The Role of pSOFA Score Combined with C-Reactive Protein and Procalcitonin in the Prognostic Evaluation of Children with Sepsis: A Single-Center Cross-Sectional Study

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Research

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Abstract

Background: The pediatric sequential organ dysfunction（pSOFA）score, C-reactive protein（CRP）and procalcitonin（PCT）play an important role in the prognosis assessment of children with sepsis. This study explores the value of their combined application, so as to provide a more comprehensive diagnosis method for the early diagnosis and prognosis evaluation of pediatric sepsis.

Methods: A retrospective cross-sectional study method was used to collect and analyze the clinical data of 289 children who were hospitalized and diagnosed with sepsis in the Pediatric Intensive Care Unit (PICU) of the Affiliated Hospital of Guangdong Medical University from August 2018 to August 2019. The 28-day survival outcome was divided into survival group and death group. Compare the differences in various physiological and laboratory data of the two groups of children within the first 24 hours after admission to PICU; Use binary logistic regression to analyze high-risk factors that affect the prognosis of children with sepsis; The receiver operating characteristic curve (ROC) was drawn, and the area under the ROC curve (AUC) was used to evaluate the role of pSOFA score combined with CRP and PCT in the early diagnosis and prognosis evaluation of children with sepsis.

Results: A total of 289 children were included in the study, 254 cases (87.9%) in the survival group and 35 cases (12.1%) in the death group; There were statistically significant differences between the two groups of children in age, whether to continuously pump vasoactive drugs, mechanical ventilation time, Glasgow coma score, gastrointestinal function, and serum PCT concentration (all $P<0.05$);Binary logistic regression showed that: pSOFA score and continuous intravenous pumping of vasoactive drugs are high-risk factors for poor prognosis in children with sepsis ($P<0.05$);The AUC of CRP and PCT in predicting the death of children with sepsis were 0.547 (95%CI: 0.488-0.606), 0.667 (95%CI: 0.609-0.721); and pSOFA+CRP, pSOFA+PCT and pSOFA scores The AUC for predicting the death of children with sepsis was 0.947 (95%CI: 0.914-0.970), and the difference was not statistically significant ($P>0.05$);

Conclusions: The pSOFA score is of high value for the prognostic evaluation of children with sepsis; but the pSOFA score combined with CRP and PCT can not improve the prognostic evaluation ability of children with sepsis.

Background

Sepsis refers to the life-threatening organ dysfunction caused by the host's unregulated response to infection[1].According to statistics, about 3 million newborns and 1.2 million children are diagnosed with sepsis worldwide each year. The prevalence of sepsis in children is about 2.9%, and the case fatality rate is 3.5% [2–3].As a critical illness, sepsis seriously affects the lives and health of children. Therefore, how to diagnose and evaluate the prognosis of sepsis at an early stage has always been a key issue for scholars at home and abroad.

Pediatric Sequential Organ Failure Score (pSOFA), as a new standard for the diagnosis and prognosis evaluation of childhood sepsis, has been recommended in recent years, and research by scholars at home and abroad has shown that it plays an important role in the prognosis evaluation of childhood sepsis[4–5].However, the pSOFA score is similar to the adult sequential organ failure score (SOFA), and there are many shortcomings[6–7].Infection and organ dysfunction are two important factors for the occurrence and development of sepsis, so both of them play an important role in the prognostic evaluation of sepsis.The lack of infection-related biomarkers in the pSOFA score will lead to overdiagnosis and treatment of sepsis in children [6–8].

The SPROUT research shows that bacterial infection is the most common cause of sepsis in children[9].C-reactive protein (CRP) and procalcitonin (PCT) are traditional biomarkers of bacterial infections, which play an important role in the diagnosis and evaluation of sepsis in children [10–12].

This study aimed to explore the effect of pSOFA score combined with CRP and PCT on the prognosis assessment of children with sepsis, to confirm whether the lack of infection-related biomarkers in the pSOFA score reduces the specificity of the diagnosis of sepsis in children.

Methods

This study used a retrospective cross-sectional study to collect clinical data of 289 children who were hospitalized in the Pediatric Intensive Care Unit(PICU)of the Affiliated Hospital of Guangdong Medical University from August 2018 to August 2019 and were considered to be diagnosed with sepsis.

According to the survival outcome of 28 days after admission, the children were divided into survival group and death group;By comparing the area under the receiver operating characteristic curve (AUC) of the pSOFA score combined with CRP and PCT in the first 24 hours after admission, the pSOFA score combined with CRP and PCT were evaluated for the prognosis of children with sepsis.

Inclusion criteria: (1) Meet the sepsis diagnostic criteria of the 2005 International Pediatric Conference [13]; (2)Newborn to ≤ 14 years old;(2) Complete clinical data.

Exclusion criteria: (1) suffering from autoimmune deficiency disease; (2) suffering from hematological tumor diseases; (3) taking immunosuppressive drugs; (4) taking corticosteroids for a long time; (5) the researcher believes that the child is not suitable for participating in the research (including: the presence of genetic metabolic diseases, the presence of severe traumatic stress, etc.); (6) The clinical data is incomplete.

Finally, 289 children who met the inclusion and exclusion criteria were divided into survival group and death group based on the 28-day survival outcome.(Fig. 1)

The latest literature reports show that the area under the ROC curve of pSOFA score is 0.937, and the ratio of the number of people in the survival group to the death group is 37 [5]; the significance level of this study (a) is set to 0.05, and the test power (1-b) is set to 0.8. The ratio between the survival group and the death group is 50; this study is a retrospective cross-sectional study with a dropout rate of 0%; the sample size is estimated by Pass15 and ROC_Test for ROC Curve software, and the results show that a total of 153 sepsis patients are needed Children.

The single-center cross-sectional study method was used to retrospectively collect the clinical data of 712 children admitted to the PICU in the Affiliated Hospital of Guangdong Medical University from August 2018 to August 2019,including: age, gender, PICU hospital stay, and total hospital stay,Site of infection, pathogen, need for mechanical ventilation, duration of mechanical ventilation,whether to continuously pump vasoactive drugs, mechanical ventilation time, Glasgow coma score, gastrointestinal function,28-day survival outcome after admission;It also includes serum CRP, PCT concentration, pSOFA score related indicators within the first 24 hours after admission, etc.Select the worst value of each indicator to record.

According to the inclusion and exclusion criteria, a total of 289 children were included in the study and grouped.The pSOFA score was calculated according to the worst value of the physiological indicators within the first 24 hours after admission.The pSOFA score includes six systems or organs: respiratory, cardiovascular, coagulation, liver, kidney, and nerve. It evaluates the degree of functional failure of each system or organ, each with a score of 0–4, any system or organ function score ≥ 2 points can be considered as dysfunction, and the higher the score, the worse the prognosis[16].

The SPSS25.0 software and MedCalc15.22 software were used for statistical analysis. First, the measurement data is tested for normality, and the measurement data that conforms to the normal distribution are expressed as mean ± standard deviation ($\bar{X} \pm S$), and the two-sample t test is used for the comparison between groups; the measurement data that does not conform to the normal distribution is used The median (quartile) [M(P25, P75)] is indicated, and the non-parametric rank sum test is used for comparison between groups.Enumeration data is expressed as relative numbers or rates, and X^2

test is used for comparison between groups.Use binary logistic regression to analyze the risk factors that affect the prognosis of sepsis in children.Then, draw the receiver operating curve (ROC), and use the area under the ROC curve (AUC) to test the predictive ability of pSOFA score combined with CRP and PCT on the death of children with sepsis;and calculate the best cut-off value, sensitivity, and specificity, Positive predictive value and negative predictive value.When AUC > 0.7 indicates that the combined diagnosis has sufficient predictive power for the death of children with sepsis; when α=0.05 is used as the test level, $P < 0.05$ indicates that the difference is statistically significant.

Results

A total of 289 children were included in the study, 254 cases (87.9%) in the

survival group and 35 cases (12.1%) in the death group;Among the 289 children, 188

were males (65.1%) and 101 were females (34.9%),male to female ratio (1.86:1); the median age was 6 (2, 24) months;

PICU hospitalization time is (6.8 ± 8.2) days, total hospitalization time is (12.4 ± 10.8) days; serum CRP concentration is 7.3 (2.9, 21.5) mg/L, serum PCT concentration is 0.4 (0.1, 2.1) ng/mL;Infection site: 82 cases(28.4%) of unknown site of infection, 149 cases (51.6%) of respiratory system infection, 10 cases (3.5%) of digestive system infection, 11 cases (3.8%) of urinary system infection, 24 cases(8.3%) of nervous system infection, 1 case (0.3%) of circulatory system infection, 5 cases (1.7%) of blood-borne infection, 7 cases (2.4%) of other site infections; Pathogens: 232 cases (80.3%) of unknown pathogen, 4 cases (1.4%) of Streptococcus pneumoniae, 1 case (0.3%) of Enterobacter, 3 cases (1.0%) of Acinetobacter baumannii, 6 cases (2.1%) of Pseudomonas aeruginosa, 4 cases (1.4%) of Staphylococcus aureus, 3 cases (1.0%) of Escherichia coli, 7 cases (2.4%) of Candida albicans, 2 cases (0.7%) of Salmonella, 1 case (0.3%) of Haemophilus egyptianus, 2 cases (0.7%) of Staphylococcus wokerii, 1 case (0.3%) of Enterococcus, 12 cases (4.2%) of cytomegalovirus, 1 case (0.3%) of influenza virus, 4 cases(1.4%) of herpes virus, 1 case (0.3%) of adenovirus, 1 case (0.3%) of enterovirus type 71, 4 cases (1.4%) of Mycoplasma pneumoniae;

Comparison of basic data between the survival group and the death group: there was no statistically significant difference in gender, infection site, pathogen, PICU hospitalization time, total hospitalization time, and serum CRP concentration (all $P > 0.05$);However, there were statistically significant differences in age, whether to continuously pump vasoactive drugs, mechanical ventilation time, Glasgow coma score, gastrointestinal function, and serum PCT concentration (all $P < 0.05$); (Table 1).

Table 1
Comparison of clinical data of children in survival group and death group

Characteristics	Survival group	Death group	X^2/Z	P
Number of cases(%)	254(89.9)	35(12.1)	0.008	0.930
Male/Female,[Number (%)]	165[65.0]/89[35.0]	23[65.7]/12[34.3]	3.388	0.001
Age [month, *M* (P25, P75)]	5.5[2.0,22.3]	17.0[6.0,53.0]	-1.142	0.215
PICU hospital stay [days, $\bar{X} \pm S$]	6.6 ± 7.2	8.4 ± 13.4	1.352	0.185
Total hospitalization time [days, $\bar{X} \pm S$]	12.8 ± 9.7	9.0 ± 16.3	-3.448	0.001
Mechanical ventilation time [d, $\bar{X} \pm S$]	1.1 ± 4.9	4.0 ± 4.7	68.695	0.000
Continuous intravenous pumping of vasoactive drugs [cases (%)]	57(22.4)	32(91.4)	84.768	≤ 0.001
Gastrointestinal function [normal/intestinal paralysis/intestinal bleeding, cases (%)]	250 [98.4]/ 3 [1.2]/	27 [77.1]/ 8 [22.9]	23.463 -9.948	0.000 0.000
Glasgow coma score[Score,*M*(P25，P75)]	1 [0.4]	/ 0	0.904	0.366
CRP[mg/l,*M*(P25，P75)]	13 [13, 13]	5 [3, 10]	3.196	0.001
PCT[ng/l,*M*(P25，P75)]	6.9[2.9,20.8]	8.1[3.7,72.7]	-11.137	0.000
pSOFA[Score,$\bar{X} \pm S$]	0.3[0.1,1.7] 3.0 ± 2.4	1.6[0.4,20.5] 10.6 ± 3.9		

CRP:C-reactive protein;PCT:Procalcitonin;pSOFA:pediatric sequential organ failure score.

The results of binary logistic regression analysis showed that: pSOFA score and continuous intravenous pumping of vasoactive drugs are high-risk factors for poor prognosis in children with sepsis ($P < 0.05$);(Table 2).

Table 2
The results of binary logistic regression analysis on prognostic risk factors of sepsis in children

Influencing factors	β	Standard error	Wald	OR	95%CI	*P*
age	0.015	0.009	2.938	1.015	0.998–1.033	0.087
Mechanical ventilation time	-0.070	0.047	2.267	0.932	0.851–1.021	0.132
Continuous intravenous pumping of vasoactive drugs	-1.756	0.804	4.772	0.173	0.036–0.835	0.029
Glasgow coma score	-0.186	0.097	3.718	0.830	0.687–1.003	0.054
Gastrointestinal function	0.371	1.972	0.106	1.372	0.204–9.216	0.745
CRP	0.007	0.005	1.686	1.007	0.997–1.017	0.194
PCT	-0.015	0.013	1.477	0.985	0.961–1.009	0.224
pSOFA score	0.371	0.105	12.394	1.449	1.179–1.782	0.000

CRP:C-reactive protein;PCT:Procalcitonin;pSOFA:pediatric sequential organ failure score.95% CI:he 95% confidence interval

The AUC of CRP's ability to predict the death of children with sepsis is 0.547 (95%CI: 0.488–0.606), the Z value is 0.819,*P* = 0.4016 (> 0.05);The AUC of PCT's ability to predict the death of children with sepsis was 0.667 (95%CI: 0.609–0.721), the Z value was 2.953, *P* = 0.0031(<0.05); The area under the ROC curve (AUC) of pSOFA + CRP, pSOFA + PCT and pSOFA scores for predicting the death of children with sepsis were all 0.947 (95%CI: 0.914–0.970), the Z value was 28.149, *P* < 0.05; (Table 3,Fig. 2–3).

Table 3
Comparison of the predictive ability of various diagnostic indicators for the death of children with sepsis

grading system	AUC	95%CI	cut off value	Sensitivity(%)	Specificity(%)	Positive predictive value(%)	Negative predictive value(%)	*Z*	*P*
CRP	0.547	0.488–0.606	>91.5	22.86	90.94	2.52	0.85	0.839	04016
PCT	0.667	0.609–0.721	>0.891	68.57	67.32	2.10	0.47	2.953	0.0031
pSOFA	0.947	0.914–0.970	> 5	85.71	88.19	7.26	0.16	28.149	<0.0001
pSOFA + CRP	0.947	0.914–0.970	>0.071	85.71	88.19	7.26	0.16	28.149	<0.0001
pSOFA + PCT	0.947	0.914–0.970	>0.071	85.71	88.19	7.26	0.16	28.149	<0.0001

CRP:C-reactive protein;PCT:Procalcitonin;pSOFA:pediatric sequential organ failure score.AUC: The area under the receiver operating characteristic curve; 95% CI:he 95% confidence interval

The results of the confirmatory test on the predictive ability of various indicators for the severity of sepsis in children:A total of 254 children in the survival group were grouped according to whether they were accompanied by multiple organ failure. They can be divided into7 211 cases (83.1%) in the sepsis group and 43 cases (16.9%) in the severe sepsis group;The area under the ROC curve (AUC) of CRP, PCT, pSOFA score, pSOFA + CRP and pSOFA + PCT predicting the severity of sepsis in children are: CRP 0.601 (95%CI: 0.538–0.662) < PCT 0.684 (95%CI: 0.623–0.741) < pSOFA score 0.904 (95%CI: 0.861–0.937) < pSOFA + CRP 0.911 (95%CI: 0.869–0.943) < pSOFA + PCT 0.913 (95%CI: 0.872–0.945) ;Obviously, the predictive value of pSOFA score and pSOFA + CRP and pSOFA + PCT on the severity of sepsis in children is greater than that of CRP and PCT infection-related biomarkers; and the difference in AUC between pSOFA score, pSOFA + CRP, and pSOFA + PCT No statistical significance ($P > 0.05$); (Table 4,Fig. 4).

Table 4:The ability of CRP, PCT, pSOFA score, pSOFA+CRP and pSOFA+PCT to predict the severity of sepsis in children

CRP:C-reactive protein;PCT:Procalcitonin;pSOFA:pediatric sequential organ failure score.AUC: The area under the receiver operating characteristic curve; 95% CI:he 95% confidence interva.

Discussion

Sepsis is a life-threatening organ dysfunction caused by the host's uncontrolled response to infection [13].Its essence is that infection leads to an imbalance of the body's inflammatory response, the release of a large number of cytokines, which stimulates the body's oxidative stress and the imbalance of the blood coagulation system, thereby causing damage to body tissues and organs [17], and with the deepening of sepsis research, sepsis The mechanism of disease has gradually involved cell function, metabolism, genes, and microcirculation [18–19].Although the pathogenesis of sepsis is complex and diverse, infection and organ dysfunction are still an important part of its occurrence and development.

According to estimates by the World Health Organization, about 1 million (approximately 10%) of the deaths of children under the age of 5 are caused by sepsis every year[20].Therefore, how to identify sepsis early and assess the severity and prognosis of sepsis has always been the focus of research by scholars at home and abroad.

grading system	AUC	95%CI	cut off value	Sensitivity （%）	Specificity （%）	Positive predictive value（%）	Negative predictive value（%）	*Z*	*P*
CRP	0.601	0.538-0.662	＞19.3	48.84	76.67	2.09	0.67	1.831	0.0671
PCT	0.684	0.623-0.741	＞1.01	62.79	76.19	2.64	0.49	3.660	0.0003
pSOFA	0.904	0.861-0.937	≥4	74.42	90.48	7.81	0.28	16.53	＜0.0001
pSOFA+CRP	0.911	0.869-0.943	＞0.29	79.07	90.48	8.30	0.23	15.45	＜0.0001
pSOFA+PCT	0.913	0.872-0.945	＞0.23	79.07	89.52	7.55	0.23	16.34	＜0.0001

Pediatric Clinical Illness Score (PCIS), Pediatric Logistic Organ Dysfunction Sore 2 (PELOD2), Pediatric Multiple Organ Dysfunction Score (P-MODS) scoring methods are commonly used in the past to predict the prognosis of critically ill children. It is of great significance in the evaluation of the prognosis of severe cases[16, 21–22].However, these critically ill scoring methods have various and complex scoring indicators, which are not conducive to timely clinical records.

In recent years, the Sequential Organ Failure Assessment (SOFA) score has been widely used in the prognosis assessment of adult sepsis due to its simple and effective scoring method.

However, the evaluation index reference data comes from adults, so it is not applicable to children[23–24].Scholars such as Matics refer to adult SOFA, children's PELOD2 and other scoring indicators, and combine the physiological characteristics of children of different ages to develop a new standard for the diagnosis of sepsis in children, that is, the pSOFA score.

Moreover, studies have proved that pSOFA score is of great significance in the prognostic evaluation of PICU patients [4];Scholars such as Zhong Mianling verified the role of pSOFA score in the prognostic evaluation of PICU children with sepsis and found that the significance of pSOFA score is better than other scoring systems, and its AUC is as high as 0.937 [5].Therefore, the pSOFA score is recommended for the diagnosis and prognostic evaluation of sepsis in children. This study once again verified that the pSOFA score is of great significance in the prognosis assessment of children with sepsis, and its AUC is 0.947 (95%CI: 0.914–0.970);

However, the lack of infection indicators in the pSOFA score may cause clinicians to ignore infection as a prerequisite when using the pSOFA score to assess pediatric sepsis, which will lead to overdiagnosis and treatment of sepsis [6].

Studies have shown that bacterial infections are the most common cause of sepsis in children [25].As traditional infection indicators, CRP and PCT are still widely used clinically.A large amount of literature shows that the levels of CRP and PCT in peripheral blood can predict infection and sepsis, and are of great significance for the diagnosis, severity assessment and prognosis of sepsis [26–27].This study found that the AUC of CRP and PCT for predicting the death of children with PICU

sepsis were 0.547 (95%CI: 0.488–0.606) and 0.667 (95%CI: 0.609–0.721). Obviously, CRP or PCT alone Factors are poor in predicting the death of children with PICU sepsis, but PCT has a stronger predictive ability than CRP;This may suggest that infection is not the direct cause of death in children with sepsis, but is only the initiating factor for the occurrence and development of sepsis.However, a series of inflammatory immune response imbalances caused by infection, resulting in organ dysfunction is the direct cause of death in children with sepsis.Organ dysfunction is closely related to the prognosis of sepsis in children.This is consistent with the reason why the Third International Sepsis Conference emphasized organ dysfunction as the main indicator for evaluating the prognosis of sepsis [13].

The AUC of the predictive ability of CRP, PCT combined with pSOFA score on the death of children with PICU sepsis is 0.947 (95%CI: 0.914–0.970).It can be seen that CRP and PCT combined with pSOFA score have a strong predictive ability for the death of children with PICU sepsis.However, there was no difference in predicting the death of children with PICU sepsis using the pSOFA score alone ($P > 0.05$).At the same time, the analysis of the ability to predict the severity of sepsis in children in the survival group showed that: pSOFA score and pSOFA + CRP, pSOFA + PCT are more valuable in predicting the severity of sepsis in children than CRP, PCT and other infection indicators;However, there was no statistically significant difference between the pSOFA score and the AUC between pSOFA + CRP and pSOFA + PCT ($P > 0.05$).

The final conclusion of the study showed that adding CRP and PCT infection-related indicators to the pSOFA score could not effectively improve the mortality prediction ability of children with PICU sepsis compared with the pSOFA score alone.The reasons for this result may be:(1) Infection is the initiating factor of sepsis, and the direct cause of death of children with sepsis is the multiple organ dysfunction caused by the inflammatory storm of the body's imbalance;(2) Severe sepsis and septic shock cause tissue and organ dysfunction, causing cell damage that releases CRP and PCT, which reduces the concentration of CRP and PCT in the serum, and thus cannot assist in diagnosis and treatment;(3) Early active and effective anti-infective treatment and delayed body fluid examination resulted in CRP and PCT serum examination results inconsistent with clinical results;(4) The sensitivity of laboratory testing instruments and kits is insufficient, causing testing errors;(5) This study is a single-center, retrospective study, with short research time and small sample size, and there may be selective deviations;(6) In this study, data collection and critical illness scores were conducted based on the worst value of the children in the first 24 hours after admission to the PICU.There was no dynamic monitoring, and there was insufficient assessment of the severity of sepsis, which may affect the experimental results.

The innovation of this research: On the basis of sepsis research, the CRP and PCT infection indicators are combined with the sepsis organ dysfunction score (pSOFA score),It lays the foundation for the development of a more complete early diagnosis and prognostic evaluation method of childhood sepsis.

The shortcomings of this study:(1) This study is a retrospective cross-sectional study, which cannot strongly explain the cause and effect relationship;(2) This study is a single-center, retrospective study, with short research time and small sample size, and there may be selective deviations;(3) In this study, the worst value in the first 24 hours after admission to the PICU was used for data collection and critical illness score. There was no dynamic monitoring, and there was insufficient assessment of the severity of sepsis;(4) The sample size of this study is too small, and there is a large amount of data loss, and it is impossible to carry out the hierarchical analysis of indicators such as CRP and PCT, which reduces the reliability of the experimental results.

Conclusion

This study explored the effect of pSOFA score combined with CRP and PCT on the prognosis evaluation of children with sepsis. The results showed that adding CRP and PCT infection indicators on the basis of pSOFA score did not increase the prognostic evaluation ability of children with sepsis.Therefore, in the early diagnosis, prognostic evaluation and treatment of sepsis in children, more attention should be paid to organ damage, rather than relying too much on infection indicators such as CRP and PCT.

Abbreviations

pSOFA
Pediatric Sequential Organ Failure Assessment;CRP:C-reactive protein;PCT:procalcitonin;PICU:Pediatric Intensive Care Unit;PCIS:Pediatric Clinical Illness Score;PELOD2:Pediatric Logistic Organ Dysfunctiao Score 2;P-MODS:Pediatric Multipie Organ Dysfunctiao Score;SOFA:Sequential Organ Failure Score;

Declarations

Ethics approval and consent to participate:This study was approved by the Medical Ethics Committee of the Affiliated Hospital of Guangdong Medical University (Lot Number: PJ2020-089). Because this study is a retrospective study, it was approved by the medical ethics committee of the hospital, and the guardian of the child was exempted with informed consent.

Consent for publication:

Not applicable.

Availability of data and materials:

Data that support the findings of this study are available on reasonable request from the corresponding author.

Competing interests:

The Authors declare no conflict of interest.

Authors' contributions:

All the authors have contributed to the manuscript in significant way and agreed upon the manuscript content.Zhou Bin: Project design, data collection and papers;Huang Yuge: Project design and implementation guidance;Zhong MianLing: project design and paper revision;Zeng Cizeng: PICU patient management, treatment and evaluation;Wu Jiayuan:Statistical Analysis.

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Figures

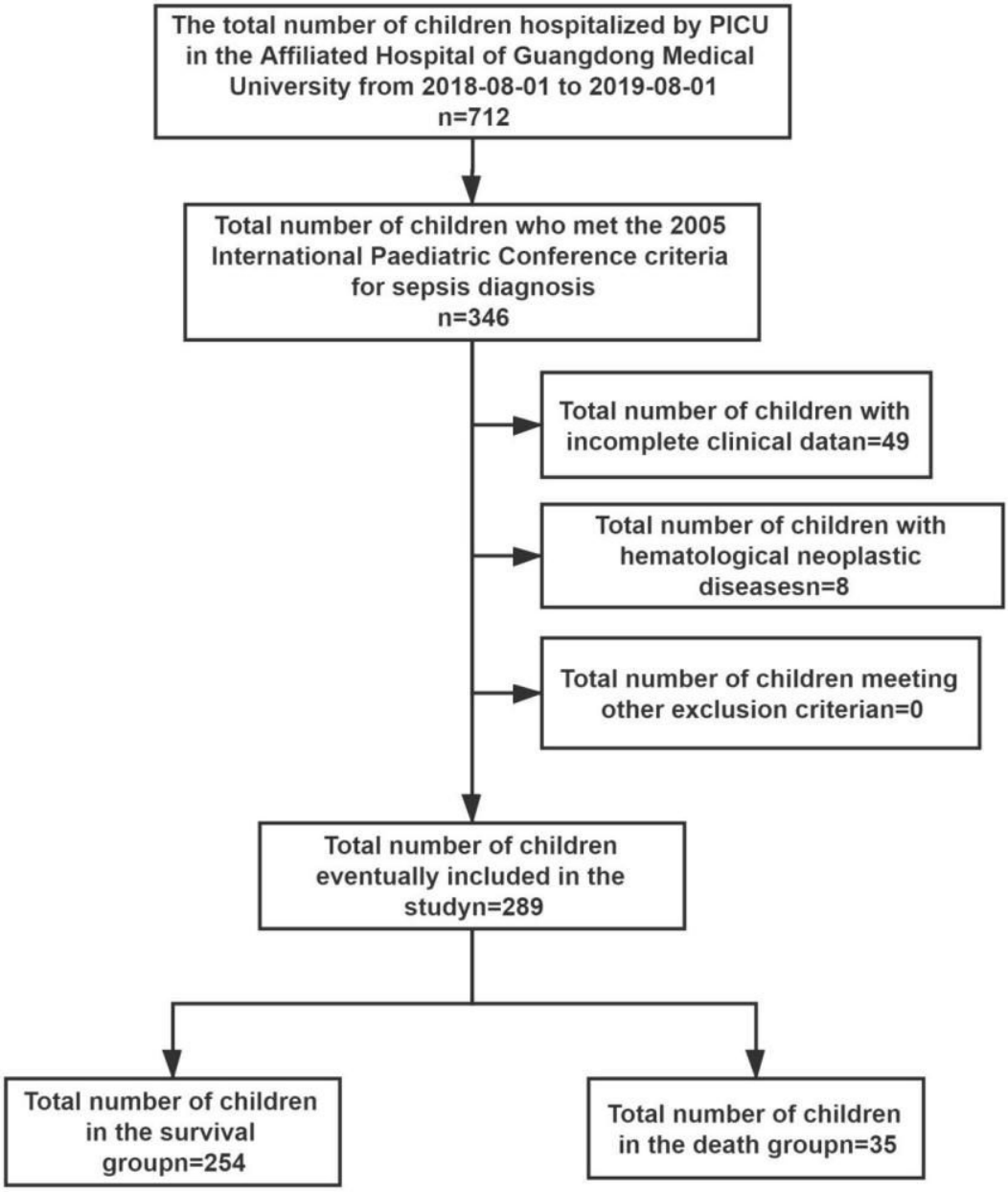

Figure 1

Flow chart of research object inclusion

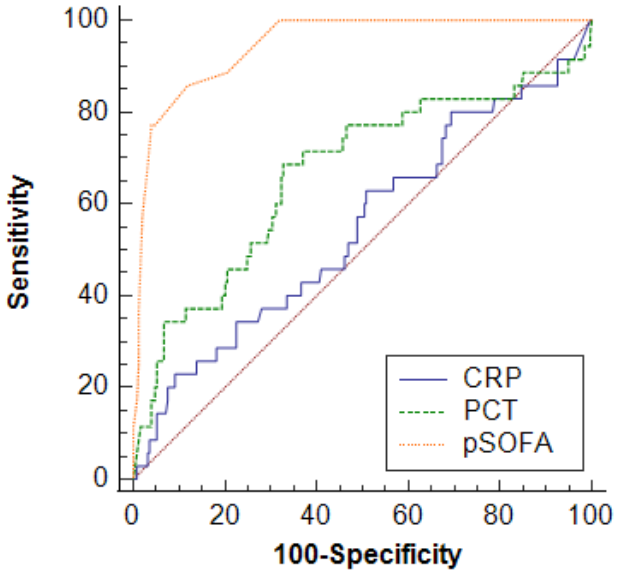

Figure 2

The receiver operating characteristic curve of serum C-reactive protein, procalcitonin, and pediatric sequential organ failure score predicting death in children with sepsis

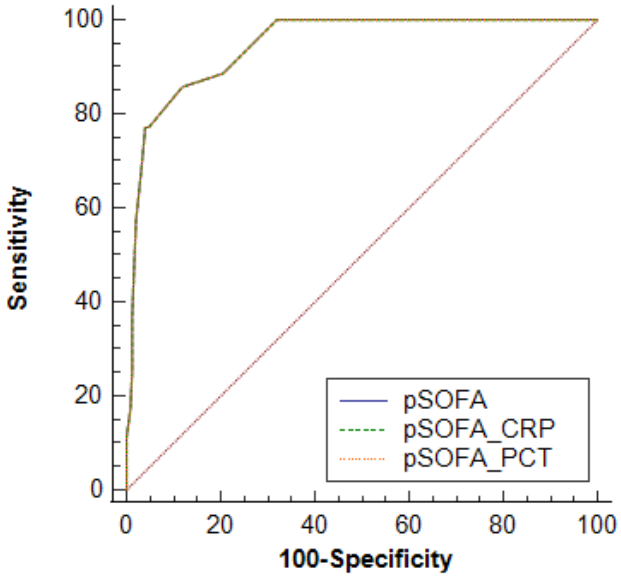

Figure 3

The receiver operating characteristic curve of pediatric sequential organ failure score and pediatric sequential organ failure score combined with CRP and PCT for the prediction of death in children with sepsis

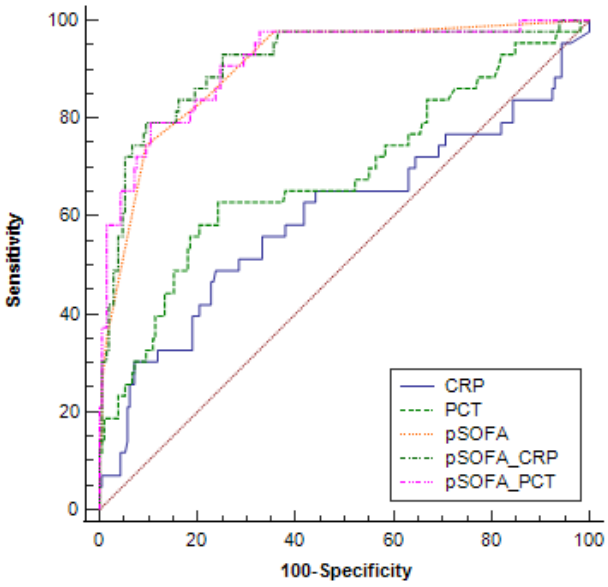

Figure 4

The predictive ability of CRP, PCT, pSOFA score, pSOFA+CRP and pSOFA+PCT to the severity of sepsis in children