

# Features of Sepsis With Worse Outcomes in the ICU Admissions: a Cohort Study From Quick Diagnostic Tests

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## Research Article

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# Abstract

**Background:** Sepsis is still a global public health priority. We aimed to investigate the features of sepsis with worse outcomes in a single ICU of China..

**Methods:** We enrolled patients with acute critically ill with sepsis from ICU in China (Jan 1, 2018 to Nov 30, 2019). All patients underwent quick diagnostic tests before and after on admission. We collected data on the features of sepsis cases from hospital medical records and follow-up information. Outcomes were compared between patients who were survivors and those who were not.

**Results:** Of 520 ICU admissions, 214 (41.2%) critically ill adults with sepsis were analyzed. The median age was 66 years (range 18-91 years) and 140 (65.4%) patients were males. 144 (78.3%) community-acquired pneumonia in 184 pneumonia cases were identified by quick chest CT and need mechanically ventilation in ICU. The rate of community- acquired sepsis was 73.8% (158/214) and was associated with a high risk of dynamic profile of inflammatory mediators for nonsurvivors. The initial common symptoms Of sepsis were fever (42.5%), altered mental status/delirium (41.1%), acute coma (34.1%), and cough/dyspnea (29.9%). Based on data with significant univariate at initial 24 hours in ICU, the multivariate logistic analysis revealed a higher SIRS score (OR,4.7; 95% CI, 2.004-14.37), a higher SOFA score which mainly showed higher prevalent lungs and brain failure (OR, 1.7; 95% CI, 1.299- 2.298), and a lower GCS score (OR, 0.8; 95% CI, 0.673- 0.987) were established as early risk factors for sepsis in nonsurvivors. The mortality of sepsis was 55.6% at 28 days.

**Conclusions and relevance:** Sepsis cases are mainly from community-acquired pneumonia. Severe SIRS and lungs/brain failure are related to the high mortality of sepsis.

## Introduction

Sepsis is a life-threatening organ dysfunction that is caused by a dysregulated host response to infection [1]. However, the sepsis—met sepsis-3 criteria, also the most frequent complication of critically ill adults in the ICU, has become the leading cause of morbidity and mortality worldwide [2, 3]. Moreover, the WHO estimates 30 million new cases of sepsis and approximately 6 million deaths per year in high-income countries worldwide, and recognizes sepsis as a global public health priority [4]. Unfortunately, this data may be severely underestimated because its statistics did not have the data from China and in low-income countries worldwide. Furthermore, this sepsis has been largely ignored by clinical workers and the public because its onset is often hidden behind various critical illnesses and is unlike coronavirus disease 2019 (COVID-2019) patients with sepsis with outbreak transmission [5, 6]. In the present study, we aimed to determine the features of worse outcomes of critically ill patients with sepsis in a single ICU of China, including epidemiological, clinical complications, radiological findings, laboratory data, and treatment. Moreover, our cohort study is from quick diagnostic tests (quick systemic CT scans and quick clinical tests). We hope that our study results will provide new evidence for the update of sepsis and achieve effective treatment.

# Methods

## Study setting and population

This study included critically ill adults who were admitted to a general ICU at the Affiliated Shuyang Hospital of Xuzhou Medical University in China. The current study recruited critically ill adults who were admitted between Jan 1, 2018, and Nov 30, 2019 (before COVID-19 outbreak), with a length of stay of more than 24 hours. We examined the electronic medical records of patients who were verified as having critically ill events with available records. We also excluded possible critically ill patients who did not have data in their medical records due to either death or transport out of the ICU within the first 24 hours. The study was approved by the ethical committee on clinical research of the Affiliated Shuyang Hospital of Xuzhou Medical University. Because the study involved only a review of records obtained as a part of routine medical care, it did not require written information consent from all patients.

## Patient identification

All patients underwent quick systemic CT scans (brain, thorax, and abdominal) before on admission. On quick chest CT tests, we identified community-acquired pneumonia (the typical pneumonia of chest CT images including bilateral multiple lobular and subsegmental areas of consolidation). The community-acquired sepsis was diagnosed by an acute change in the total Sequential Organ Function Assessment (SOFA) scores  $\geq 2$  points consequent to the community-acquired pneumonia and/or systemic inflammatory response syndrome (SIRS).

A SIRS mainly involves massive inflammatory cytokine release [7]. More recently, this response has been called a cytokine storm or cytokine release syndrome, which is a life-threatening systemic inflammatory syndrome [8]. Furthermore, SIRS has been recognized as a clinical manifestation of the host response to suspected infection. Thus, we used SIRS criteria  $\geq 2$  to identify infection events within first 0.5-1 hour in ICU. The clinical manifestations of SIRS include the following 4 points: (1) temperature  $> 38^{\circ}\text{C}$  or  $< 36^{\circ}\text{C}$ ; (2) heart rate  $> 90$  beats per minute; (3) tachypnea greater than 20 respirations per minute or  $\text{Pco}_2$  less than 32mmHg; (4) white blood cell count  $> 12.0 \times 10^9/\text{L}$  or  $< 4.0 \times 10^9/\text{L}$ , or  $> 10\%$  band forms. The identified criteria for SIRS must be at least  $\geq 2$  points/scores ( $\geq 3$  points/scores = severe). In addition, this inflammatory syndrome also involves other inflammatory mediators in the blood (e.g., interleukin-6, D-dimer and C-reactive protein). Therefore, we also quick tested these inflammatory mediators.

Sepsis must present one or more acute organ dysfunctions caused by infection. Acute organ dysfunction is defined as equivalent to a sequential [sepsis-related] organ function assessment (SOFA) score  $\geq 2$  for a particular organ [with  $>4$  scores indicating a multiple organ dysfunction syndrome (MODS)]. For example, a SOFA score  $\geq 2$  for acute respiratory failure/ARDS indicates  $\text{PaO}_2/\text{Fio}_2 < 300$  mmHg or  $\text{SpO}_2 < 93\%$  on minimal 2 L/min supplemental oxygen. The SOFA criteria for other organ failures are reported in document [9].

## Data collected

The collected clinical profile for this study performed in the ICU included patient demographics, comorbidities, time from critical illness to ICU admission, presenting symptoms, vital sign data, acute organ dysfunction, laboratory tests, cranial and thorax/ abdominal CT scans findings, and treatment during the ICU stay. Laboratory tests included complete blood count, coagulation data (D-dimer and fibrinogen), liver and renal function, cytokines and other inflammatory mediators, SIRS score, SOFA score, mechanical ventilation, length of stay (LOS) in the ICU, and outcomes.

The outcome events were reviewed by two of the investigators (the first and fourth authors). To investigate the outcomes of patients during the first 72 hours and at 28 days, the survival results were determined from the hospital records and followed up to 28 days.

Based on the inclusion criteria for sepsis after critically ill events, the study data were divided into the sepsis survivor group and nonsurvivor group for statistical analysis.

## Statistical methods

The results for each group are expressed as the mean  $\pm$  standard deviation (SD) or median (IQR), and n (%) indicates qualitative values. Fisher's exact test and the Mann-Whitney *U* test were used to examine the relationship between baseline patient variables. Continuous variables were compared using Student's *t* test. Multivariate-adjusted odds ratios (ORs) and 95% confidence intervals (CIs) were estimated using a logistic regression model if they were significant according to the univariate analysis. Differences between patients were considered significant if the p-value was  $<0.05$ . Statistical calculations were performed using a proprietary, computerized statistics package (SPSS 17.0.).

## Results

A total of 520 acute critically ill adult patients were recruited. After ruling out patients who did not meet the eligibility criteria for the study design, infection was confirmed by a brain-chest-abdomen CT scan before on admission. Finally, 214 (41.2%) critically ill patients with sepsis at ICU admission were identified by the sepsis-3 criteria (Figure 1).

The clinical characteristics of the 214 sepsis patients are shown in Table 1. The median age was 66.7 years (range 18-91 years) and 140 (65.4%) patients were males. Of these patients, the most common comorbidity was hypertension (45.8%), followed by previous cardiac-cerebral vascular disease (33.6%), current acute traumatic brain injury events (27.1%), and current intracranial hemorrhage events (18.7%). The most common initial presenting symptoms were fever [91 (42.5%)], altered mental status/delirium [88 (41.1%)], acute coma [73 (34.1%)], and cough/dyspnea [64 (29.9%)]. The median time from onset to ICU admission was 3.2 hours (range, 0.5-240 h).

Table 1

## Clinical characteristics in patients with sepsis (n=214)

	Total (n=214)	Non- survivors (n=119)	Survivors (n=95)	<i>p</i> Value
Age (years, mean±SD)	66.7± 16.1	67.7± 15.7	65.4± 16.5	0.297
Male gender ( n,%)	140(65.4)	79(66.4)	61(64.2)	0.774
Comorbidities				
Hypertension( n,%)	98(45.8)	54(45.4)	44(46.3)	1.000
Previous cardiac-cerebral vesicular disease,( n,%)	72(33.6)	39(32.8)	33(34.7)	0.773
Diabetes( n,%)	35(16.4)	22(18.5)	13(13.7)	0.360
Chronic lung disease( n,%)	30(14.0)	11(9.0)	19(20.0)	0.029
Cancer( n,%)	19(0.9)	12(10.1)	7(7.4)	0.630
Current traumatic brain injury, ( n,%)	58(27.1)	34(28.6)	24(25.3)	0.644
Current intracranial hemorrhage, ( n,%)	40(18.7)	31(26.1)	9(9.5)	0.002
Initial presenting symptoms				
Fever,( n,%)	91(42.5)	59(49.6)	32(33.7)	0.026
Altered mental status/delirium,( n,%)	88(41.1)	57(47.9)	31(32.6)	0.026
Acute coma,( n,%)	73(34.1)	49(41.2)	24(25.3)	0.020
Cough/dyspnea,( n,%)	64(29.9)	44(37.0)	20(21.1)	0.016
Chest/abdominal pain,( n,%)	12(5.6)	6(5.0)	6(6.3)	0.769
Dizziness/headache,( n,%)	11(5.1)	5(4.2)	6(6.3)	0.554
Other, ( n,%)	5(2.3)	3(2.5)	2(2.1)	1.000
Acute pneumonia/lung infection, n (%)	184(86.0)	99(83.2)	85(89.5)	0.236
Community-acquired sepsis, n (%)	158(73.8)	88(73.9)	70(73.7)	1.000
Median(IQR) time from onset to ICU(hours)	3.2(0.5-240)	2.7(0.5-144)	5.5(0.5-240)	0.012
Median(IQR)GCS score	13(5-15)	12(5-15)	13(5-15)	0.044
Median(IQR) temperature(°C)n (%)	37.5(35.3-40.0)	37.8(36-40.0)	36.9(35.3-39.7)	0.075
Median(IQR)arterial pressure(mmHg)	93(40-160)	93(40-160)	98.7(90-130)	0.266
Median(IQR)Heart rate(beats/min)				0.354

Median(IQR)Respiratory rate(breaths/mim)	102(58-107)	102(70-107)	102(58-148)	0.818
MODS, n (%)	27(0-45)	27(5-35)	27(0-45)	0.007
LOS (days,IQR)	206(96.3)	119(100.0)	87(991.6)	0.001
Mortality at 28 days,n (%)	8.8(1-127)	7.5(1-90)	9.5(2-127)	0.300
	119(55.6)	NA	NA	

Abbreviations: ICU, intensive care unit; GCS, Glasgow Coma Scale; SOFA, Sequential [sepsis-related] Organ Function Assessment; LOS, length of stay; IQR;interquartile range MODS, multiple organ dysfunction syndrome.

Among the 214 critically ill patients with sepsis, 184 (86.0%) pneumonia patients, including 78.3% (144/184) community-acquired pneumonia (Figure 2) and 21.7% nosocomial- acquired pneumonia, were diagnosed by chest CT and/or digital radiography (DR) and need mechanically ventilation in ICU. Of these, 158 (73.8%) community-acquired sepsis patients were diagnosed based on SOFA scores  $\geq 2$  points. In all sepsis patients, the risk of death was 16.8% (36/214) at the initial 72 hour point and 55.6% (119/214) at 28 days.

### Dynamic profile of laboratory findings in patients with sepsis

The data of the surviving or nonsurviving sepsis patients are described in Table 2. The laboratory findings in the survivors were from the worst value during the clinical course in the ICU, but the major critical values in the nonsurvivors were tracked before death. The main dynamic findings during sepsis progression included 6 laboratory parameters, which were from within the initial 1 days to 24 days after ICU admission at 3-day intervals. The interleukin-6 (IL-6), D-dimer, C-reactive protein (CRP), and SpO2 levels and the SIRS and SOFA scores were higher in the nonsurvivors than in the survivors (Figure 3). In addition, we found that nonsurviving sepsis patients were more likely to present with higher qSOFS scores, elevated procalcitonin, elevated creatinine, elevated blood glucose, and elevated lactic acid than survivors (all  $p < 0.05$ ). However, the white blood cell counts and neutrophil counts were similarly high between the nonsurvivors and survivors.

Table 2

Laboratory findings in patients with sepsis who died and survivor (n=214)

Variables	Normal value	Total(n=214) M(IQR)	Non-survivor(n=119) M(IQR)	Survivor(n=95) M(IQR)	P Value
White blood cell count, x10 <sup>9</sup> /L	3.5-9.5	13.0(0.87-34.6)	13.0(0.87-34.6)	13.3(2.3-34.6)	0.847
Neutrophil count, x10 <sup>9</sup> /L	1.8-6.3	7.6(2.9-19.8)	7.4(5.3-19.8).	7.8(2.9-19.6)	0.820
Neutrophil percent,%	40-75	85.6(56-92.7)	84.7(66.6-97.2)	85.7(56-96.4)	0.599
Lymphocyte count, x10 <sup>9</sup> /L	1.1-3.2	0.66(0.19-4.3)	0.66(0.19-4.3)	0.66(0.23-3.1)	0.826
Platelet count, x10 <sup>9</sup> /L	125-350	171.7(3-887)	177(23-887)	168(3.0-493)	0.265
Interleukin-6,pg/mL	<7	24.6(3.6-4000)	24.6(9.6-4000)	11.2(3.6-91)	0.000
C-reactive protein,mg/L	0-8	122(4.2-379)	122(4.2-379)	102(4.2-378)	0.005
procalcitonin, ng/mL	0-0.05	2.7(0.03-500)	2.7(0.03-500)	1.2(0.3-35.4)	0.005
D-dimer, mg/mL	0-0.232	1.9(0.07-94.7)	1.9(0.07-94.7)	1.2(0.17-67.8)	0.038
Fibrinogen,g/L	2.38-4.98	2.7(0.47-8.8)	2.7(0.47-8.8)	2.5(0.86-7.8)	0.318
Cardiac troponin I,pg/mL	0-0.04	0.05(0.0-50.3)	0.52(0.0-50.3)	0.02(0.0-27.9)	0.058
Lactic acid ,mmol/L	0.7-2.1	3.0(1.15-15.9)	3.2(1.2-12.2)	2.8(1.2-15.9)	0.032
Serum glucose,mmol/L	3.9-6.1	8.4(3.4-44.5)	8.6(3.6-44.5)	7.9(4.0-41.0)	0.010
Creatinine, umol/L	64-104	81(10.4-739)	99.6(38.99-739)	72(10.4-494)	0.019
Total bilirubin,mmol/L	0-23	19.2(4.7-1245)	19.2(6.2-1245)	19.1(4.7-181)	0.783
SpO <sub>2</sub>	<93%	76.8(30-92)	72.5(49-92)	82(32-90)	0.001
SIRS score	0-4	2.8(2-4)	3.4(3-4)	2.1(1-4)	0.000
qSOFA score	0-3	1.8(0-3)	2.0(0-3)	1.7(0-3)	0.042
SOFA score	0-4	9.1(2-18)	11.2(6-18)	7.4(2-13)	0.000

Abbreviations: SPO<sub>2</sub>, saturation of arterial oxygen; SIRS, systemic inflammatory response syndrome; SOFA, Sequential [sepsis-related] Organ Function Assessment; qSOFA, quick SOFA.

However, by logistic regression analysis, only a severe SIRS (OR, 4.7; 95% CI, 2.004-14.37), a higher SOFA score which mainly indicate lungs and brain failure (OR, 1.7; 95% CI, 1.299- 2.298), and a lower GCS score (OR, 0.8; 95% CI, 0.673- 0.987), were established as early risk factors for sepsis in nonsurvivors. (Table 3)

Table 3

Logistic regression analysis to identify the death risk factors of sepsis patients in ICU (n=214)

Variables	Non-survivors (n=119)	Survivors (n=95)	OR (95% CI)	<i>P</i> Value
SIRS score (mean±SD)	5.3±0.65	3.8±0.68	4.7(2.004-14.37)	0.000
SOFA score (mean±SD)	11.3±2.9	7.3±2.4	1.7(1.299-2.298)	0.000
GCS score (mean±SD)	10.4±3.3	11..7±3.8	0.8(0.673-0.987)	0.035

Abbreviations: SIRS, systemic inflammatory response syndrome; SOFA, Sequential [sepsis-related] Organ Function Assessment; ICU, intensive care unit.

Acute respiratory failure/ARDS (93.5%, 200/214) and acute brain failure (94.4%, 202/214) were the most frequent life-threatening organ dysfunctions for sepsis, followed by septic shock (47.7%, 102/214), and acute kidney failure (33.2%, 71/214). Moreover, MODS was associated with up to 96.3% (206/214) and 57.0% mortality (Figure 4).

## Discussion

The prevalence of sepsis in the last 30 years has been reported to range from 21.7–51.5% of all patients admitted to the ICU [10, 11], about 30–42.8% community-acquired pneumonia associated sepsis [2, 3, 11, 12], with a mortality rate of 23–48.2% in the ICU [2, 3, 11], 81.7% of septic patients with delirium in the ICU develop acute respiratory distress syndrome (ARDS), requiring intubation and mechanical ventilation [13]. Although sepsis has been frequently studied, its clinical features and risk factors of patients who were non-survivors still need clarification. Undoubtedly, early diagnosis and treatment can reduce the mortality of sepsis. In the present study, so we used quick diagnosis tests, including early systemic CT scans and quick clinical tests to screen infection and sepsis. We found that the features of sepsis were mainly from community-acquired sepsis (73.8%), and most of them with community-pneumonia (78.3%). These data are higher than previous study [14], and the features are similar to the current outbreak of COVID-19 sepsis [9, 15].

More importantly, we found that acute respiratory failure/ARDS (93.5%) and acute brain failure (94.4%) were the most common life-threatening organ dysfunctions in most of the sepsis cases, with a 55.6% risk of death within the initial 28 days in the ICU.



It should be noted, however, that critically ill ICU patients with sepsis with a high risk of death in our study were more likely to present with a higher SIRS score, a higher SOFA score, a higher qSOFA score, elevated interleukin-6, elevated D-dimer, lower GCS score and lower SpO<sub>2</sub>, elevated CRP and procalcitonin, elevated creatinine, elevated blood glucose, and elevated lactic acid. Notably, by multivariate regression analysis, only higher SIRS scores and higher SOFA scores (MODS) were related to high mortality in critically ill patients with sepsis.

Several possible interpretations of the results for sepsis with high mortality are as follows. First, MODS due to sepsis resulting in high mortality has been recognized [4, 14, 16–19], and previous studies have shown that sepsis patients with MODS are more likely to exhibit ARDS [4, 17–19] and acute brain dysfunction [13, 20–22], which is related to their vulnerability to hypoxia/SIRS [7, 13, 19–22]. Our data showed that current sepsis had MODS and that over 90.0% of patients with sepsis had acute respiratory failure/ARDS. The features of ARDS are mainly acute pneumonia/pulmonary infection due to a dysregulated immune response leading to higher inflammation in the lungs, followed by the development of pulmonary edema, hyaline membrane formation, and respiratory failure [19, 23]. Moreover, acute respiratory failure/ARDS plays a pivotal role in the development of MODS in septic events [7, 13, 14, 18]; epithelial damage and SIRS are the main pathophysiological features of ARDS and play an important role in distinguishing the hyperinflammatory subtypes of ARDS [19].

Another possibility is that acute brain failure is also ranked as the leading organ dysfunction and for the host response to hyperinflammation, which is more likely to be due to hypoxic/SIRS [13, 14, 16, 20–22], especially with a cause of acute pneumonia/pulmonary infection [14, 17, 18]. Similar to the current outbreak of COVID-19 pneumonia, the mechanisms of bacterial pneumonia are also related to angiotensin conversion enzyme 2 (ACE2)-involved inflammatory response/cascade [24, 25]. Furthermore, blood-brain barrier (BBB) leakage is also due to an overwhelming release of proinflammatory cytokines and anti-inflammatory factors [26–28]. SIRS is responsible for extensive BBB leakage and even brain edema and cerebral ischemic injury as well as cell death [26–29]. Our current study confirmed that SIRS is a very high risk factor for dying from sepsis, supporting that it is a life-threatening systemic inflammatory syndrome [8, 30].

Strengths in this study, we are a first to report that a brain-chest-abdomen CT scan before arriving at the hospital to identify early infection site which is a visible really infection. Severe SIRS and severe lungs/brain failure could use to predict the risk of sepsis with worse outcomes,

However, some limitations of our design must be addressed. One limitation is the single center design, which may present a selection bias. However, this hospital is responsible for the medical care of the prefecture's population of approximately 1.8 million people, including an urban center and 38 villages and towns. This hospital ICU is a unique regional ICU (open 21-bed) with an emergency center (a total of 10 ambulances) that is responsible for all critically ill referrals in this prefecture. Thus, we believe that this sample does not lead to a large bias. The second limitation of this study is that organ dysfunction meeting the SOFA criteria was evaluated only according to old criteria. Although we made some changes,

the observed SOFA scores may still be underestimated. In addition, although the prognosis for sepsis was related to SIRS and MODS, further prospective multicenter studies are needed for some of the intermediary links.

## Conclusion

The vast majority of sepsis cases are from highly prevalent community-acquired pneumonia and with high risk of death. Severe SIRS and high prevalent lungs/brain failure are related to the high mortality of sepsis, suggesting that rapid antibiotic IV within the initial 1.0 hours in the ICU may improve patients' outcomes.

## Abbreviations

ICU: Intensive care unit; GCS, Glasgow Coma Scale; LOS, length of stay; IQR; interquartile range; MODS, multiple organ dysfunction syndrome. SPO<sub>2</sub>, saturation of arterial oxygen; SIRS, systemic inflammatory response syndrome; SOFA, Sequential [sepsis-related] Organ Function Assessment; qSOFA, quick SOFA.

## Declarations

### Contributors

Dr. Tong had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

*Study concept and design:* Tong, Zhou,

*Acquisition, analysis, or interpretation of data:* Tong, Zhou

*Drafting of the manuscript:* Tong.

*Statistical analysis:* Tong.

*Critical revision of the manuscript for important intellectual content:* All authors..

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### Declaration of Interests

No potential conflicts of interest were reported For all .authors

## Availability of data and materials

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

## Ethics approval and consent to participate

Approval was provided by the Institutional Review Board of the Shuyang People's Hospital, China.

## Consent for publication

Because the study involved only a review of records obtained as a part of routine medical care, it did not require written information consent from all patients for publication of this article and any accompanying images. Informed consent was waived by ethics committee of Shuyang Hospital.

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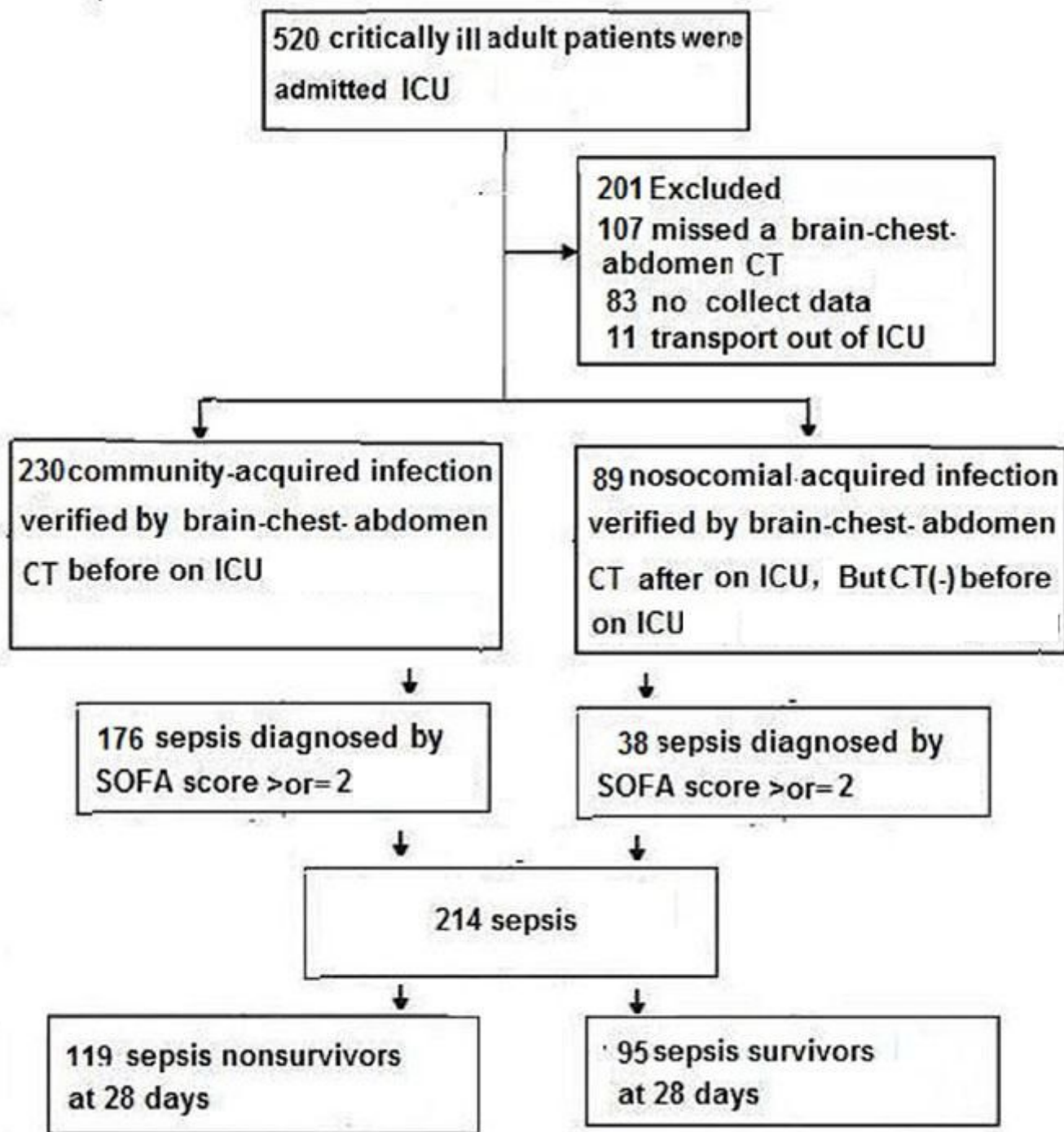
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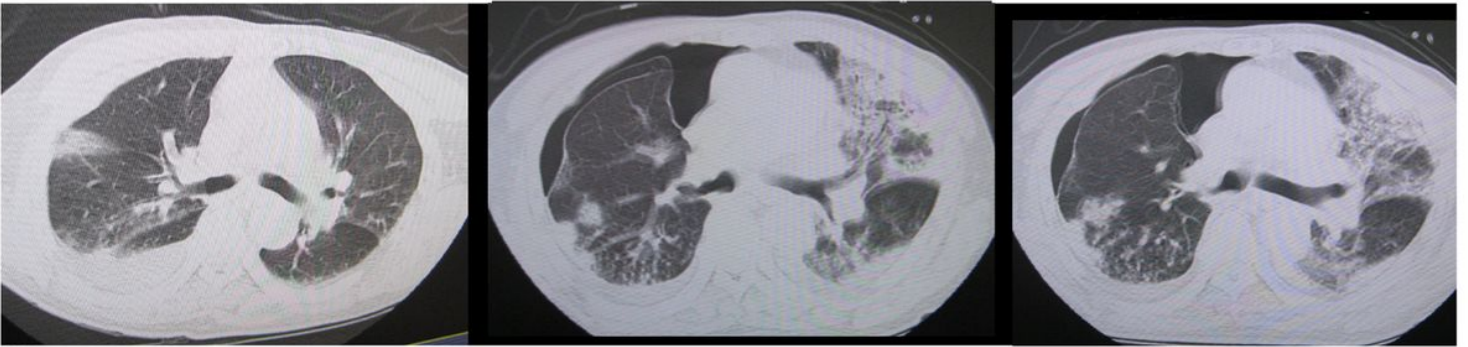
## Figures



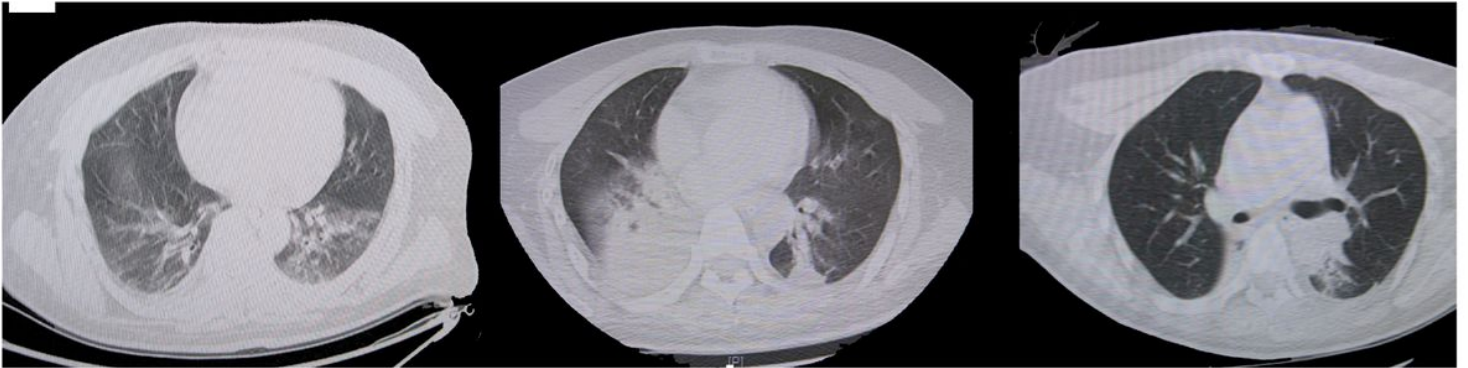
**Figure 1**

Study profile. Acute critically ill adult patients who were undergone a brain- chest-abdomen computed tomograph(CT) scans before arriving at the ICU were selected as an eligibility criteria.

2A

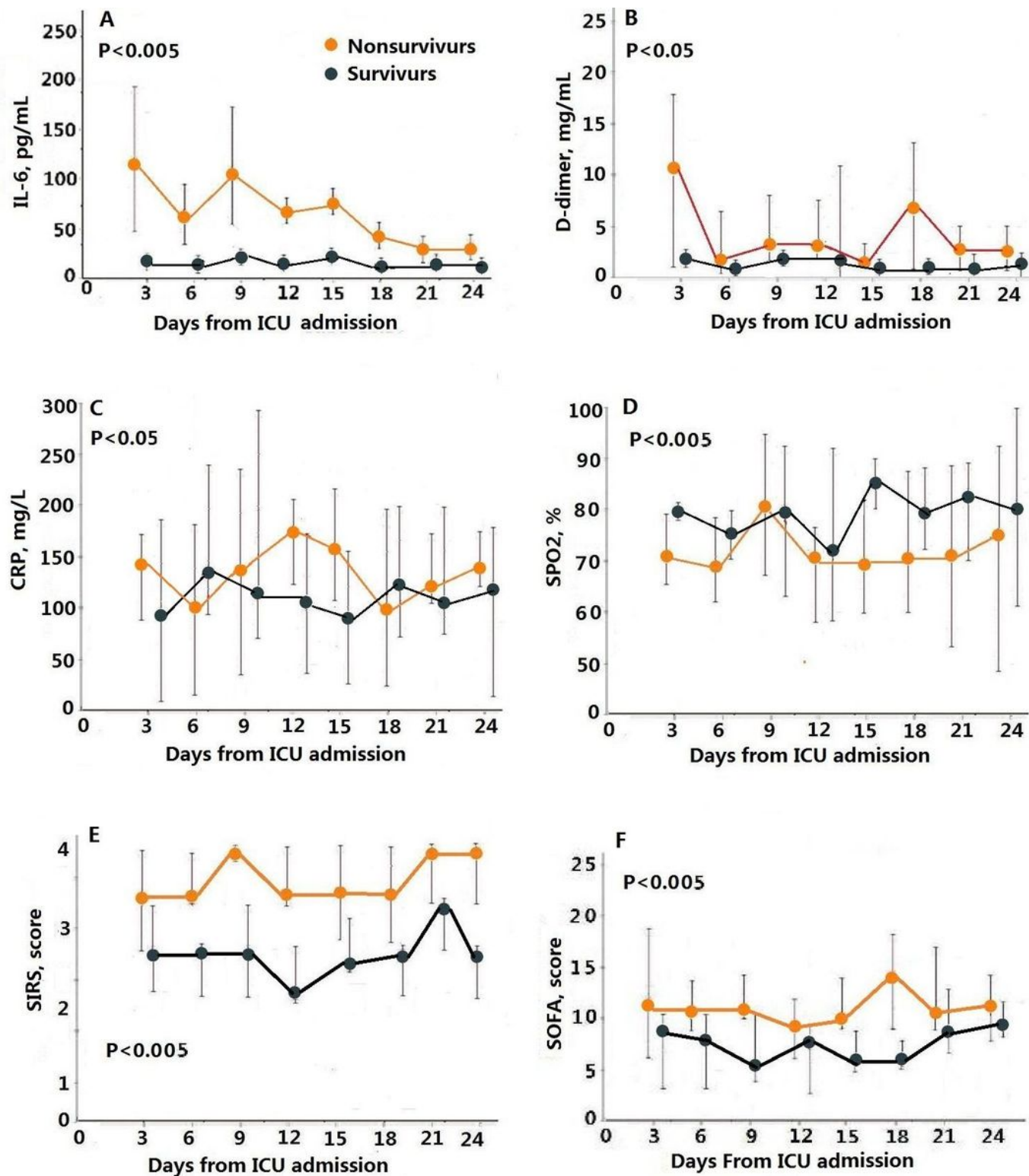


2B



**Figure 2**

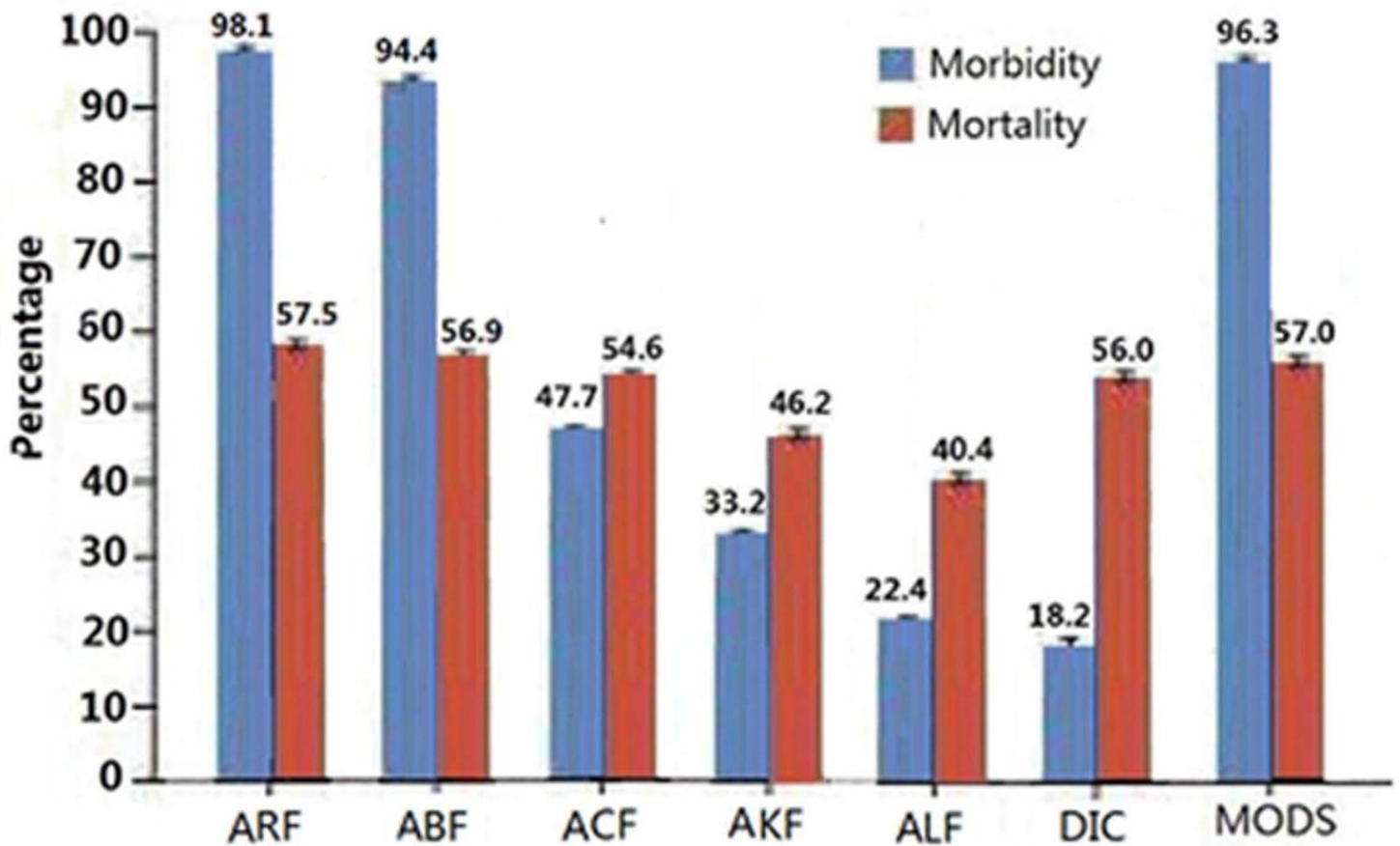
The features of the chest computed tomographic (CT) images. Figure 2 A is from a patient with bacterial sepsis and ARDS. On days 2, 7, and 17 after symptom onset, chest CT showed progressive bilateral pneumonia deterioration with a large area of ground glass opacities in the left lobe, and due to resistance to antibiotics, the patient died. Figure 2 B is from a patient with sudden delirium who was admitted to the ICU. On day 2 and day 7 after symptom onset, chest CT showed bilateral pneumonia in the lungs. On day 3, the patient was in coma and respiratory failure requiring respiratory intubation, and bacterial sepsis was diagnosed. On day 10, chest CT showed that the bilateral lesions had improved by using antibiotics for treatment, and the patient finally recovered.



**Figure 3**

Temporal changes in laboratory parameters from nonoutbreak bacterial sepsis in the ICU. IL-6 (A), D-dimer (B), CRP (C), SPO<sub>2</sub> (D), the SIRS score (E), and the SOFA score (F) were higher in nonsurvivors than in survivors (all  $P < 0.05$ ). IL-6, Interleukin-6; CRP, C-reactive protein; SpO<sub>2</sub>, saturation of arterial oxygen; SIRS, systemic inflammatory response syndrome; SOFA, sequential [sepsis-related] organ function assessment.





**Risk of morbidity and mortality of 214 ICU patients with acute organ dysfunction, according to SOFA criteria**

ARF, acute hypoxemic respiratory failure(AHRF)/acute respiratory distress syndrome(ARDS); ABF, acute brain Failure; ACF, acute circulation failure/shock; AKF, acute kidney failure; ALF, acute liver failure, DIC, disseminated intravascular coagulation; MODS, multiple organ dysfunction syndrome.

Figure 4

Risk of morbidity and mortality of 214 sepsis patients with acute organ dysfunctions in the ICU, according to the sepsis-sequential organ function assessment (SOFA).