: A total of 43 patients with severe sepsis who were treated in Trakya University Medical Faculty, Department of Medical Intensive Care, between July 2009 and December 2009, were enrolled in this

prospective observational study. Patients were grouped as survivors and non-survivors. Clinical characteristics and APACHE II, SAPS II, SOFA scores were recorded. Factors associated with mortality were analyzed by Cox regression.

Results: Overall mortality rate was 23.2%. Patients with failure in three or more organs had higher mortality ($p = 0.001$). Also, mortality rates were higher in patients with cardiovascular, renal, hematological and neurological failure in the first day ($p = 0.002$, $p = 0.011$, $p = 0.020$, $p = 0.019$, respectively). All scores at the 24th and 72nd hours were significantly higher in the non-survivor group compared to survivors ($p < 0.05$, for all). While the initial SOFA and APACHE II values were higher in non-survivors compared to survivors ($p = 0.013$ and $p = 0.017$, respectively), initial SAPS II scores were similar ($p = 0.107$). The diagnosis of septic shock (HR: 0.080, 95%CI: 0.007-0.961), chronic heart failure (HR: 0.133, 95%CI: 0.032-0.558), inappropriate empirical antibiotic use (HR: 0.106, 95%CI: 0.034-0.326), the number of organs failing on the first day of admission (HR: 17.091, 95%CI: 2.877-101.529), cardiovascular failure (HR: 0.427, 95%CI: 0.201-0.906) and renal insufficiency (HR: 0.075, 95%CI: 0.016-0.348) were found to be associated with mortality.

Conclusion: The presence of chronic heart failure, inappropriately administered empirical antibiotherapy, renal and cardiac failure on the first day of admission were the notable independent factors that increased the mortality risk of patients with severe sepsis and septic shock. In addition, SOFA, APACHE II, and SAPS II scores were higher in sepsis patients who ultimately died. Initiating correct antibiotherapy in the early period and applying appropriate measures against organ failure may increase survival in cases with severe sepsis.

Keywords: Intensive care, Mortality, Septic shock, Severe sepsis.

1. Introduction

Sepsis is a clinical condition resulting from the interaction of infectious microorganism(s) and the body's immune, inflammatory and coagulation systems. It directly and swiftly affects many organs, causes significant hemodynamic changes and may progress to shock, organ failure and death [1]. Acute organ dysfunction caused by sepsis is referred to as "severe sepsis" and persistent hypotension or tissue hypoperfusion that continues despite adequate fluid resuscitation is called "septic shock" [2].

Severe sepsis and septic shock cause high rates of mortality and morbidity all over the world. Apart from specialized coronary care units, sepsis is the most important cause of death in intensive care units. Despite advances in diagnosis and treatment, mortality rates remain considerably high in severe sepsis and septic shock [2, 3]. Treatment approach in such cases includes the administration of targeted therapy as early as possible. In various studies, mortality rates were found to be decreased when cardiac parameters were balanced (preload, afterload and contractility), oxygen delivery and utilization were increased, tissue hypoperfusion was prevented, and adequate antibiotic treatment was administered. Clear identification of parameters associated with mortality, such as advanced age, organ failure and comorbidities, is critical to decrease the risk of mortality in patients admitted to the intensive care unit, since treatment approach can vary on a patient-by-patient basis [1-3]. Different scoring systems have been used for the assessment of sepsis severity, prediction of mortality and morbidity, and determination of prognosis in the intensive care unit. Researchers have examined the utility of these scores and additional parameters in predicting mortality among patients with sepsis in many studies, which have resulted in the publication of various findings contributing to the guidelines of sepsis management [4-11].

In Turkey however, there are only a few studies examining outcomes associated with the clinical practice of the international guidelines for the management of severe sepsis and septic shock. Therefore, the aim of our study was to assess prognosis in sepsis patients admitted to the intensive care unit who were treated according to international guidelines by way of recording data pertaining to the results of the treatment protocol, morbidity and mortality rates, infection foci and pathogens. Also, we evaluated Simplified Acute Physiology Score II (SAPS II), Acute Physiology and Chronic Health Evaluation II (APACHE II) and Sequential Organ Failure Assessment (SOFA) scores to assess their relationships with mortality.

2. Materials and Methods

Forty-three patients admitted with severe sepsis and septic shock to the intensive care unit of Trakya University Medical Faculty Hospital, between July 1st 2009 and December 31st 2009, were included in this prospective observational study. Informed consent was acquired from each patient or their legal representative(s) if the patient was unconscious. Patients who were admitted to the intensive care unit with a diagnosis of severe sepsis, septic shock, and those diagnosed with severe sepsis and septic shock while hospitalized in the internal intensive care unit for reasons other than existing sepsis were included in the study. Pregnant women, those under the age of 18 years, patients with terminal cancer and those who refused to participate in the study were excluded. The diagnosis of severe sepsis and septic shock was determined according to the ACCP / SCCM consensus definitions. The treatments of the patients were administrated according to the 2008 International guidelines for management of severe sepsis and septic shock.

The mortality rate was taken as a base for calculating sample size according to an expected mortality rate of 50%, confidence of 95% and power of 80%, determined by the results of prior studies in the

literature. The margin of error was accepted as 0.015, and the final sample size was determined as n = 43. Data collection had continued while patients were in the intensive care unit until discharge or death.

Measurements

Age, gender, comorbidities, possible infection focus, infection origin (hospital or community), causative microorganisms, culture results, organ failure, timing of organ failure (with respect to admission), routine laboratory analyses during intensive care monitoring, mechanical ventilation support, hemodynamic monitoring, urine output, treatments performed according to the sepsis treatment protocol, APACHE II, SAPS II, SOFA scores (at admission to the intensive care unit and on the 24^{th} and 72^{nd} hours of admission) were recorded prospectively.

Brief description of treatment protocols

1. Fluid therapy: Crystalloid (at least 2000 ml of fluid is given within 1 hour. Afterwards, the fluid rate is adjusted by monitoring blood pressure, pulse, urine output, Central vein pressure [CVP]CVP, Mean arterial pressure [MAP]).
2. Vasopressor therapy: Dopamine (5-20 mcg / kg / min).
3. Inotropic therapy: Dobutamine (2.5-15mcg / kg / min).
4. Empirical antibiotic initiation with respect to the focus of infection.
5. Steroid treatment: If hypotension is present despite fluid and vasopressor treatment in septic shock, methylprednisolone 60 mg divided into 3-4 doses is administered for a maximum of 7 days. When the need for vasopressor treatment ceases, steroids are discontinued.
6. Mechanical ventilation targets: Tidal volume → 6 ml / kg, Pplato ≤ 30 cmH2O, PEEP ≥ 5 cmHg
7. Target blood glucose ≤ 150 mg / dl (administer crystalline insulin infusion if needed).
8. Dialysis is applied to patients in need.
9. Prophylaxis (low molecular weight heparin) is given for deep vein thrombosis.
10. Stress ulcer prophylaxis (proton pump inhibitor) is given.

Treatment goals and monitoring in the intensive care unit

Patients were intubated if they needed invasive mechanical ventilation. At least two samples for blood culture were obtained from the patient and other cultures (urine, sputum, wound swab, etc.) were performed, after which empirical antibiotics were immediately administered. Fluid therapy was started as early as possible. If blood pressure was <90/60 mmHg, MAP <65 mmHg and CVP was <8 mmHg, we utilized rapid fluid loading (20 ml / kg / hour). Afterwards, fluid therapy was maintained in a manner to keep CVP between 8-12 mmHg with respect to the patient's additional diseases, urine output, blood pressure and pulse. Vasopressor therapy (dopamine) was given to patients when blood pressure and MAP were not at desired levels despite fluid therapy. Dobutamine was administered to patients if there were signs suggestive of tissue hypoperfusion. With an aim to reduce tissue hypoxia, patients with low hemoglobin (hemoglobin level 7-9 gr/dL) received erythrocyte suspension until reaching a hematocrit level of >30%. In the event that shock persisted despite fluid, vasopressors and inotropic treatment, we applied steroid treatment (methylprednisolone 60 mg/day, divided into 3 doses for a maximum of 7 days). Each patient received proton pump inhibitor for stress ulcer prophylaxis and low molecular weight heparin for deep vein thrombosis prophylaxis. After hemodynamic stability was achieved, insulin infusion was administered when necessary to retain blood glucose levels of at most 150 mg / dl. Patients who required dialysis due to any reason received dialysis in the intensive care unit.

Statistical analysis

Data were analyzed using SPSS version 21 (IBM, Armonk, NY, USA). Chi-square tests were used to compare the distribution of categorical variables. Normality check was performed by the Shapiro-Wilk test. Since parametric assumptions were not met for any quantitative variable, the Mann-Whitney U test was used to compare continuous variables. Survival analysis was performed using the log-rank test. A Cox regression model was used with mortality as the dependent variable. All independent parameters found to be significant in the univariate comparison of the survivor and non-survivor groups were included in the Cox regression model as covariates. P-values of <0.05 were accepted as a statistically significant.

3. Results and Discussion

3.1. Results

There Was No Significant Difference Between The Survivor And Non-Survivor groups in terms of age, gender and the origin of sepsis. Mortality rate was higher in septic shock patients (45%) compared to those with only severe sepsis (4.3%). Thirty-three patients were discharged and the overall mortality rate was 23.2%. The existence of hypertension and chronic cardiac failure was associated with increased mortality ($p = 0.028$, $p = 0.017$, respectively) (Table 1).

Inability to reach treatment goals (in each investigated parameter) was found to significantly increase the risk of mortality. Positive culture results were shown in 28 of the patients. It was observed that 14 of these patients had received effective antibiotics at the initial empirical treatment step. In these patients, no deaths had occurred; whereas mortality rate was 50% in patients who had positive culture but had received inappropriate empirical antibiotics. The appropriation of empiric antibiotics decreased mortality (Table 2).

Patients with failure in three or more organs had higher mortality ($p = 0.001$). When evaluated separately, mortality rates were found to be higher in patients who had cardiovascular, renal, hematological and neurological failure on the first day of admission ($p = 0.002$, $p = 0.011$, $p = 0.020$ and $p = 0.019$, respectively) (Table 3).

Table 1. Characteristics of survivors and non-survivors

	Total (n=43)	Survivors (n=33)	Non-survivors (n=10)	P
Age	63.84±16.27	61.70±16.95	70.90±11.90	0.134†
CRP	21.11±11.83	21.77±12.01	18.96±11.53	0.565
Leucocyte	15081.40±7266.00	15460.61±7629.75	13830.00±6093.35	0.518
Lactate	36.02±16.53	32.97±15.90	46.10±15.14	0.063
Comorbidity				
COPD	11 (25.6%)	8 (24.2%)	3 (30%)	0.698
DM	9 (20.9%)	8 (24.2%)	1 (10%)	0.659
HT	25 (58.1%)	16 (48.4%)	9 (90%)	0.028
CHF	12 (27.9%)	6 (18.2%)	6 (60%)	0.017
CAD	7 (16.3%)	4 (12.1%)	3 (30%)	0.325
CRF	6 (14%)	4 (12.1%)	2 (20%)	0.611
Gender				
Male	26 (60.5%)	20 (60.6%)	6 (60%)	1.000*
Female	17 (39.5%)	13 (39.4%)	4 (40%)	
Diagnosis				
Severe sepsis	23 (53.5%)	22 (66.7%)	1 (10%)	0.003*
Septic shock	20 (46.5%)	11 (33.3%)	9 (90%)	
Sepsis type				
HAS	20 (46.5%)	15 (45.5%)	5 (50%)	1.000*
CAS	23 (53.5%)	18 (54.5%)	5 (50%)	

COPD: Chronic obstructive pulmonary disease, DN: Diabetes Mellitus, HT: Hypertension, CHF: Chronic Heart Failure, CAD: Coronary Artery Disease, CRF: Chronic Renal Failure, HAS: Hospital-acquired sepsis; CAS: Community-acquired sepsis

Table 2. Achievement of goals in survivors and non-survivors

	Total (n=43)	Survivors (n=33)	Non-survivors (n=10)	P
Antibiotic were administered within 1 hour				
Yes	35 (81.4%)	30 (91%)	5 (50%)	0.010
No	8 (18.6%)	3 (9%)	5 (50%)	
Reached to the targeted central venous pressure				
Yes	32 (74.4%)	29 (87.9%)	3 (30%)	0.001
No	11 (25.6%)	4 (12.1%)	7 (70%)	
Reached to the targeted mean arterial pressure				
Yes	37 (86%)	32 (97%)	5 (50%)	0.001
No	6 (14%)	1 (3%)	5 (50%)	
Reached to the targeted urine output				
Yes	36 (83.7%)	30 (91%)	6 (60%)	0.040
No	7 (16.3%)	3 (9%)	4 (40%)	
Reached to the targeted lactate level				
Yes	34 (79%)	30 (91%)	4 (40%)	0.002
No	9 (21%)	3 (9%)	6 (60%)	
The patients who are reached all targeted levels				
Yes	27 (62.8%)	26 (78.8%)	1 (10%)	0.001
No	16 (37.2%)	7 (21.2%)	9 (90%)	
Inappropriate empiric antibiotic use*				
No	14 (50%)	14 (66.6%)	0 (0%)	0.006
Yes	14 (50%)	7 (33.4%)	7 (100%)	

*It was evaluated only in patients whose blood culture was exist

Table 3. First-day organ failure rates in survivors and non-survivors

	Total (n=43)	Survivors (n=33)	Non-survivors (n=10)	P
Respiratory	41 (95.3%)	31 (93.9%)	10 (100%)	1.000*
Cardiovascular	19 (44.2%)	10 (30.3%)	9 (90%)	0.002
Renal	23 (53.5%)	14 (42.4%)	9 (90%)	0.011
Liver	14 (32.6%)	10 (30.3%)	4 (40%)	0.704
Hematologic	9 (21%)	4 (12.1%)	5 (50%)	0.020
Neurologic	15 (34.8%)	8 (24.2%)	7 (70%)	0.019
The number of organ failure at first day				
<3	22 (51.2%)	22 (66.7%)	0 (0%)	0.001
≥3	21 (48.8%)	11 (33.3%)	10 (100%)	

All scores at the 24th hour and 72nd hour were significantly higher in the non-survivor group compared to the survivor group ($p < 0.05$, for all). Additionally, the initial SOFA and APACHE II values were higher in non-survivors compared to survivors ($p = 0.013$ and $p = 0.017$, respectively); however, initial SAPS II scores were similar in the two groups ($p = 0.107$) (Table 4).

Table 4. Scale scores in survivors and non-survivors

		Total (n=43)	Survivors (n=33)	Non-survivors (n=10)	P
APACHE II					
	Initial	21.44±7.67	19.94±7.43	26.40±6.55	0.017
	24th hour	17.88±7.53	15.97±6.66	24.89±6.56	0.003
	72nd hour	15.81±8.90	12.30±5.45	28.67±7.14	<0.001
SAPS II					
	Initial	46.05±16.01	43.94±16.29	53.00±13.51	0.107
	24th hour	37.45±12.14	35.15±11.91	45.89±9,28	0.021
	72nd hour	34.48±15.19	29.39±10.05	53.11±16.78	<0.001
SOFA					
	Initial	8.56±3.70	7.94±3.85	10.60±2.27	0.013
	24th hour	7.33±3.77	6.27±3.48	11.22±1.71	0.001
	72nd hour	6.57±3.75	5.30±2.99	11.22±2.33	<0.001

APACHE II: Acute Physiology and Chronic Health Evaluation II; SAPS II: Simplified Acute Physiology Score II, SOFA: Sequential Organ Failure Assessment

Cox regression analysis revealed that the diagnosis of septic shock (HR: 0.080, 95%CI: 0.007-0.961), chronic heart failure (HR: 0.133, 95%CI: 0.032-0.558), inappropriate empirical antibiotic use (HR: 0.106, 95%CI: 0.034-0.326), the number of organs failing on the first day of admission (HR: 17.091, 95%CI: 2.877-101.529), cardiovascular failure (HR: 0.427, 95%CI: 0.201-0.906) and renal insufficiency (HR: 0.075, 95%CI: 0.016-0.348) were found to be associated with mortality (Table 5).

Table 5. Results of multivariate Cox regression model

Variables	p	HR	95% CI
Septic shock	0.046	0.080	0.007-0.961
Chronic heart failure	0.006	0.133	0.032-0.558
Inappropriate empirical antibiotics	0.000	0.106	0.034-0.326
The number of organ failure at first day	0.002	17.091	2.877-101.529
Cardiovascular failure	0.027	0.427	0.201-0.906
Renal insufficiency	0.001	0.075	0.016-0.348

3.2. Discussion

Severe sepsis and septic shock cause high rates of mortality and morbidity all over the world, and remain as the most important causes of death in intensive care units. Determining parameters that can affect the prognosis of these patients will help reduce mortality risk. In this study, which examined the prognosis of sepsis cases treated in the intensive care unit, septic shock, use of inappropriate empirical antibiotics, cardiovascular failure, renal failure and the number of organs failing at admission were found to be independently associated with mortality risk. In addition, SOFA, APACHE II and SAPS II scores were higher among non-survivors in almost all assessments.

Sepsis can be classified as severe sepsis and septic shock according to its clinical severity. Septic shock is the clinical presentation of sepsis that leads to the most serious consequences. Consistent with this, septic shock was found to be associated with mortality independently from other variables in our study. Previous studies are also compatible with the result of our study. Hajj et al. emphasized that there was a relationship between the severity of sepsis and mortality [12]. Investigating the long-term mortality results of sepsis, Rahmei et al. reported that the mortality risk of septic shock cases was significantly higher compared to patients with sepsis [13]. The remarkable effect of having shock status was also shown by Xie et al. who reported that the mortality rate in septic shock cases was higher compared to those with severe sepsis or sepsis [14]. Therefore, it is evident that efforts to prevent progression to severe sepsis or septic shock in patients with sepsis can significantly reduce the frequency of mortality.

In sepsis, initiation of broad-spectrum antibiotics against likely microorganisms until the determination of definitive pathogen is crucial to allow better results and overall outcome [15]. Initiation of appropriate antibiotics in the early period in sepsis has been frequently demonstrated to significantly affect mortality rates [16,17]. If possible, antibiotic treatment should be started within the first three hours [18]. Weiss et al. reported that survival was better in patients with sepsis and septic shock who received effective antibiotics at the appropriate time [19]. Al-Sunaidar and colleagues showed that receiving appropriate antibiotics reduces mortality in patients with sepsis [20]. However, of note, Puntawang et al. reported that appropriate antibiotic initiation decreased the risk of mortality in culture-negative sepsis cases, but that appropriate antibiotic initiation was not associated with mortality in culture-positive cases [21]. In our study, in line with previous studies, it was determined that using inappropriate empirical antibiotics was associated with increased mortality. Although it is well-established that initiating empirical antibiotic treatment as soon as possible after sepsis diagnosis is of vital importance, these data suggest that determining causative agents as early as possible will allow appropriation of effective treatment, thereby increasing treatment efficacy and lowering mortality.

Other comorbidities accompanying sepsis are evidently influential on the risk for mortality in patients hospitalized in the intensive care unit. Examining variables affecting mortality in sepsis, Rhee et al. reported that severe chronic comorbidities increased the risk of mortality [22]. Similarly, Driessen and colleagues found that multiple organ failure increases

mortality in patients with sepsis hospitalized in the intensive care unit [23]. Population-based national mortality registries have also shown supporting data, for instance Weng et al. found that comorbidities increase mortality from sepsis, independent of other variables [24]. In addition, different studies have shown that kidney injury [25] and heart failure [14, 26] are prominent factors independently associated with mortality in patients with sepsis. In our study, in agreement with these studies, the presence of chronic heart failure, cardiovascular failure, renal failure and the number of organ failures on the first day of admission were found to be associated with an elevated risk of mortality. Care should be taken to address other factors to limit the effect of comorbidities on mortality and to prevent the development of additional organ failure(s) in patients with sepsis. Besides, in our study, the relationship between mortality and SOFA score, which is a scoring system used to quantify the degree of organ failure, was examined. SOFA scores at admission, the 24th hour, and the 72nd hour were significantly higher in non-survivors compared to survivors. Likewise, in different studies, it has been shown that the SOFA score can be used to predict sepsis-induced mortality, which are conclusions that agree with the present findings [6-9, 27].

Other scoring systems have also found utility in predicting mortality in sepsis. Apart from SOFA, we evaluated APACHE II and SAPS II scores and investigated their relationships with other parameters. At all three measurement time points, APACHE II scores were higher in non-survivors, akin to the comparisons of SOFA scores mentioned previously. SAPS II scores were also observed to be higher among non-survivors in all three assessments, but statistical significance was not reached for the comparison of admission scores between the groups. In a study examining the mortality characteristics of sepsis patients hospitalized in the intensive care unit, Krasselt et al. suggested that –similar to our study– SOFA, SAPS II and APACHE II scores could be used to predict mortality [4]. Haas et al. reported that these 3 scales were successful in predicting mortality in sepsis, but, interestingly, quick SOFA (qSOFA) had better results than SOFA, SAPS II and APACHE II [5]. In addition, successful results with SOFA [6-9], APACHE II [10] and SAPS II [11] in predicting mortality have been published in different studies. In this regard, the search for a promising new biomarker such as presepsin for the detectionof sepsis continues [28].

The most important limitations of this study are that it is single-centered and the number of patients may be considered low, especially in the non-survivors group. The generalizability of the study should be evaluated in this respect. In addition, the long-term results of these cases have not been examined. Mortality rates may indeed be different in mid- or long-term follow-up.

4. Conclusion

The presence of chronic heart failure, septic shock, inappropriately administered empirical antibiotherapy and existence of renal and cardiac failure at admission were determined to be independent factors associated with increased mortality risk in patients with severe sepsis and septic shock. In addition, SOFA, APACHE II and SAPS II scores were higher in sepsis patients with mortal progress. Starting antibiotic treatment in the early period in sepsis and taking appropriate precautions in high-risk cases by evaluating these factors may increase survival.

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The authors declare that they have no conflict of interest.

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