EMERGENT MEDICINE: POTENTIALLY LIFE-SAVING INTERVENTIONS PERFORMED DURING THE PREHOSPITAL TRANSPORT OF SEPTIC PATIENTS

Nicholas Caputo[3] OMS-III, BSE, NRP; William Taber[2] MD; Nicholas Scaturo[4] PharmD, Richard Wilbert[5] NRP, Emily Meyers[5] BSN, RN, CEN, Marshall Frank[1,4,5] DO, Erica Warkus[1] MD, PhD

5 - Sarasota County Fire Department; 4 - Sarasota Memorial Health Care System; 3 - Nova Southeastern University Doctor Kiran C. Patel College of Osteopathic Medicine;
2 - Virginia Tech Carilion Emergency Medicine; 1 - Florida State University Emergency Medicine Residency Program at Sarasota Memorial Hospital

INTRODUCTION

Emergency Medical Services (EMS) often transport patients with suspected sepsis to the receiving hospital via emergent transport using red lights and sirens (RLS). Screening tools such as the qSOFA score aid early recognition of sepsis, but it remains unclear whether septic patients benefit from emergent transport. Emergent transport has risks, including accidents and injuries to EMS personnel. There is little evidence that the time saved, or the potentially life-saving interventions (PLSI) performed during emergent transport of prehospital sepsis improves patient outcomes.

OBJECTIVES:

1) To ***describe the frequency and nature of interventions*** performed by EMS personnel during emergent or non-emergent transport of patients with a positive prehospital screen for sepsis.
2) To assess the ***impact of emergent transport*** on the number and type of interventions performed for patients identified as prehospital sepsis alerts.

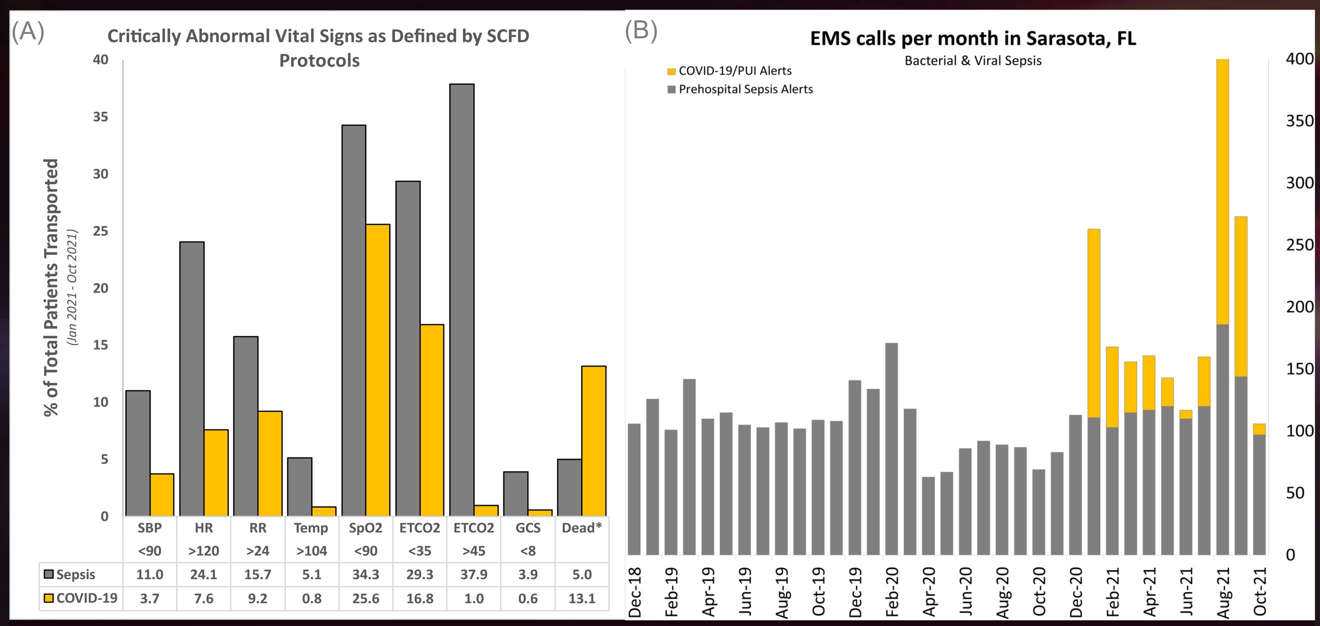

FIGURE 1. (A) Critical patients were identified by the presence of abnormal vitals signs as documented by prehospital providers. (B) COVID-19/PUI Alerts are overlaid on the combination chart showing retrospective and prospectively collected data on prehospital sepsis alert outcomes. **Mortality data is only available for a portion of the overall sample evaluated in this data set.*

METHODS

This data is from a prospective, non-randomized controlled trial evaluating the clinical impact of emergent transport for patients identified as prehospital sepsis alerts and transported by the Sarasota County Fire Department (SCFD). Patients meeting criteria for sepsis were transported *EMERGENTLY* with red lights and sirens (RLS) on EVEN days or *NON-EMERGENTLY* (no RLS) on ODD days. The proportion of patients receiving potentially life-saving interventions (PLSI) was analyzed by the priority of transport. We also included a retrospective analysis of pre-COVID 911 calls that resulted in a prehospital "Sepsis Alert" notification from November 2018 to December 2020. We assessed the call nature, mode of transportation to and from the scene, estimated call severity via dispatch assignment, the severity of patient illness, and interventions performed. We calculated the proportion of calls with RLS response, RLS transport and the proportion with PLSI performed, both overall and stratified by alert type, call nature or severity. Finally, we evaluated a subset of critical patients, identified by the escalation to critical interventions (e.g., intraosseous line placement) or abnormal vital signs per SCFD protocols. Full data analysis is ongoing. Preliminary analysis of the prospective data used two-tailed T-tests in Excel ($\alpha = 0.01$). Error bars represent 99% confidence intervals where applicable. ***(INTERVENTION**: Emergent transport on EVEN days & non-emergent transport on ODD days; **ENDPOINTS**: Prehospital potentially life-saving interventions (PLSI); **SUBGROUPS**: Call Nature, Critical illness, Alert Type; **EXCLUSIONS**: Not transported, not alerted, incomplete data; **IRB-approved**: Yes.)*

RESULTS

There were 4,916 calls across 38 EMS units included in the analysis (Figure 1). The majority (87.0%; n = 4280) of calls utilized red lights and sirens (RLS) to the scene and 53.6% (n = 2634) of patients were transported emergently. Contrary to the findings of previous prehospital literature, the majority (89.8%) resulted in some form of potentially life-saving intervention (PLSI) (Figure 2). When stratified by call nature (Figure 4), "ILLP" calls had the highest frequency (12.0%, 76.5% received PLSI). "RESP" problems were the second most common (11.9%, 85.6% PLSI). Oxygen was the most frequently administered PLSI, (n=2532, 47.9%) (Figure 2). When including multiple administrations to the same patient, normal saline was the most frequently administered PLSI with 57,586 documented administrations to 1958 patients (43.8%). Mode of transport had minimal effect on the PLSI performed because many patients had critical vital signs and nearly all patients received at least one PLSI (Figure 5). There was little to no discernable difference in severity of illness by SIRS criteria or comorbidities by Charlson score between sepsis alerts and COVID-19 alerts. The emergent transport populations pre- and post-implementation did not significantly differ in either number of PLSI administered or in patient qSOFA scores (Figure 3). This persisted despite the removal of "non-compliant" events, such as patients who were transported emergently on odd/non-emergent days. This suggests that emergent transport itself may influence provider behaviors and clinical decision making or that patient responses to emergent transport may prompt additional interventions. Previously presented data (included for reference) showed that emergent transport did not impact time to antibiotic administration and had only ~ 4.5-minute difference in transport time (Figure 6).

THE INTERVENTION

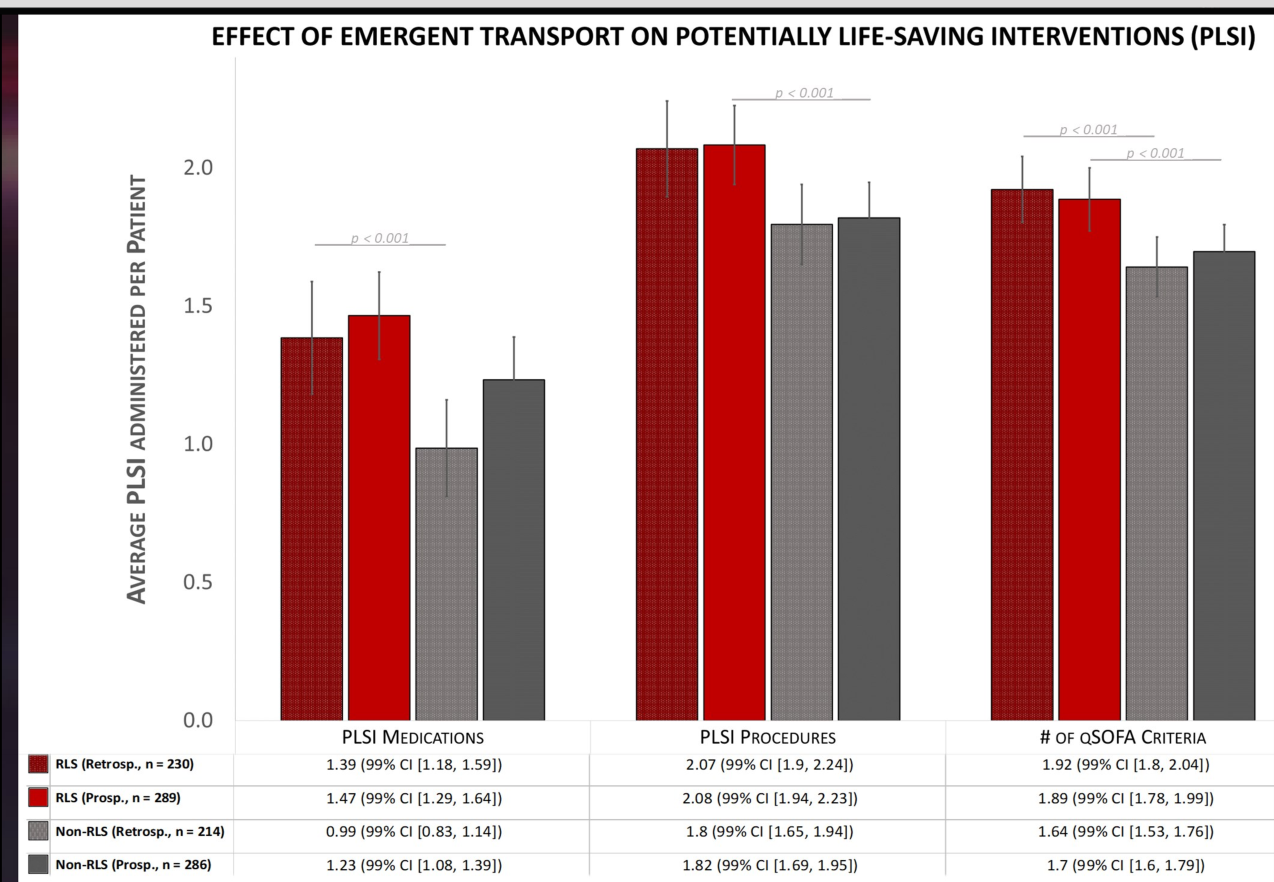

FIGURE 3. The prospective portion of this controlled trial ran from January to October 2021. In May through October of 2021, all EMS crews transported sepsis patients using red lights and sirens, i.e., emergently, on EVEN days of the month and non-emergently on ODD days. Only compliant transports of prehospital sepsis alert patients are included. (N = 1019; $\alpha = 0.001$). Emergent transport as the independent variable appears to account for the observed differences between the average number of PLSI procedures performed. There was no significant difference between emergent transport groups (Pre- vs. Post-intervention: $p_{Meds} = 0.43$, $p_{Proced} = 0.86$, $p_{qSOFA} = 0.57$). Non-emergent transports post-intervention had higher average than preintervention (Pre- vs. Post-intervention: $p_{Meds} = 0.004$), likely because many would have previously been transported emergently.

(A)

	Procedure	N
	Any PLSI - Procedure:	4448
1	Vascular Access	4209
2	ECG	1943
3	Trauma Evaluation	117
4	End-Tidal Capnography	108
5	Intubation	90
6	Ventilation	40
7	Patient Cooling	32
8	Airway Management	27
9	Cardioversion	7
10	CPR, Manual	3

(B)

	Medication	N
	Any PLSI - Medication:	3520
1	Oxygen	2532
2	Normal saline	2199
3	Solu-Medrol	277
4	Albuterol	205
5	Terbutaline	201
6	Zofran	196
7	Ipratropium	176
8	Etomidate/ Succinylcholine	79
9	Midazolam	74
10	Nitroglycerin	52
11	D10	48
12	Narcan	41
13	Diltiazem	39
14	Aspirin	38
15	Epinephrine	16

(C)

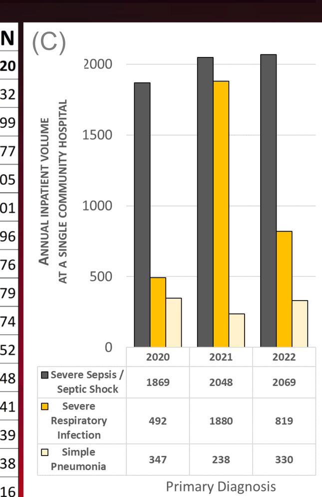

FIGURE 2. The most frequent PLSI are listed by procedures performed (A) or medications administered (B) to the cohort of patients transported by EMS after being identified as a prehospital "Sepsis Alert" or a "COVID-19/PUI Alert." (C) Shows the annual impact of COVID-19 infections on inpatient census at a single community hospital in the first three years of the global pandemic.

Rank	Call Nature	Emergent Transport			Non-Emergent Transport			PUI / COVID Positive			Sepsis		
		N	Medication Count	Procedure Count	N	Medication Count	Procedure Count	N	Medication Count	Procedure Count	N	Medication Count	Procedure Count
	Total	**4916**	**1.4**	**1.8**	**2369**	**1.0**	**1.5**	**759**	**1.0**	**1.4**	**4157**	**1.2**	**1.7**
1	ILLP	215	1.0	2.0	319	0.9	1.6	125	0.8	1.5	490	1.0	1.8
2	RESP	211	1.9	2.0	267	1.2	1.5	244	1.4	1.4	307	1.8	2.0
3	FLU	94	1.4	1.8	256	0.8	1.1	245	0.8	1.1	152	1.2	1.8
4	FALL	38	1.0	2.6	49	0.7	2.1	26	0.5	1.9	71	1.0	2.4
5	UNCO	43	1.9	2.4	37	1.1	2.1	28	1.1	2.2	62	1.5	2.3
6	CVA	32	0.6	2.0	29	0.4	1.7	14	0.4	1.5	57	0.5	1.9
7	CHES	25	1.8	2.0	25	1.9	1.8	21	1.7	1.8	36	1.8	2.0
8	PSRV	20	1.3	2.2	26	1.1	2.0	8	1.7	1.9	45	1.3	2.1
9	HEART	14	1.0	2.2	27	0.9	2.1	9	0.3	2.3	38	1.1	2.1
10	HEMO	17	1.0	1.8	17	0.5	1.6	7	0.0	1.0	30	1.0	1.8
11	ABDO	8	1.6	2.4	11	0.9	1.7	5	0.8	1.2	17	1.4	2.3
12	DIAB	10	1.7	1.9	5	0.5	1.8	2	0.5	2.5	19	1.5	1.8
13	SEIZ	6		1.5	12	0.5	1.9	6	0.0	2.2	12	1.0	1.6
14	REAC	8	2.5	1.8	3	0.0	2.0	1		2.0	11	1.7	1.8
15	UNKM	3	2.0	2.3	8	0.0	2.0	5	0.0	1.8	6	2.0	2.3

FIGURE 4. PLSI performed, stratified by transport mode, alert, call nature and severity of illness.

Rank	Call Nature	Critical Vital Signs by Call Nature			All Transport	
		N	% with Critical VS	Avg. # of Crit. VS per patient	Medication Count	Procedure Count
	Total	**4916**	**69.4%**	**1.7**	**1.2**	**1.7**
1	ILLP	615	61.8%	1.4	0.9	1.8
2	RESP	551	80.8%	2.3	1.6	1.7
3	FLU	397	58.2%	1.4	1.0	1.3
4	FALL	97	51.5%	1.2	0.8	2.3
5	UNCO	90	77.8%	2.7	1.4	2.3
6	CVA	71	62.0%	1.3	0.5	1.8
7	CHES	57	47.4%	1.2	1.7	1.9
8	PSRV	53	58.5%	1.6	1.4	2.1
9	HEART	47	59.6%	1.2	1.0	2.1
10	HEMO	37	62.2%	1.4	0.7	1.7
11	ABDO	22	59.1%	1.4	1.2	2.0
12	DIAB	21	71.4%	1.8	1.2	1.9
13	SEIZ	18	22.2%	0.5	0.5	1.8
14	REAC	12	83.3%	2.0	1.7	1.8
15	UNKM	11	63.6%	1.9	1.3	2.1

FIGURE 5. Top 15 call natures with number of calls, critical vitals, and PLSI performed.

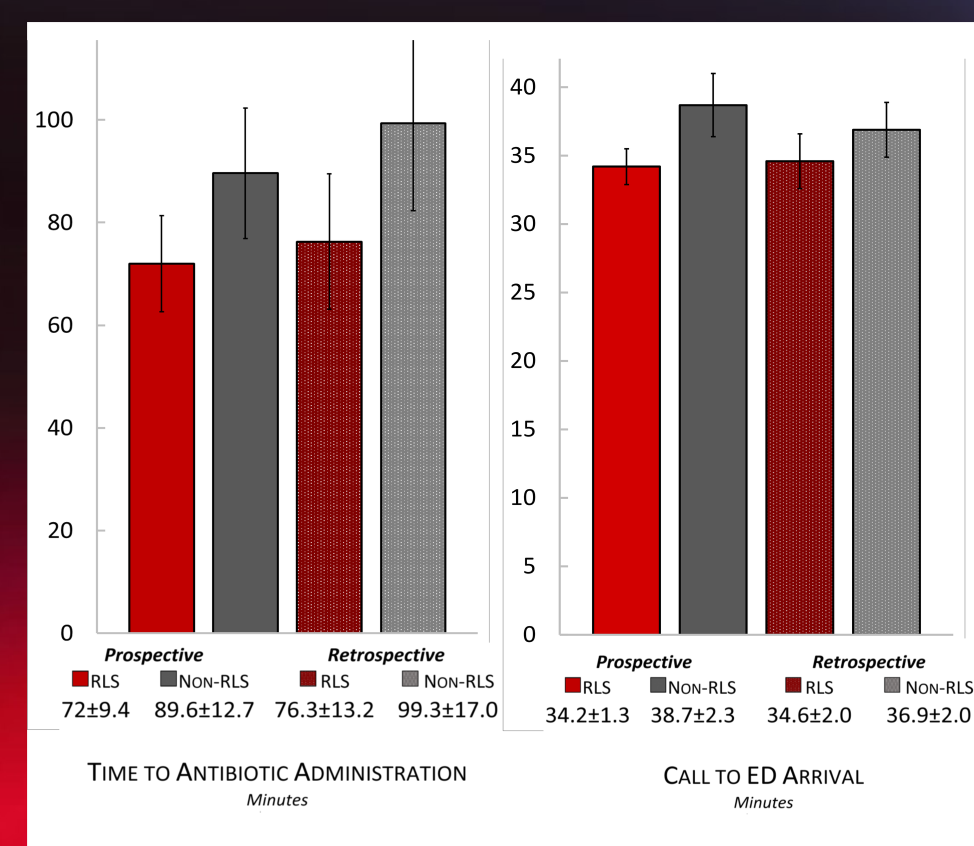

FIGURE 6. (Previously presented data) showing that emergent transport has a persistent impact on the time to antibiotic administration but little meaningful effect on transport time.

DISCUSSION

The emergent transport populations pre- and post-implementation did not significantly differ in either number of PLSI administered or in patient qSOFA scores (Figure 3). This persisted despite the removal of "non-compliant" events, such as patients who were transported emergently on odd/non-emergent days. This suggests that emergent transport itself may influence provider behaviors and clinical decision making or that patient responses to emergent transport may prompt additional interventions. Previously presented data (included for reference) showed that emergent transport did not impact time to antibiotic administration and had only ~ 4.5-minute difference in transport time (Figure 6).

HOW DID YOU FEEL WHEN VIEWING THIS POSTER?
CAN YOU IMAGINE THE SIRENS WAILING?

This poster is designed to make YOU feel rushed, hurried, stressed.

Now imagine you are in the back of a speeding ambulance with a patient….

WOULD YOUR CLINICAL DECISIONS BE AFFECTED?

CONCLUSION

Emergent transport may have an impact on prehospital provider clinical decision-making or patient autonomic responses to prehospital transport. Emergent transport independently influences the number of PLSI administered and may impact patient qSOFA scores. The reproducibility of this preliminary finding remains to be seen. In this large dataset of prehospital sepsis alerts, RLS responses, transports and PLSI were very common. However, the potentially life-saving interventions performed did not have any impact on subsequent care or outcomes such as time to antibiotic administration or patient mortality as was previously presented. Sepsis is a disease that develops over the course of days to weeks, and the average of 4.5 minutes saved using emergent transport is unlikely to meaningfully alter patient outcomes. PI & Contact: erica.warkus@gmail.com

MANY THANKS TO:

Sarasota County Fire Department & all the crews that contributed to this project, *"E for Emergent!"*, Sarasota Memorial Health Care System & the SMHCS IRB, Florida State University Emergency Medicine Residency Program, Dr. Frank, Dr. O'Keefe, & Dr. Galwankar.

REFERENCES

SUPPLEMENTAL MATERIALS

E-POSTER