OBSTETRICS

The Sepsis in Obstetrics Score: a model to identify risk of morbidity from sepsis in pregnancy

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OBJECTIVE: We sought to design an emergency department sepsis scoring system to identify risk of intensive care unit (ICU) admission in pregnant and postpartum women.

STUDY DESIGN: The Sepsis in Obstetrics Score (S.O.S.) was created by modifying validated scoring systems in accordance with recognized physiologic changes of pregnancy. The S.O.S. was applied to a retrospective cohort of pregnant and postpartum patients from February 2009 through May 2011 with clinical suspicion of sepsis. The primary outcome was ICU admission. Secondary outcomes were telemetry unit admission, length of stay, positive blood cultures, positive influenza swabs, perinatal outcome, and maternal mortality. Receiver operating characteristic curves were constructed to estimate the optimal score for identification of risk of ICU admission.

RESULTS: In all, 850 eligible women were included. There were 9 ICU (1.1%) and 32 telemetry (3.8%) admissions, and no maternal deaths. The S.O.S. had an area under the curve of 0.97 for ICU admission. An S.O.S. $\geq$6 (maximum score 28) had an area under the curve of 0.92 with sensitivity of 88.9%, specificity of 95.2%, positive predictive value of 16.7%, and negative predictive value of 99.9% for ICU admission, with an adjusted odds ratio of 109 (95% confidence interval, 18—661). An S.O.S. $\geq$6 was independently associated with increased ICU or telemetry unit admissions, positive blood cultures, and fetal tachycardia.

CONCLUSION: A sepsis scoring system designed specifically for an obstetric population appears to reliably identify patients at high risk for admission to the ICU. Prospective validation is warranted.

Key words: disease severity score, intensive care unit, pregnancy, sepsis

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The United States currently ranks 47th (of 184 countries) in overall maternal mortality with a rate of 21/100,000, vs an average rate of 16/100,000 in developed countries.[1] Maternal sepsis, especially puerperal sepsis, is a common pregnancy-related condition and in the United States is the fourth leading cause of maternal mortality, accounting for up to 13% of maternal deaths[2] and approximately 5% of maternal admissions to the intensive care unit (ICU).[3] Unfortunately, the frequency of severe sepsis in pregnancy is increasing in the United States, from 1:15,385 in 1998 to 1:7246 in 2008, as well as sepsis-related maternal death, up 10% per year in that same time frame.[4]

The progression from the systemic inflammatory response syndrome (SIRS) to septic shock is clearly defined in the nonpregnant population using specific objective vital signs and laboratory values. Based on these parameters, critical care and infectious disease experts developed management guidelines for severe sepsis and septic shock with the Surviving Sepsis Campaign.[5] This campaign highlighted the need for appropriate assessment of the severity of sepsis to enable early detection of cases at risk for rapid clinical deterioration, leading to the development of many disease severity scoring systems related to sepsis. None included pregnant women in the initial study population and all have been shown to overestimate morbidity and mortality in an obstetric population.[6-11]

The failure of existing scoring systems to identify risk of morbidity in an obstetric population likely stems from their failure to account for the normal physiologic changes seen in pregnancy. These changes include a decrease in diastolic blood pressure by 5-10 mm Hg in the second trimester with return to baseline by the third trimester, an increase in heart rate by 17% (to 83 $\pm$ 10 beats per minute), and an elevation in leukocyte count (up to 16.9/μL by the third trimester and up to 30/μL in labor).[12-14] Temperature, systolic blood pressure, respiratory rate, blood oxygen saturation (SpO_2), and percentage of immature neutrophils are unchanged.[12-14] Little is known about the effect of pregnancy on lactic acid.

To our knowledge, no study to date has evaluated the use of a pregnancy-specific scoring system for use in an emergency

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FIGURE 1
Sepsis in Obstetrics Score

Variable	High abnormal range				Normal	Low abnormal range			
Score	+4	+3	+2	+1	0	+1	+2	+3	+4
Temperature (°C)	>40.9	39-40.9		38.5-38.9	36-38.4	34-35.9	32-33.9	30-31.9	<30
Systolic Blood Pressure (mmHg)					>90		70-90		<70
Heart Rate (beats per minute)	>179	150-179	130-149	120-129	≤119				
Respiratory Rate (breaths per minute)	>49	35-49		25-34	12-24	10-11	6-9		≤5
SpO_2 (%)					≥92%	90-91%		85-89%	<85%
White Blood Cell Count (/μL)	>39.9		25-39.9	17-24.9	5.7-16.9	3-5.6	1-2.9		<1
% Immature Neutrophils			≥10%		<10%				
Lactic Acid (mmol/L)			≥4		<4				

Scoring template for S.O.S., a sepsis scoring system designed specifically for obstetric patients.

S.O.S., Sepsis in Obstetrics Score; *SpO_2*, blood oxygen saturation.

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department (ED) to predict clinical deterioration in an obstetric population presenting with signs of sepsis. Therefore, the objective of this study was to evaluate the utility of an ED scoring system designed specifically for an obstetric population to identify risk of ICU admission for pregnant and postpartum women who presented with signs of sepsis.

Materials and Methods

We performed a retrospective cohort study of pregnant and postpartum women evaluated in the ED at Women and Infants Hospital, a large tertiary care obstetric hospital, with suspected SIRS or sepsis from February 2009 through May 2011. To identify women deemed at high risk for sepsis, only those who had blood cultures or an influenza swab sent to the clinical laboratory were included. Blood cultures or an influenza swab were used as surrogate markers for a patient presenting with signs or symptoms concerning for sepsis and were used as the sole enrollment criterion because the aim was to capture patients in whom there was a clinical suspicion of a severe infectious process as determined by the primary ED physician.

The Women and Infants ED serves as both an obstetric triage unit and a free-standing emergency room, and thus is the point of entry to the hospital for every patient, regardless of gestational age or pregnancy status. It is staffed by obstetricians who are employed as full-time ED providers. This ED is equipped with an electronic medical record that is programmed to alert the provider when a patient meets ≥2 of the following criteria, which were taken from the standard SIRS criteria: mean arterial pressure ≤65, systolic blood pressure ≤90, heart rate ≥110, respiratory rate ≥22, temperature ≥38°C or ≤36°C, and leukocyte count ≥14/μL, <4/μL, or >10% immature neutrophils. The physician then determines if there is a high clinical suspicion for sepsis and makes the decision to draw blood cultures or perform an influenza swab.

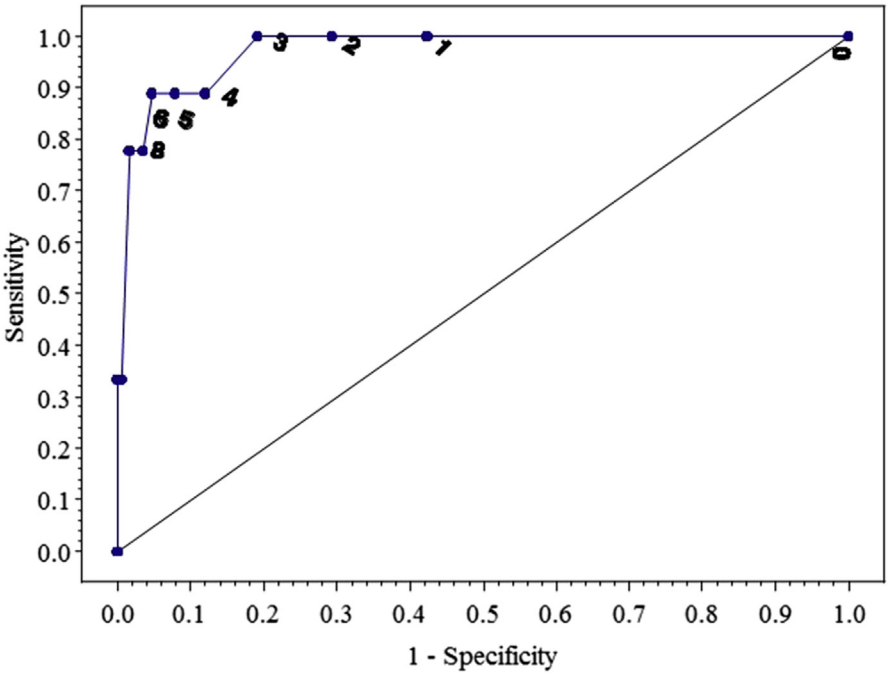
Chart abstraction was conducted for women who presented to the ED at any gestational age through the first 2 postpartum weeks. All women had been discharged from the hospital prior to data collection and analysis. Exclusion criteria included a known or suspected ectopic pregnancy, multiple gestation (because of concern regarding additional hemodynamic changes from a multiple compared to a singleton gestation), transfer from an outside hospital (because of the possibility of treatment prior to presentation), or subsequent delivery at an outside hospital (because of inability to ascertain neonatal outcome). The population of this study was restricted to the ED because the scoring system that was developed was modeled after validated ED scoring systems.

Vital sign and laboratory data were individually abstracted from the electronic medical record by 2 investigators (C.M.A. and T.N.A.). Maximum

temperature, heart rate, respiratory rate, leukocyte count, percentage of immature neutrophils, lactic acid, and minimum temperature, SpO_2, and systolic blood pressure for the duration of the ED course were recorded. Other maternal data collected were age, race, body mass index (BMI), gestational age, and medical comorbidities. Fetal data collected included presence or absence of fetal tachycardia, defined as a heart rate of >160 beats per minute.

The Sepsis in Obstetrics Score (S.O.S.), a scoring system modified in accordance with recognized physiologic changes of pregnancy to assess specifically for sepsis, was created (Figure 1). The S.O.S. combines and modifies the elements of the Rapid Emergency Medicine Score (REMS),[15] a validated ED scoring system created by taking those elements of Acute Physiology and Chronic Health Evaluation (APACHE) II[16] easily obtained in the prehospital setting, and the SIRS/sepsis criteria as described by the Surviving Sepsis Campaign.[5] The APACHE II score provides an estimate of ICU mortality based on 12 vital sign and laboratory parameters and additionally takes into account acute and chronic disease states, including chronic organ insufficiency or history of immunocompromise. REMS is a strong predictor of in-hospital mortality and is based on only age and vital sign data recorded in the ED. Both scoring systems use the most abnormal recorded value for each parameter to determine the overall score. To create a sepsis-specific scoring system, the S.O.S. combines parameters taken from APACHE II and REMS (temperature, heart rate, respiratory rate, oxygen saturation, and leukocyte count) and the SIRS criteria (systolic blood pressure, leukocyte count, percentage of immature neutrophils, and lactic acid). To make the score pregnancy-specific, parameters with known changes in pregnancy, as described above, were modified accordingly (systolic blood pressure, heart rate, and leukocyte count).[12-14] The S.O.S. scoring procedure is similar to that of APACHE II and REMS with scores ranging from 0–4 for each variable, with a maximum score of 28. A score of 0 indicates a normal value. Higher points were given for both high and low abnormal values. If a parameter was not recorded in the medical record, a score of 0 was assigned, and that parameter was therefore considered normal in the analysis.

FIGURE 2
Receiver operating characteristic curve for intensive care unit admission for composite S.O.S.



Point labels are values of S.O.S. area under curve for composite score is 0.97.

S.O.S., Sepsis in Obstetrics Score

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The primary outcome was ICU admission within 48 hours of presentation to the ED. Secondary outcomes included telemetry unit admission, length of hospital stay, mortality, positive blood cultures, positive influenza swabs, antibiotic use, and adverse perinatal outcome, defined as a composite outcome of fetal or neonatal death, respiratory distress syndrome, grade III or IV intraventricular hemorrhage, necrotizing enterocolitis, or sepsis within 72 hours of birth. The criteria for ICU admission for sepsis are not standardized in our hospital; however in general, patients who meet criteria for septic shock and have a vasopressor requirement or require mechanical ventilation are transferred to the ICU. The criteria by which patients should be sent to the telemetry unit include a diagnosis of SIRS or sepsis requiring early goal-directed therapy.

The hypothesis of this study was that the S.O.S., a pregnancy-specific sepsis scoring system, would accurately identify women at risk of ICU transfer for sepsis. In 2 prior studies, approximately 2% of patients who presented to the ED with a clinically suspected infection concerning for sepsis were admitted to the ICU within 48 hours of admission.[17,18] Therefore, to detect an area under the receiver operating characteristic curve (AUC-ROC) of 0.7 vs 0.5 (no association) with an alpha of 0.05, 80% power, and an estimated 2% ICU admission rate, required 850 patients. Descriptive statistics were used to compare variables by χ^2 or t test. The AUC-ROC and 95% confidence interval were calculated by simple logistic regression. Sensitivity and specificity at different

TABLE 1
Demographic information

Variable	S.O.S. ≥6	S.O.S. <6	*P* value
Age, y	(n = 48)	(n = 802)	
Mean (SD)	24.0 (6.5)	26.3 (6.1)	.01
Median (min-max)	22.5 (15-42)	26.0 (15-43)	
Pregnancy status, n (%)	(n = 48)	(n = 802)	
Pregnant	35 (72.9)	732 (91.3)	< .0001
Postpartum	13 (27.1)	70 (8.7)	
Gestational age, wk	(n = 35)	(n = 732)	
Mean (SD)	26.6 (7.0)	23.6 (10.0)	.12
Median (min-max)	26.9 (12.8-40)	24.1 (2.7-42.3)	
No. of days postpartum, d	(n = 13)	(n = 70)	
Mean (SD)	6.9 (3.7)	6.9 (3.4)	.90
Median (min-max)	6 (1-13)	7 (0-14)	
BMI	(n = 43)	(n = 743)	
Mean (SD)	26.4 (7.8)	28.5 (6.9)	.07
Median (min-max)	25.7 (16.9-64.5)	27.5 (13.5-69.3)	
Race/ethnicity, n (%)	(n = 45)	(n = 773)	
White	16 (35.6)	362 (46.8)	.08
Black	3 (6.7)	100 (12.9)	
Hispanic	23 (51.1)	287 (37.1)	
Asian	3 (6.7)	13 (1.7)	
Multiracial	0 (–)	4 (0.5)	
Other	0 (–)	7 (0.9)	
Insurance, n (%)	(n = 41)	(n = 662)	
None	1 (2.4)	13 (1.9)	.88
Government	25 (61.0)	428 (64.6)	
Private	15 (36.6)	221 (33.4)	
Substance abuse, n (%)	(n = 39) 8 (20.5)	(n = 626) 105 (16.8)	.54
Tobacco, n (%)	(n = 39) 7 (17.9)	(n = 626) 88 (14.1)	.50
Alcohol, n (%)	(n = 39) 2 (5.1)	(n = 626) 10 (1.6)	.15
Illegal drugs, n (%)	(n = 39) 2 (5.1)	(n = 626) 19 (3.0)	.35
Hypertension, n (%)	(n = 48) 1 (2.1)	(n = 798) 41 (5.1)	.51
Diabetes, n (%)	(n = 48) 1 (2.1)	(n = 798) 20 (2.5)	1.0
Asthma, n (%)	(n = 48) 8 (16.7)	(n = 798) 190 (23.8)	.25

Albright. The Sepsis in Obstetrics Score. Am J Obstet Gynecol 2014. *(continued)*

S.O.S. values were determined from the ROC curve. The sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of the S.O.S. were then compared to other validated ED scoring systems. All statistical analyses were completed using SAS 9.2. (SAS Institute, Cary, NC). This study was approved by the Women and Infants Hospital Institutional Review Board (no. 11-0059).

RESULTS

From February 2009 through May 2011, 850 eligible women were evaluated in the ED and included in this study. Nine were admitted to the ICU (1.1%), 32 to the telemetry unit (3.8%), and none died. The most common diagnosis at presentation was influenza-like illness (ILI) (60.4%), followed by nonrespiratory viral syndrome (11.1%), pyelonephritis (5.3%), endometritis (4.5%), pneumonia (2.4%), mastitis (1.2%), chorioamnionitis (0.7%), and septic abortion (0.6%).

The S.O.S. ranged from 0−13, with a mean of 1.3 and a median of 0. The overall AUC for the S.O.S. was 0.97. The ROC curve for the composite score is shown in Figure 2. This curve was used to estimate the optimal S.O.S. cutoff for identification of risk of ICU admission. Using a cutoff of ≥6, the S.O.S. had a sensitivity of 88.9%, a specificity of 95.2%, a PPV of 16.7%, and a NPV of 99.9%. The AUC for a cutoff of 6 was 0.92.

Those with an S.O.S. ≥6 and <6 were similar demographically. There was a statistical difference in age but no difference in BMI, race/ethnicity, insurance coverage, gestational age at presentation, or medical comorbidities (Table 1). Of those patients with an S.O.S. of ≥6, the most common diagnoses at presentation were pyelonephritis (25%), ILI (25%), and endometritis (10.4%). In contrast, those with an S.O.S. of <6 most commonly presented with ILI (62.6%) and nonrespiratory viral syndrome (11.4%) (Table 2).

Those with an S.O.S. ≥6 were significantly more likely to be admitted to the ICU or telemetry unit, and to have positive blood cultures, fetal tachycardia, and longer hospital stays than those

TABLE 1
Demographic information *(continued)*

Variable	S.O.S. ≥6	S.O.S. <6	*P* value
Thyroid disease, n (%)	(n = 48) 1 (2.1)	(n = 798) 32 (4.0)	1.0
HIV, n (%)	(n = 48) 0 (–)	(n = 798) 3 (0.4)	1.0
Current antibiotic use, n (%)	(n = 48) 1 (2.1)	(n = 793) 50 (6.3)	.35

BMI, body mass index; *HIV*, human immunodeficiency virus; *S.O.S.*, Sepsis in Obstetrics Score.

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with an S.O.S. <6 (Table 2). Of those patients with positive blood cultures, the most common pathogen identified was *Escherichia coli* (33.3%), followed by *Fusobacterium* (14.3%). There was no difference between groups in the frequency of positive influenza swabs or in composite adverse perinatal outcome (Table 2). After adjusting for potential clinical confounders that had been determined a priori (age, BMI, and race), an S.O.S. of ≥6 was highly associated with risk of ICU admission, with an adjusted odds ratio of 109 (95% confidence interval, 18–661). Additionally, individual variables were assessed, and with the exception of SpO_2, each variable was positively associated with ICU admission (Table 3).

TABLE 2
Outcome data

Variable	S.O.S. ≥6	S.O.S. <6	*P* value
Admission to ICU, n (%)	(n = 48) 8 (16.7)	(n = 802) 1 (0.1)	< .0001
Admission to telemetry unit, n (%)	(n = 40) 16 (33.3)	(n = 801) 16 (2.0)	< .0001
Length of hospital stay, d	(n = 42)	(n = 192)	
Mean (SD)	4.4 (2.9)	2.8 (1.6)	.0004
Median (min-max)	3.5 (0-14)	2 (0-9)	
Working diagnosis, n (%)	(n = 48)	(n = 796)	
Pyelonephritis	12 (25.0)	33 (4.2)	
ILI	12 (25.0)	498 (62.6)	< .0001
Endometritis	5 (10.4)	33 (4.2)	
Nonrespiratory viral syndrome	3 (6.3)	91 (11.4)	
Septic abortion	2 (4.2)	3 (0.4)	
Chorioamnionitis	2 (4.2)	4 (0.5)	
Pneumonia	1 (2.1)	19 (2.4)	
Mastitis	1 (2.1)	9 (1.1)	
Other	10 (20.8)	106 (13.3)	
Positive blood cultures, n (%)	(n = 39) 12 (30.8)	(n = 141) 12 (8.5)	.0003
Positive influenza swabs, n (%)	(n = 27) 4 (14.8)	(n = 720) 100 (13.9)	.78
Fetal tachycardia, n (%)	(n = 30) 18 (60.0)	(n = 598) 77 (12.9)	< .0001
Composite perinatal outcome, n (%) (Fetal or infant death, RDS, grade III/IV IVH, stage 2 or 3 NEC, sepsis)	(n = 35) 2 (5.7)	(n = 716) 47 (6.6)	1.0

ICU, intensive care unit; *ILI*, influenza-like illness; *IVH*, intraventriular hemorrhage; *NEC*, necrotizing enterocolitis; *RDS*, respiratory distress syndrome; *S.O.S.*, Sepsis in Obstetrics Score.

Albright. The Sepsis in Obstetrics Score. Am J Obstet Gynecol 2014.

The S.O.S. was then compared to other validated ED sepsis scoring systems. This was done by calculating the sensitivity, specificity, PPV, and NPV of the Modified Early Warning Score (MEWS) using a cutoff of 5 (a commonly used threshold outside of pregnancy)[19] and the REMS using a cutoff of 6 (a validated cutoff for identification of bacteremia[20]) (Table 4).

Of the 850 patients, 180 had blood cultures drawn. This subset was found to have an ICU admission rate of 3.9% with an overall AUC for the S.O.S. of 0.95 (Figure 3). An S.O.S. of ≥8 was determined to be the appropriate cutoff for this group with a PPV of 30% for ICU admission. They were then separately analyzed (Table 5). Notably, this subset was more likely to have a bacterial etiology as the suspected source of infection, most commonly endometritis (20.3%), followed by pyelonephritis (18.6%).

Comment

No scoring system has been developed to date that accounts for the normal physiologic changes of pregnancy. Not accounting for these normal physiologic changes likely explains why none have been able to accurately predict morbidity and mortality in a pregnant population. The S.O.S., a sepsis scoring system modified for physiologic changes specific to pregnancy, was able to identify pregnant and postpartum patients at risk for admission to the ICU for sepsis within 48 hours of presentation to the ED. Importantly, while each variable with the exception of SpO_2 seemed to contribute to the overall score, the composite score was superior to any individual variable.

TABLE 3
Area under curve (including for individual variables)

Variable	AUC
S.O.S.	0.97
Temperature	0.78
Heart rate	0.94
Systolic blood pressure	0.93
Respiratory rate	0.80
SpO_2	0.62
Leukocyte count	0.89
% immature neutrophils	0.74
Lactic acid	0.72

AUC, area under curve; *S.O.S.*, Sepsis in Obstetrics Score; *SpO_2*, blood oxygen saturation.

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The S.O.S. had a PPV of 16.7% for admission to the ICU. Because pregnant (and postpartum) women are generally young and without chronic medical conditions, their rate of SIRS- and sepsis-related morbidity is low, reducing the PPV of any given score. Additionally, given a low ICU admission rate (1.1%), a high NPV is expected. However, the S.O.S. seems to have a better PPV than either REMS or MEWS. Similarly, Lappen et al[9] evaluated the predictive value of the SIRS and MEWS criteria in 913 pregnant women with chorioamnionitis. Specifically, they assessed whether either of these sets of criteria accurately identified disease progression as defined by ICU admission, sepsis, or death. Two thirds of women met SIRS criteria, which had only a 1% PPV for disease progression. Ten percent had a MEWS of at least 5 and the PPV for ICU admission, sepsis, or death was 0.05%.[9]

Consistent with prior studies, the most common causes of maternal disease concerning for sepsis, as indicated by an S.O.S. ≥6, included pyelonephritis and endometritis. We did not see a high rate of pneumonia, but instead a high rate of suspected ILI. Also consistent is the low rate of morbidity and mortality. In 2008, Paruk et al[21] summarized 5 studies of obstetric sepsis and reported that the most common causes of sepsis in pregnancy include: "puerperal sepsis" (2.5-27.5%) including endometritis and chorioamnionitis, urinary tract infections (1.3-14%), and pneumonia (2.5-9.3%). Additionally, the overall mortality in this study was low (2.5-3.1%).[21] More recently, Bauer et al[4] evaluated trends in maternal sepsis and found that the most common diagnoses included pneumonia (29.7%), genitourinary infection (29.7%), chorioamnionitis (18.4%), endometritis (8.6%), and pyelonephritis (5.8%).

Patients with ILI were included because they often meet SIRS criteria and it is known that ILI can cause severe morbidity in an obstetric population. We therefore thought it reasonable to evaluate the S.O.S. in this population. However, the pathophysiology of sepsis stems from bacteremia rather than viremia. It therefore follows that in those patients who had an S.O.S. ≥6, vs those with an S.O.S. <6, the percentage of patients who had positive blood cultures was significantly higher (30.8% vs 8.5%), indicating that a higher S.O.S. identifies those at risk of having positive blood cultures. As previously stated, we analyzed separately those patients who had blood cultures drawn, excluding those who only had an influenza swab. In doing so, we were hoping to capture a cohort of patients at higher risk of sepsis. Indeed, in this group, there was an almost 4% admission rate to the ICU as compared to the 1.1% admission rate in the entire data set. The overall AUC for the S.O.S. in this group was similar to that in the entire data set, but interestingly, only heart rate, systolic blood pressure, white blood cell count, and lactic acidosis seemed to identify those at risk of ICU admission. This correlates with the pregnancy-specific physiologic changes that were accounted for in the scoring system.

Based on a PubMed search using the terms "sepsis," "pregnancy," "disease severity score," "emergency department," and "critical care," this is the only study we are aware of that has created a scoring system for sepsis based on physiologic changes specific to pregnancy. Furthermore, no study has looked at a scoring system in an obstetric population presenting to an ED to identify those at risk for adverse outcomes. The other major strength of this study is its relatively large sample size.

This study has several limitations. These include that it is retrospective and was performed at a single institution. The overall rate of serious morbidity and mortality was low in our cohort, and thus the S.O.S. has a relatively low PPV. We used ICU admission as a surrogate marker for maternal morbidity rather than a different biologic endpoint. Not all variables included in this scoring system were collected on each patient in the ED over the study period, ranging from 0% missing for temperature and systolic blood pressure to 81.3% missing for lactic acid. Overall, 23% of the parameters of the scoring system were not collected, but by assuming those variables that were missing were normal, our results are biased toward the null, suggesting that had those values been abnormal, the scoring system would have performed even better. The patients included were only those with signs of sepsis in the ED, and not those who became septic once admitted. Therefore,

TABLE 4
Performance of S.O.S. and other validated scoring systems on this cohort

Scoring system	Sensitivity, %	Specificity, %	Positive predictive value, %	Negative predictive value, %
S.O.S.	88.9	99.2	16.7	99.9
REMS	77.8	93.3	11.1	99.7
MEWS	100	77.6	4.6	100

MEWS, Modified Early Warning Score; *REMS*, Rapid Emergency Medicine Score; *S.O.S.*, Sepsis in Obstetrics Score.

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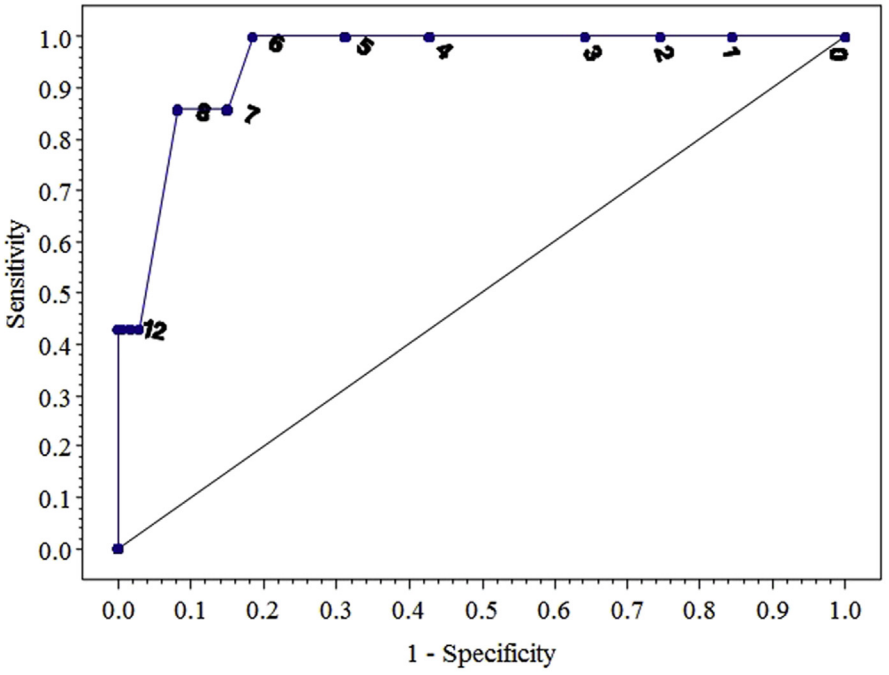
FIGURE 3
Receiver operating characteristic curve for intensive care unit admission for S.O.S. (blood cultures only)



Point labels are values of S.O.S. area under curve for composite score when evaluating only those who had blood cultures drawn is 0.95.

S.O.S., Sepsis in Obstetrics Score

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TABLE 5
Outcome data (blood cultures only)

Variable	S.O.S. ≥8	S.O.S. <8	*P* value
Admission to ICU, n (%)	(n = 20) 6 (30)	(n = 160) 1 (0.6)	< .0001
Admission to telemetry unit, n (%)	(n = 14) 10 (71.4)	(n = 159) 19 (11.9)	< .0001
Length of hospital stay, d	(n = 20)	(n = 129)	
Mean (SD)	4.7 (2.7)	3.3 (1.6)	.005
Median (min-max)	4 (2-14)	3 (1-10)	
Positive blood cultures, n (%)	(n = 20) 5 (25)	(n = 160) 19 (11.9)	.15
Positive influenza swabs, n (%)	(n = 6) 0 (0)	(n = 71) 12 (16.9)	.58
Fetal tachycardia, n (%)	(n = 8) 5 (62.5)	(n = 90) 37 (41.1)	.28
Composite perinatal outcome, n (%) (Fetal or infant death, RDS, grade III/IV IVH, stage 2 or 3 NEC, sepsis)	(n = 19) 2 (10.5)	(n = 158) 22 (13.9)	1.0

ICU, intensive care unit; *IVH*, intraventriular hemorrhage; *NEC*, necrotizing enterocolitis; *RDS*, respiratory distress syndrome; *S.O.S.*, Sepsis in Obstetrics Score.

Albright. The Sepsis in Obstetrics Score. Am J Obstet Gynecol 2014.

this score may not be generalizable to that broader group of patients. Finally, the study was not adequately powered to statistically test the performance of the S.O.S. against other scoring systems.

Given the increasing rate of sepsis-related maternal morbidity and mortality in the United States, it is important to rapidly and accurately identify patients at risk of becoming septic, as early initiation of therapy improves outcome. Moreover, reducing overall maternal morbidity and mortality in the United States needs to be a top priority given our high maternal mortality rate as compared to other developed countries. A tool to help in the identification of sepsis in pregnancy could aid in this reduction. The S.O.S. could allow physicians in an ED setting to better triage pregnant and postpartum patients with signs of sepsis to receive the appropriate goal-directed care and guide further research by providing a more accurate definition of sepsis during pregnancy. This scoring system, therefore, warrants prospective evaluation. ■

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