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Patient Factors Associated With Identification of Sepsis in the Emergency Department

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To the editor

Early antibiotics and quantitative fluid resuscitation have been shown to reduce mortality in patients with severe sepsis in the Emergency Department (ED) [1, 2]. However, estimates of ED identification of sepsis are as low as 17% [3]. The goal of this study was to identify patient factors that are most practically and accurately associated with identification of sepsis in the ED.

We performed a retrospective, single center study of 122 adult patients with sepsis, severe sepsis, or septic shock who were transported by EMS to a single large-volume public hospital emergency department with the following abnormal vital signs documented in the EMS setting: pulse >90 beats per minute, respiratory rate >20 breaths per minute, and systolic blood pressure <110 mmHg. All patients were diagnosed with sepsis, severe sepsis, or septic shock by clinical documentation by the hospital admitting team within 48 hours of ED presentation.

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ED records were reviewed to determine whether the ED clinician documented a diagnosis of sepsis, severe sepsis, or septic shock, or documented sepsis as part of a differential diagnosis and ordered antibiotics. We conducted univariable analyses of biologically plausible patient characteristics potentially associated with a sepsis diagnosis in the ED, using simple logistic regression and retained variables with a p-value <0.20 in a multiple logistic regression model.

Seventy-nine of the 122 patients with sepsis (64.8%) were identified in the ED. Among patients diagnosed in the ED, 92.4% were admitted to an intensive care unit or step down unit, compared to 72.1% among those not diagnosed in the ED ($p=0.003$). Hospital mortality was not significantly different between the two groups (29.1% vs. 23.2%, $p=0.5$). Patients identified with sepsis in the ED had a higher temperature (37.6°C vs. 36.7°C, $p=0.004$), and were more likely to have the following: lactate > 4 mmol/L (32.9% vs. 16.3%, $p=0.04$), Glasgow Coma Scale (GCS) <15 (73.7% vs. 51.2%, $p=0.01$), and mean arterial blood pressure (MAP) <65 mmHg (30.2% vs. 7.3%, $p=0.004$). Age, gender, white blood cell count (WBC), and Sequential Organ Failure Assessment (SOFA) score were not different between the two groups (Tables 1 and 2). Multivariable logistic regression showed that temperatures >38.0°C and GCS <15 were associated with ED identification of sepsis (Table 3).

We found that approximately 1/3 of septic patients that present by EMS with abnormal vital signs are not identified in the ED. Those identified as septic in the ED were more likely to have a higher temperature, GCS <15, MAP <65 mmHg, and lactate >4 mmol/L. In multivariable analysis, the presence of fever and an abnormal GCS were associated with sepsis identification. In our study, ED identification of sepsis was associated with higher admission rates to intensive care and step down units but was not associated with reduced in-hospital mortality.

The proportion of septic patients that were identified in the ED in our study is higher than the 17% estimated by Cronshaw, et al. Causes of this discrepancy may include differences in the data abstraction method (manual chart review as opposed to identification of sepsis diagnosis by diagnostic coding) [4] and differences in study population (patients who presented by EMS with abnormal vital signs vs. “all-comers” to the ED) [5, 6].

Our study suggests that certain septic phenotypes are less likely to be identified in the ED. A better understanding of phenotypes in which sepsis may be missed will be useful as ED clinicians aim to improve identification of patients with sepsis. It is possible that the EMS environment might prove conducive to making a preliminary diagnosis of sepsis.

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TABLE 1

Analysis of patient factors comparing septic patients identified as septic in the ED and septic patients not identified as septic in the ED

Variable at ED presentation ^a	Identified in ED (n=79)	Not identified in ED (n=44)	p-value ^b
Age (years)	55.9 (14.8)	55.6 (16.7)	0.9
Temperature (°C)	37.6 (1.5)	36.7 (1.1)	<0.01
Serum Lactate (mmol/L)	4.6 (3.1)	4.4 (3.2)	0.7
WBC (mm ³)	12.1 (7.5)	12.3 (7.4)	0.9
GCS	9.7 (4.5)	10.8 (4.8)	0.2
MAP (mmHg)	76.6 (20.5)	79.0 (15.8)	0.5
SOFA score	4.3 (3.5)	3.2 (2.5)	0.05

^a Mean, (SD)

^b Two-tailed t-test

TABLE 2

Analysis of frequencies of patient factors comparing septic patients identified as septic in the ED and septic patients not identified as septic in the ED

Variable at ED presentation ^c	Identified in ED (n=79)	Not identified in ED (n=43)	p-value ^d
Female	37 (47.0)	25 (58.0)	0.3
Temp >38°C	30 (38.4)	9 (20.6)	0.06
Temp <36°C	11 (13.5)	13 (29.4)	0.07
Lactate >4 mmol/L	26 (32.9)	7 (16.3)	0.04
WBC >12,000 cells/mm ³	48 (60.3)	24 (56.4)	0.7
WBC <4,000 cells/mm ³	12 (15.4)	6 (13.9)	0.7
GCS <15	58 (73.7%)	22 (51.2%)	0.01
MAP <65 mmHg	24 (30.2%)	3 (7.3%)	<0.01

^c n (%)

^d Chi-squared test

TABLE 3Patient characteristics associated with Emergency Department identification of sepsis^e

Variable	Univariable analysis		Multivariable analysis	
	Odds Ratio (95% Confidence Interval)	P-value	Odds Ratio (95% Confidence Interval)	P-value
Temperature > 38°C	2.13 (0.74–6.12)	0.08	6.61 (1.55 – 28.24)	0.01
Temperature < 36°C	0.50 (0.16–1.56)	0.08	2.83 (0.77 – 10.43)	0.11
WBC >12,000/mm ³	1.35 (0.56–3.26)	0.7	-	-
WBC <4,000/mm ³	1.52 (0.43–5.39)	0.7	-	-
GCS <15	2.67 (1.20–5.92)	0.02	2.96 (1.05 – 8.35)	0.04
MAP <65 mmHg	5.50 (1.54–19.64)	0.009	4.54 (0.88 – 23.44)	0.07
Lactate >4 mmol/L	2.52 (0.99–6.43)	0.05	-	-

^eVariables associated with a p-value of <0.2 in univariable logistic regression were included in the multivariable stepwise logistic regression analysis. Stepwise selection was performed using selection and stay criteria of p-value <0.20.