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Value of SOFA score, APACHE II score, and WBC count for mortality risk assessment in septic patients

A retrospective study

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Abstract

Sepsis is characterized by rapid onset, swift progression, and poor prognosis. Delay in early recognition and treatment may easily escalate to septic shock, resulting in a markedly high mortality rate. Early prognosis assessment holds significant value in enhancing the clinical outcomes of septic patients. The sequential organ failure assessment (SOFA) score and acute physiology and chronic health evaluation II (APACHE II) score are commonly utilized clinical tools for assessing patients' conditions, while white blood cell (WBC) count is frequently employed to evaluate the inflammatory status of the body. The study aimed to investigate the prognostic value of SOFA score, APACHE II score, and WBC count in assessing the risk of mortality in septic patients, providing valuable insights for improving the prognosis of septic patients. In this retrospective study, 139 patients diagnosed with sepsis in our hospital from January 2021 to December 2023 were selected as the study subjects. Clinical outcomes of the patients were collected through a 28-day follow-up period, and patients were categorized into the survival group (n = 96) and the death group (n = 43). The value of SOFA score, APACHE II score, and WBC count for the mortality risk assessment in septic patients was calculated by plotting ROC curves, and the risk factors for mortality in septic patients were analyzed. The AUC of SOFA score was 0.809 (95% CI = 0.734–0.871, $P < .0001$) for predicting the mortality risk of sepsis. The AUC of APACHE score was 0.806 (95% CI = 0.729–0.884, $P < .0001$) for predicting the mortality risk of sepsis. The AUC of WBC count was 0.689 (95% CI = 0.591–0.788, $P = .004$) for predicting the mortality risk of sepsis. The AUC of combined detection was 0.861 (95% CI = 0.792–0.914, $P < .0001$) for predicting the mortality risk of sepsis. Univariate analysis revealed that SOFA, APACHE II, and WBC were correlated with mortality in septic patients ($P < .05$). Patients with sepsis demonstrate significant elevations in WBC count, SOFA, and APACHE II scores. The combined application of these indicators holds considerable value in predicting the mortality outcomes of septic patients. Accordingly, clinical treatment plans can be adjusted based on these aforementioned indicators to ameliorate the prognosis of septic patients.

Abbreviations: APACHE II = acute physiology and chronic health evaluation II, SOFA = sequential organ failure assessment, WBC = white blood cell.

Keywords: APACHE II score, mortality outcome, predictive value, sepsis, SOFA score, WBC count

1. Introduction

Sepsis is a prevalent clinical issue in the field of critical care medicine, with its incidence showing an increasing trend in recent years.[1] Despite the continuous advancements in diagnosis and treatment, the mortality rate of sepsis remains persistently high, emerging as one of the foremost causes of death among critically ill patients worldwide. As of 2017, the World Health Organization has designated the identification, prevention, and management of sepsis as a global health priority, with sepsis-related fatalities accounting for approximately 19.7% of global mortality.[2] Even with prompt and effective treatment, septic patients still confront significant challenges in physical, psychological, and cognitive realms. Thus, early identification and assessment of patients' conditions, along with identifying those at higher risk of mortality, are pivotal for guiding clinical interventions and enhancing patients' clinical prognosis.[3]

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The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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The sequential organ failure assessment (SOFA) score of ≥2 is utilized as a diagnostic criterion for sepsis. Numerous previous studies[4,5] have confirmed that SOFA score stands as one of the prime discriminators for ICU septic patients. The acute physiology and chronic health evaluation II (APACHE II) score system is primarily employed to assess the severity of acute illnesses, enabling the quantification and evaluation of abnormality levels of various physiological parameters in individuals, and it is frequently utilized in the clinical assessment of the condition and prognosis of critically ill patients.[6] The white blood cell (WBC) count refers to the number of white blood cells per unit volume, and its elevation is commonly associated with acute infections, uremia, severe burns, etc.[7] Although studies[8] have analyzed the prognostic assessment for sepsis patients, there is a scarcity of research combining the application of SOFA score, APACHE II score, and WBC counts for prognostic assessment of sepsis. The aim of this study was to investigate the efficacy of the aforementioned indicators in the prognostic assessment of sepsis, with the aim of providing reference for improving the prognosis of septic patients.

2. Materials and methods

2.1. Study subjects

This is a retrospective study, which was obtained approval from the ethics committee of Aviation General Hospital (approval number: HK2024-03). The clinical data of 261 patients diagnosed with sepsis in our hospital from January 2021 to December 2023 were collected from the information system of our hospital and screened according to the inclusion and exclusion criteria.

2.2. Inclusion and exclusion criteria

Inclusion criteria: (1) Diagnosis of sepsis in our hospital, with diagnostic standards based on the "Chinese Expert Consensus on Early Prevention and Interruption of Sepsis in Emergency Medicine" (specific criteria included the presence of infection and a SOFA score ≥ 2)[9]; (2) Age ≥ 18 years.

Exclusion criteria: (1) Chronic renal disease; (2) Administration of radiocontrast media and nephrotoxic drugs; (3) Cancer and HIV infection; (4) Incomplete laboratory test results; (5) Inadequate baseline clinical data; (6) Pregnant or lactating women.

Based on the aforementioned inclusion and exclusion criteria, a total of 139 patients out of 261 were included. According to the clinical outcomes at 28-day follow-up, the included patients were categorized into a survival group (n = 96) and a death group (n = 43). The specific research process is shown in Figure 1.

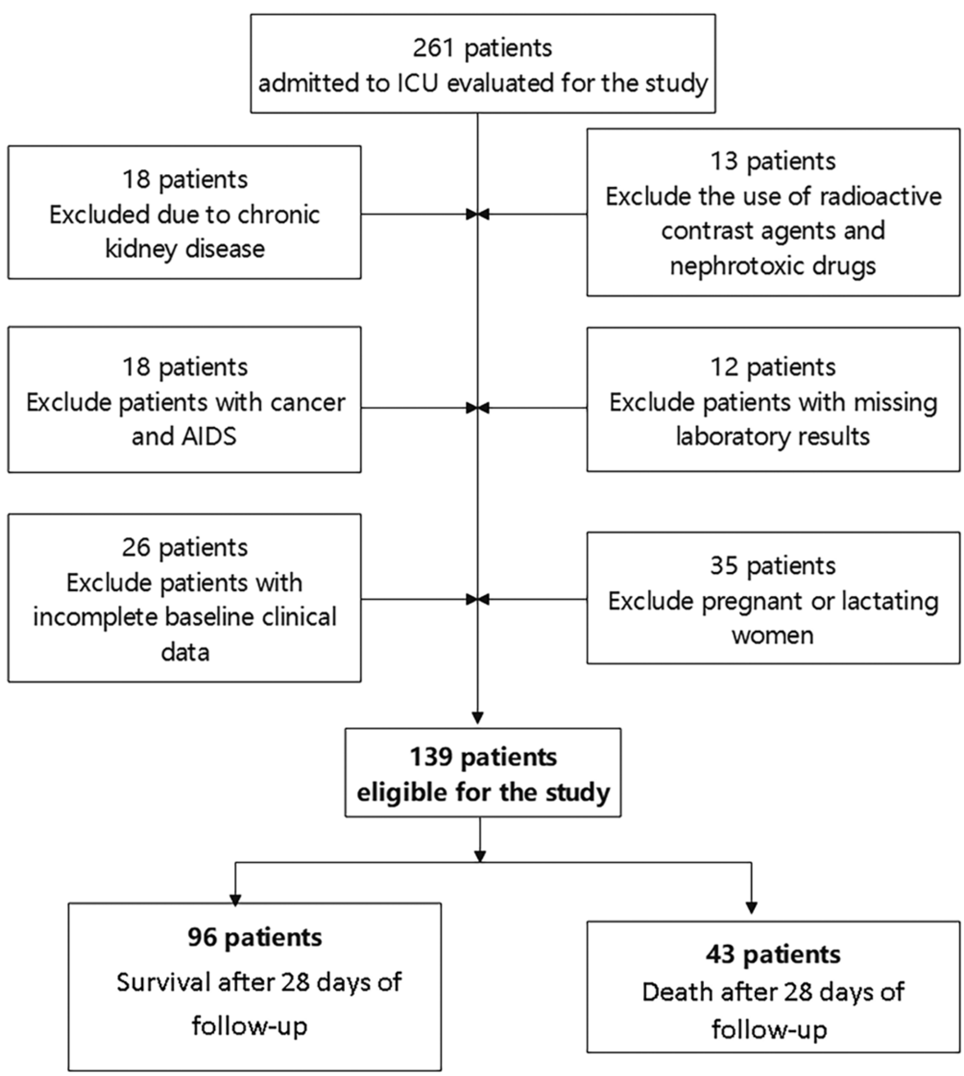

Figure 1. Flow diagram of the study.

2.3. Research methods and contents

Relying on the hospital's internal information system, EXCEL spreadsheets were utilized to gather the clinical data of patients, including baseline demographic data (gender, age, temperature at admission, smoking, and drinking status), medication history (use of vasopressors), basic vital signs (mean arterial pressure, heart rate, fraction of inspired oxygen, respiratory rate, etc), laboratory test results at admission (WBC, neutrophilic granulocyte, red blood cell, hematocrit, hemoglobin, etc), SOFA score, APACHE II score, complications (presence of acute kidney injury, disseminated intravascular coagulation, etc), and treatment (ventilator usage, antifungal medication administration, etc). After grouping patients according to their 28-day follow-up clinical outcomes, differences in various data were compared between the death and survival groups. ROC curves were plotted to separately calculate the predictive value of SOFA score, APACHE II score, WBC count, and combined detection for the clinical outcomes of septic patients. Regression analysis was utilized to investigate the risk factors for adverse prognosis in septic patients.

The SOFA scoring criteria[10] include evaluations of the circulatory, respiratory, renal, hepatic, coagulation, and neurological systems, with each assessed on a scale of 0 to 4 points. A score of ≥2 on the scale indicates a diagnosis of sepsis, with higher scores indicative of more severe patient conditions.

The APACHE II scoring criteria,[11] comprising acute physiological scoring (12 physiological variables), age scoring (utilizing scores of 0, 2, 3, 5, and 6), and chronic health scoring (2 points for admissions to the ICU after elective surgery, and 5 points for admissions to the ICU after emergency surgery or nonsurgical procedures), yields a composite score from three dimensions, with a total score ranging 0 to 71 points. Higher scores correlate with greater severity of the subject's condition.

Table 1

Comparison of baseline data between the death and survival groups.

Clinical data	Sepsis survival group (n = 96)	Sepsis death group (n = 43)	*P* value
Male sex (n)	59	28	.68
Female sex (n)	37	15	
Age (yr)	62.53 ± 1.90	65.93 ± 2.20	.29
T (°C)	37.98 ± 0.13	38.14 ± 0.18	.458
Smoking	34/96	20/43	.215
Drinking	16/96	6/43	.685
MAP (mm Hg)	80.55 ± 1.81	67.16 ± 2.33	<.001
HR	107.71 ± 2.453	131.12 ± 4.526	<.001
RR	26.30 ± 0.774	31.30 ± 1.484	.001
FiO_2	0.40 (0.30,0.50)	0.60 (0.40,1.00)	.001
OI	244.805 ± 12.10	179.66 ± 18.35	.003
PCO_2	35.0 (32.0, 43.0)	39.0 (33.25, 46.0)	.181
PH	7.41 (7.38, 7.45)	7.45 (7.41, 7.48)	.05
WBC ($\times10^9$/L)	10.55 ± 0.68	15.23 ± 1.25	.01
NE (%)	90.80 (86.0, 92.5)	81.75 (73.875, 88.475)	<.001
RBC ($\times10^{12}$/L)	3.62 ± 0.095	3.29 ± 0.14	.056
HCT	32.35 ± 0.75	29.96 ± 1.16	.081
HGB (g/L)	108.01 ± 2.63	99.93 ± 3.79	.087
PLT ($\times10^9$/L)	191.125 ± 10.93	140.814 ± 14.55	.009
PCT (ng/mL)	1.67 (0.24, 11.69)	3.10 (0.76, 9.79)	.091
HCO_3	27.19 ± 0.73	25.02 ± 1.420	.114
D-Dimer	6.16 ± 1.52	8.67 ± 2.02	.05
PT	13.98 ± 0.96	15.30 ± 0.86	.395
PA	80.31 ± 1.44	69.70 ± 2.56	<.001
TT	20.71 ± 1.10	24.57 ± 3.55	.183
INR	1.143 ± 0.021	1.324 ± 0.069	.001
FBG	397.48 ± 17.68	316.25 ± 25.05	.011
APTT	39.70 ± 1.98	50.34 ± 4.52	.013
Highest ALT	46.13 ± 5.88	111.24 ± 41.66	.133
ALT	30.50 ± 4.87	60.46 ± 12.97	.243
Highest AST	142.17 ± 52.03	187.32 ± 40.73	.073
AST	52.25 ± 6.79	128.13 ± 35.97	.103
TBIL	23.58 ± 5.79	46.54 ± 14.76	.359
BUN (mmol/L)	11.02 (7.07, 16.72)	20.00 (12.17, 30.10)	<.001
sCr (μmol/L)	72.45 (57.05, 130.575)	140.80 (105.0, 230.7)	.001
APACHE II	15.09 ± 0.61	23.26 ± 1.07	<.001
GCS	13 (10, 15)	10 (6, 13)	<.001
Infection state (n)			
Lung	60/96	28/43	.767
Abdomen	18/96	5/43	.296
Biliary tract	10/96	6/43	.546
Other parts	8/96	4/43	.851
Background disease			
Diabetes	25/96	11/43	.954
Hypertension	38/96	16/43	.791
Ischemic heart disease	19/96	10/43	.624
cerebrovascular disease	13/96	6/43	.948
chronic pulmonary disease	6/96	4/43	.52
ICU epidemiological data			
Septic shock	24/96	26/43	<.001
Mechanical ventilation (h)	72.0 (0, 168)	182.0 (72.0, 414.0)	<.001
SOFA at ICU admission	5.0 (4.0, 7.0)	10.0 (7.0, 13.0)	.24
ICU LOS (d)	11.67 ± 1.04	15.76 ± 2.51	.184
Concurrent DIC	19/96	28/43	<.001
Concurrent AKI	34/96	35/43	<.001
Concurrent ARDS	31/96	19/43	.177
Na (mmol/L)	140.46 ± 0.62	140.86 ± 1.32	.756
K (mmol/L)	3.87 ± 0.05	4.27 ± 1.02	.002
BNP	640.50 (240.10, 3316.00)	1994.0 (729.6, 7942.0)	.001
CVVH	3/96	10/43	<.001
Ventilator utilization	63/96	40/43	.001
Administration of anti-G+ cocci agents	34/96	26/43	.006
Administration of antifungal agents	23/96	24/43	<.001
Administration of antiviral drugs	13/96	7/43	.671
Use of 2 or more anti-infective agents	19/96	18/43	.007
Proportion of G+ cocci culture	21/96	16/43	.059
Proportion of G- cocci culture	40/96	21/43	.431
Proportion of fungi culture	34/96	22/43	.08
Proportion of virus culture	5/96	4/43	.365

AKI = acute kidney injury, ALT = alanine aminotransferase, APACHE II = acute physiology and chronic health evaluation II, APTT = activated partial thromboplastin time, ARDS = acute respiratory distress syndrome, AST = aspartate aminotransferase, BNP = brain natriuretic peptide, BUN = blood urea nitrogen, CVVH = continuous venovenous hemofiltration, DIC = disseminated intravascular coagulation, FBG = fasting blood glucose, FiO_2 = fraction of inspired oxygen, GCS = Glasgow Coma Scale, HCT = hematocrit, HGB = hemoglobin, HR = heart rate, INR = International normalized ratio, LOS = length of stay, MAP = mean arterial pressure, NE = neutrophilic granulocyte, OI = oxygenation index, PA = prothrombin activity, PCT = procalcitonin, PH = power of hydrogen, PLT = platelets, PT = prothrombin time, RBC = red blood cell, RR = respiratory rate, sCr = serum creatinine, SOFA = sequential organ failure assessment, TBIL = total bilirubin, TT = thrombin time, WBC = white blood cell.

The WBC count criteria: the normal range for adults is 4–10 × 10^9/L.[12]

2.4. Statistical methods

EXCEL 2021 was utilized for data collection and collation, and IBM SPSS 26.0 was used for statistical analysis. Measurement data in this study were calculated to be normally distributed and expressed as (mean ± standard deviation), and intergroup differences were assessed using independent t tests. Counting data were represented as rate, and intergroup differences were assessed using the chi-square test. The ROC curves were plotted to assess the prognostic value of SOFA score, APACHE II score, and WBC count in septic patients. A binomial regression analysis was conducted to assess the risk factors for adverse prognosis in septic patients. The difference was statistically significant at a significance level of $P < .05$.

3. Results

3.1. Comparison of baseline data between the death and survival groups

The baseline data of the death and survival groups were collected, including gender, age, underlying diseases, and laboratory test results, and the intergroup comparison showed statistically significant differences in indicators such as mean arterial pressure, heart rate, respiratory rate, fraction of inspired oxygen, oxygenation index, WBC, neutrophilic granulocyte, platelets, prothrombin activity, International normalized ratio, fasting blood glucose, activated partial thromboplastin time, blood urea nitrogen, serum creatinine, APACHE II, Glasgow Coma Scale, septic shock, mechanical ventilation, concurrent disseminated intravascular coagulation, concurrent acute kidney injury, serum K, brain natriuretic peptide, continuous venovenous hemofiltration, ventilator utilization, administration of anti-Gram-positive bacterial agents, administration of antifungal agents, and use of 2 or more anti-infective agents. Other aspects showed no significant differences ($P > .05$) (Table 1 and Fig. 2).

3.2. SOFA score predicts mortality risk of sepsis

The ROC curve of the SOFA score was plotted to predict the mortality risk of sepsis, yielding an AUC of 0.809 (95% CI = 0.734–0.871, $P < .0001$) (Fig. 3).

3.3. APACHE II score predicts mortality risk of sepsis

The ROC curve of the APACHE II score was plotted to predict the mortality risk of sepsis, yielding an AUC of 0.806 (95% CI = 0.729–0.884, $P < .0001$) (Fig. 4).

3.4. WBC count predicts mortality risk of sepsis

The ROC curve of the WBC level was plotted to predict the mortality risk of sepsis, yielding an AUC of 0.689 (95% CI = 0.591–0.788, $P = .004$) (Fig. 5).

3.5. Analysis of the predictive value of combined detection for mortality risk of sepsis

The ROC curves of the combined detection of WBC count, SOFA score, and APACHE II score were plotted to predict the mortality risk of sepsis, yielding an AUC of 0.861 (95% CI = 0.792–0.914, $P < .0001$) (Table 2 and Fig. 6).

3.6. Univariate regression analysis of mortality in septic patients

To verify the application value of WBC count, SOFA score, and APACHE II score in predicting mortality among septic patients, a univariate regression analysis was conducted concerning the mortality outcomes of septic patients, indicating that SOFA, APACHE II scores, and WBC count were correlated with mortality in septic patients ($P < .05$) (Table 3).

3.7. Logistic regression analysis of prognosis in septic patients

The binomial regression analysis showed that SOFA score, APACHE II score, and WBC count were the independent risk

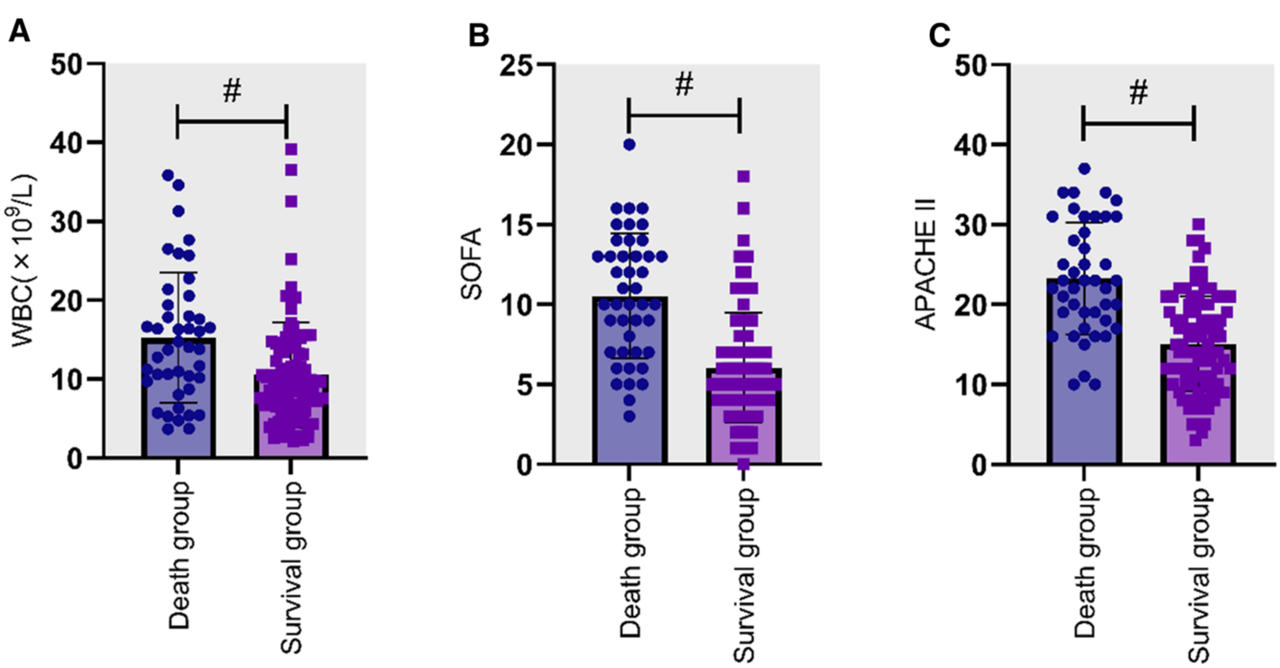

Figure 2. Comparison of WBC count, SOFA score, and APACHE II score between the death and survival groups. APACHE II = acute physiology and chronic health evaluation II, SOFA = sequential organ failure assessment, WBC = white blood cell.

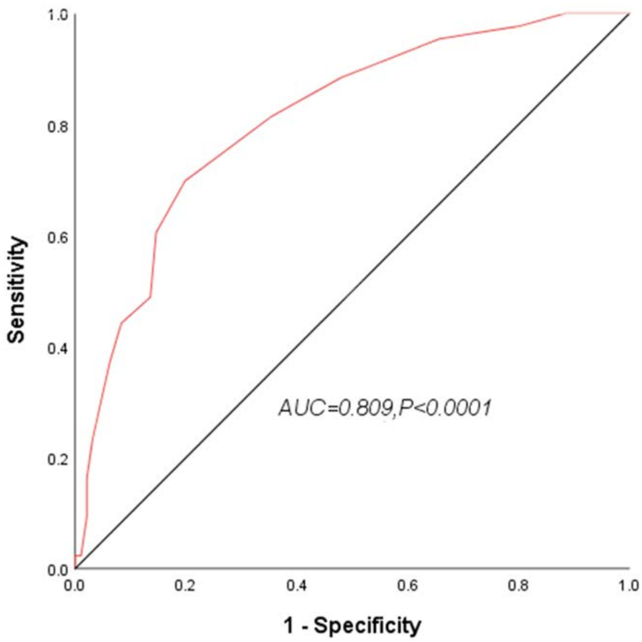

Figure 3. ROC curve of SOFA score for predicting mortality risk of sepsis. SOFA = sequential organ failure assessment.

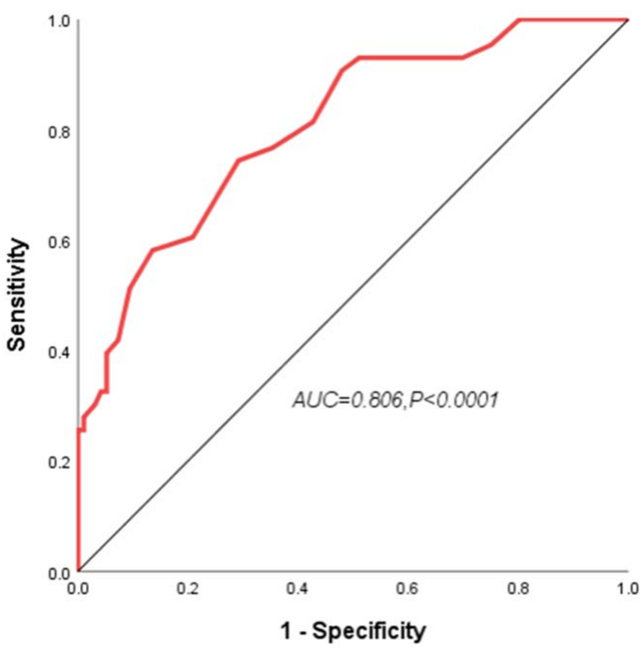

Figure 4. ROC curve of APACHE II score for predicting mortality risk of sepsis. APACHE II = acute physiology and chronic health evaluation II.

factors for adverse prognosis in septic patients ($P < .05$) (Table 4 and Fig. 7).

4. Discussion

The pathogenesis of sepsis is intricate, with various theories existing regarding its onset, such as exotoxins, signaling and receptor transduction mechanisms, neuroendocrine-immune networks, gut microbiota translocation, coagulation dysfunction, inflammatory imbalance and immune suppression, genetic polymorphisms, etc.[13,14] The occurrence and progression of sepsis is a continuous dynamic process. Despite the recent

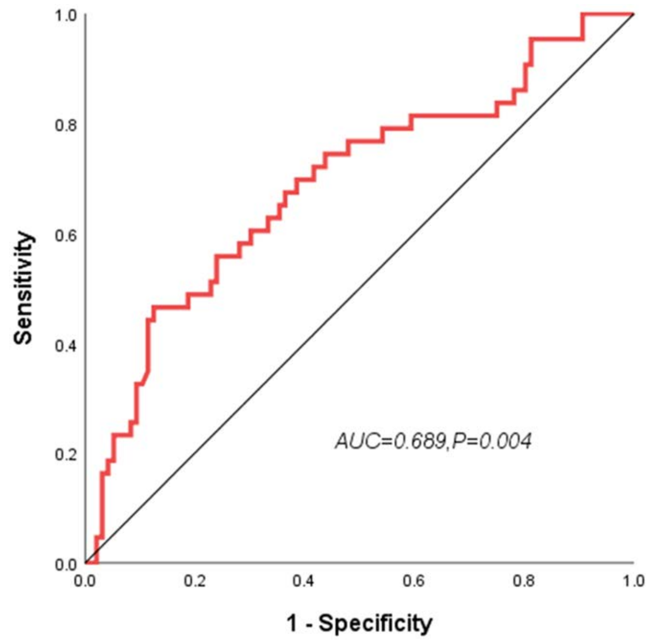

Figure 5. ROC curve of WBC count for predicting mortality risk of sepsis. WBC = white blood cell.

Table 2

Analysis of the predictive value of different indicators.

Indicators	B	SE	Wals	df	Sig.	Exp (B)
SOFA score	0.18	0.07	6.64	1	0.01	1.198
APACHE II score	0.133	0.044	9.068	1	0.003	1.143
WBC	0.076	0.032	5.621	1	0.018	1.079
Constant	-5.739	0.976	34.559	1	0	0.003
Combined detection	-0.803	0.184	19.156	1	0.000	0.448

APACHE II = acute physiology and chronic health evaluation II, SOFA = sequential organ failure assessment, WBC = white blood cell.

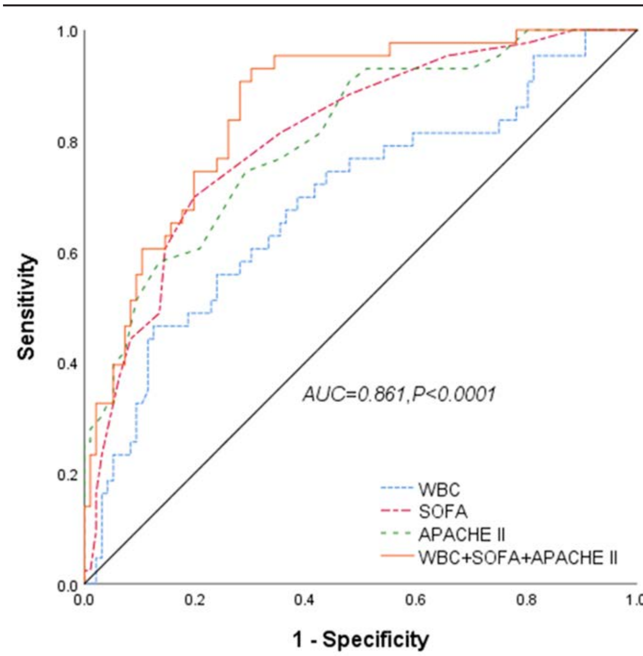

Figure 6. Analysis of the predictive value of combined detection for mortality risk of sepsis.

application of various advanced medical devices and refined medical management in the treatment of septic patients, the mortality rate of both sepsis and septic shock patients remains as high as 20% to 50%, with many surviving patients experiencing significant complications.[15,16] Existing research[17] indicates that the pathogenesis of sepsis is rather intricate, yet not entirely elucidated. However, severe infection in the body triggers immune dysregulation, leading to an excessive production of cytokines, which in turn are involved in the progress of immune dysregulation, ultimately resulting in a cascade of reactions that manifests as multiorgan hypoperfusion and eventually death.[18]

The results of this study indicated that after subgroup differentiation of septic patients based on 28-day clinical outcomes, WBC levels, SOFA scores, and APACHE II scores of patients in the survival group were significantly lower than those of patients in the death group, consistent with the findings of other scholars.[19] Early assessment of illness and prognosis contributes to providing insights into the treatment of septic patients, thereby holding positive significance for ameliorating the prognosis of patients afflicted with sepsis.

The SOFA score has been demonstrated to have significant potential in early identification of sepsis and dynamic monitoring of patient condition. Previous research[20] suggests that clinicians can assess organ function in septic patients using the SOFA score, which is capable of assessing the function of respiratory, hematologic, hepatic, circulatory, neurological, and renal systems in subjects, facilitating an evaluation of individual organ function through the scale. A study involving 182 ICU patients with sepsis[21] has found that a SOFA score of ≥2 is more accurate in predicting the 24-hour mortality rate of patients compared to qSOFA score and SIRS criteria. A controlled study involving 1782 ICU patients with sepsis[22] revealed that the SOFA score had an AUC of 0.879 for predicting mortality in ICU septic patients, and the SOFA scores of deceased patients were significantly higher than those of survival patients ($P < .05$), consistent with the findings of this study.

The application of the APACHE II scoring system is widespread in clinical practice. This scale necessitates assessment within 24 hours after admission to the ICU, and the score derived from this scale enables a quantification of the patient's condition, thereby providing insight into the determination of treatment strategies. It assists physicians in assessing the adequacy of medical interventions and determining the appropriate timing for surgery. Research conducted on patients with sepsis[23] suggests that the higher the APACHE II score, the higher the hospital infection rate and inpatient mortality rate of sepsis patients, indicating that this score has good predictive and evaluative value for the prognosis of septic patients. The results of this study suggested that the utilization of the APACHE II scale yielded an AUC of 0.806 for assessing the adverse prognosis of septic patients, consistent with the findings from other researchers. For instance, Safari et al[24] assessed the predictive value of the APACHE II score for diabetic ketoacidosis, a severe metabolic disorder that typically requires close monitoring and treatment in the ICU; by analyzing the APACHE II scores of emergency department patients with hyperglycemia, the research of Safari et al[24] likely aimed to determine whether this scoring system can effectively identify patients at higher risk of developing diabetic ketoacidosis, thereby aiding clinicians in making more accurate treatment decisions. However, the APACHE II scale has numerous inadequacies, such as its plethora of evaluation

Table 3

Univariate regression analysis of mortality in septic patients.

Parameters	B	SE	Wals	df	Sig.	Exp (B)
Vasopressors	1.523	0.391	15.186	1	0	4.588
MAP (mm Hg)	-0.052	0.014	14.109	1	0	0.949
HR	0.034	0.008	17.844	1	0	1.034
RR	0.07	0.023	9.523	1	0.002	1.073
FIO_2	-0.022	0.1	0.047	1	0.829	0.979
OI	-0.005	0.002	7.996	1	0.005	0.995
PH	-4.917	2.214	4.932	1	0.026	0.007
WBC ($\times 10^9$/L)	0.083	0.026	10.082	1	0.001	1.087
NE (%)	0.019	0.014	1.888	1	0.169	1.019
PLT ($\times 10^9$/L)	-0.006	0.002	6.518	1	0.011	0.994
D-Dimer	0.04	0.019	4.407	1	0.036	1.041
PA	-0.046	0.013	11.705	1	0.001	0.955
INR	2.522	0.903	7.796	1	0.005	12.45
FBG	-0.003	0.001	6.183	1	0.013	0.997
APTT	0.019	0.009	4.62	1	0.032	1.019
BUN (mmol/L)	0.062	0.017	12.714	1	0	1.064
sCr (μmol/L)	0.004	0.002	6.092	1	0.014	1.004
APACHE II	0.193	0.037	26.876	1	0	1.213
GCS	-0.22	0.057	14.903	1	0	0.802
Septic shock	1.523	0.391	15.186	1	0	4.588
Mechanical ventilation (h)	1.944	0.636	9.339	1	0.002	6.984
SOFA at ICU admission	0.304	0.058	27.276	1	0	1.355
Concurrent DIC	2.024	0.41	24.373	1	0	7.565
Concurrent AKI	2.077	0.446	21.659	1	0	7.978
K (mmol/L)	0.84	0.298	7.969	1	0.005	2.317
BNP	0	0	3.89	1	0.049	1
CVVH	2.24	0.689	10.578	1	0.001	9.394
Ventilator utilization	1.026	0.378	7.365	1	0.007	2.789
Administration of anti-G+ cocci agents	1.026	0.378	7.365	1	0.007	2.789
Administration of antifungal agents	1.389	0.389	12.729	1	0	4.009
Use of 2 or more anti-infective agents	1.071	0.401	7.115	1	0.008	2.918

AKI = acute kidney injury, APACHE II = acute physiology and chronic health evaluation II, BUN = blood urea nitrogen, CVVH = continuous venovenous hemofiltration, DIC = disseminated intravascular coagulation, FBG = fasting blood glucose, FiO_2 = fraction of inspired oxygen, GCS = Glasgow Coma Scale, HR = heart rate, INR = International normalized ratio, MAP = mean arterial pressure, NE = neutrophilic granulocyte, OI = oxygenation index, PH = power of hydrogen, PLT = platelets, RR = respiratory rate, sCr = serum creatinine, SOFA = sequential organ failure assessment, WBC = white blood cell.

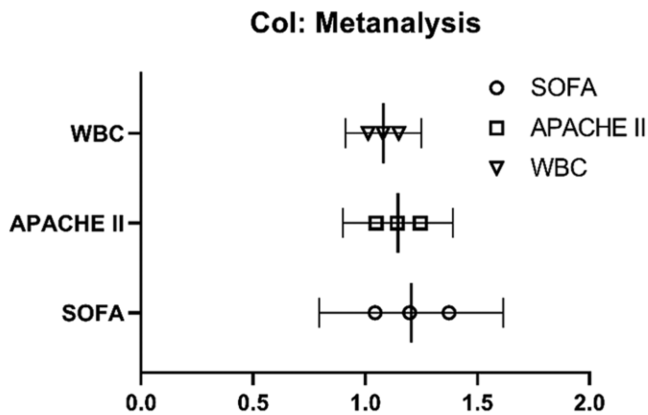

Figure 7. Logistic regression analysis of prognosis in septic patients.

indicators and prolonged assessment duration, potentially rendering it unsuitable for the evaluation of critically ill patients.

The WBC count has been used in clinical settings to reflect individual immune status for a long time. Previous research[25] has also confirmed the close association between sepsis and systemic inflammatory response, thus selecting this indicator to evaluate the prognosis of septic patients has a certain theoretical basis. The findings in this study also confirmed the valuable utility of WBC count in assessing the adverse prognosis of septic patients (AUC = 0.689). Although its predictive accuracy is inferior to SOFA and APACHE II scores, this discrepancy may stem from the comprehensive nature of the latter scoring systems, which evaluate the functional status of multiple organ systems, thereby providing a more holistic reflection of organ dysfunction in sepsis patients. In contrast, WBC count primarily reflects the inflammatory state of the body and lacks the capacity for a comprehensive assessment. However, it is essential to acknowledge the certain limitation of single-index evaluation in predicting adverse prognosis. Therefore, this study analyzed the efficacy of the combined detection in assessing sepsis prognosis, with results indicating that WBC + SOFA + APACHE II yielded an AUC of 0.861 for assessing the adverse prognosis of sepsis, superior to any single index. The idea has been validated by other scholars, as demonstrated by the research of Wei et al,[26] indicating that the combined use of sTREM-1 and sST2 holds superior diagnostic and prognostic utility for septic patients, in line with the point of this study. Finally, logistic regression analysis was conducted to verify that WBC count, SOFA, and APACHE II scores were all independent risk factors for adverse prognosis in septic patients, thereby corroborating the preceding findings indirectly.

Although this study proposes a novel approach for assessing the prognosis of sepsis, it also has several limitations, such as a small sample size and a single source. A multicenter, prospective study with a larger sample will be conducted in the future to help rectify the research findings and provide more accurate reference data for the treatment of septic patients. Moreover, the authors of this study suggest that innovative diagnostic methods can be applied to the diagnosis and prognostic evaluation of sepsis. For instance, the study by Mahmoodpoor et al[27] highlights the significant potential of flow cytometry in assessing the immune status of sepsis patients, which may contribute to enhancing sepsis diagnosis and prognosis. By analyzing specific immune cell markers, such as CD64 (a macrophage activation marker), HLA-DR (associated with immune cell function), CD25 (linked to regulatory T cells), and TLRs (Toll-like receptors involved in immune response recognition), researchers can gain deeper insights into the immune status of sepsis patients, thereby guiding treatment strategies and providing valuable direction for the subsequent research efforts of our team.

Table 4

Logistic regression analysis of prognosis in septic patients.

Risk factors	B	SE	Wald	P	Exp (B)	95% CI
SOFA	0.180	0.070	6.640	.010	1.198	1.044–1.374
APACHE II	0.133	0.044	9.068	.003	1.143	1.048–1.246
WBC	0.076	0.032	5.621	.018	1.079	1.013–1.149
Constant	-5.739	0.976	34.559	.000	0.003	

APACHE II = acute physiology and chronic health evaluation II, SOFA = sequential organ failure assessment, WBC = white blood cell.

5. Conclusions

Patients with sepsis demonstrate significant elevations in WBC count, SOFA, and APACHE II scores. The combined application of these indicators holds considerable value in predicting the mortality outcomes of septic patients. Accordingly, clinical treatment plans can be adjusted based on these aforementioned indicators to ameliorate the prognosis of septic patients.

Author contributions

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