



Regions Hospital
HealthPartners


Pre-Hospital Lactate: A Severity Indicator in Early Sepsis Management



Kurt Isenberger, MD, Aaron Burnett, MD, Jeff Anderson, ScD, MPH, Adam Mayer, BS, Joseph Pasquarella, RN, MS, Sandi Wewerka, MPH, NREMT-B, RJ Frascone, MD


Disclosures

- None
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Background

- Elevated serum lactate levels have been associated with poor outcomes in patients with undifferentiated shock.
- Early Goal Directed Therapy leads to significant decrease in patient mortality
- Two components of sepsis management are antibiotics administration and lactate measurement
- 2014 Regions Emergency Department – urban, level one trauma center started RN driven protocol for sepsis
 - Identification of 2/4 SIRS criteria a “Code Red – Sepsis” paged overhead, requiring physician rapid response



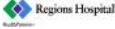
Study Aims

- **Aim #1:** Does a POC Pre-hospital Lactate (PL) value decrease the time to order of antibiotics for patients with suspected sepsis as compared to similar patients with no lactate reading prior to arrival (control)?
- **Aim #2:** Does a POC PL value decrease the time from arrival to in-hospital lactate (IL) test order for patients with suspected sepsis as compared to similar patients with no lactate reading prior to arrival (control)?
- **Hypothesis:** EMS communication of a PL value to the ED provider would result in improved time to antibiotics order and an IL order



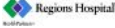
Study Design

- Prospective, observational study (6/2016-5/2017)
- Inclusion criteria based on medic impression of serious infection, >60yo, transported to Regions Hospital, IV access
- POC pre-hospital lactate performed and reported to the ED team (n=170)
- Control group: previously collected group of patients (walk in and ambulance) without POC pre-hospital lactate performed meeting 2/4 SIRS criteria. (n=269)
- Cox regression models were used to estimate hazard ratios (HRs) with 95% confidence intervals for time to physician order for an antibiotic or in-hospital lactate test.



Key Measures

- Arrival to antibiotic order
- Arrival to in-hospital lactate test order




Baseline Characteristics of the Study Population

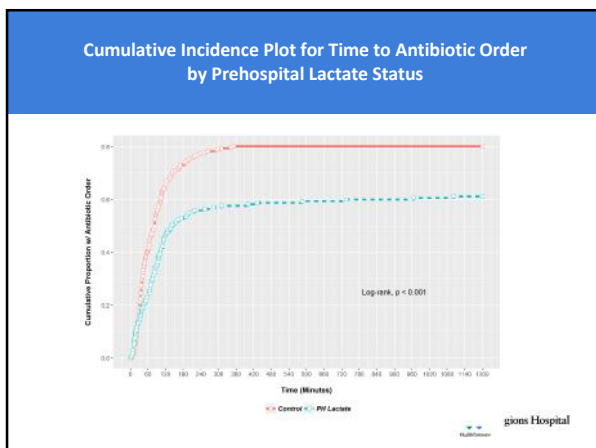
VARIABLE	SEPSIS COHORT				P-VALUE
	CONTROLS		PH LACTATE		
	N	PCT	N	PCT	
Total	269	100.0%	170	100.0%	-
Age					0.000
Mean ± SD	54.1 ± 19.5		69.6 ± 14.8		
Q1 Median Q3	40 55 69		61 69 81		
[Min, Max]	[16, 94]		[22, 96]		
Gender					0.062
Female	135	50.2%	69	40.6%	
Male	134	49.8%	101	59.4%	
Admitted					0.576
No	37	13.8%	26	15.9%	
Yes	232	86.2%	138	84.1%	
Expired					0.027
No	257	95.5%	146	88.6%	
Yes	12	4.5%	17	10.4%	

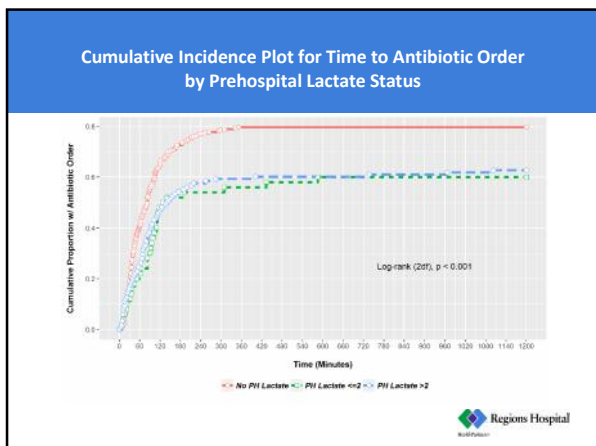
Cox Models for Time to First Antibiotic Order by Prehospital Lactate Status

	N	ABX ORDERED	PERSON-HOURS	HAZARD RATIO ¹	95% LOWER	95% UPPER	P-VALUE
Time to 1st Antibiotic Order							
<i>Unadjusted</i>							
Control (vs. PH Lactate)	269	216	1340	1.73	1.37	2.19	0.000
PH Lactate (vs. Control)	170	104	1524	0.58	0.46	0.73	0.000
<i>Adjusted²</i>							
Control	269	216	1340	1.83	1.50	2.48	0.000
PH Lactate	170	104	1524	0.52	0.40	0.67	0.000

NOTES
¹ Hazard ratios given for either two-way comparison.
² Adjusted for age (continuous) and gender.





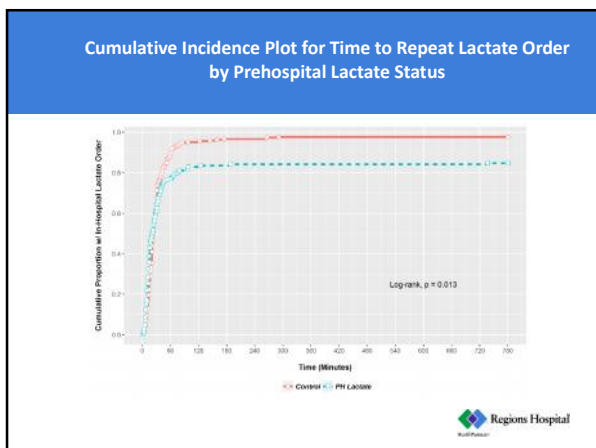


Cox Models for Time to In-Hospital Lactate Order by Prehospital Lactate Status

	N	IN LACTATE ORDERED	PERSON-HOURS	HAZARD RATIO ¹	95% LOWER	95% UPPER	P-VALUE
Time to In-Hospital Lactate Order							
<i>Unadjusted</i>							
Control (vs. PH Lactate)	269	263	215	1.31	1.06	1.61	0.012
PH Lactate (vs. Control)	170	144	410	0.77	0.62	0.94	0.012
<i>Adjusted²</i>							
Control	269	263	215	1.57	1.25	1.98	0.000
PH Lactate	170	144	410	0.64	0.51	0.80	0.000

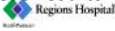
NOTES
¹ Hazard ratios given for either two-way comparison.
² Adjusted for age (continuous) and gender.

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Conclusions

- Control Group had a nearly two-fold faster rate of time to antibiotic order
- Among the PL patients, time to antibiotic order did not differ by PL value
- Time to In-hospital Lactate order did not significantly differ between CG and patients with PL >2
- Comparison within the PL group shows time to In-hospital Lactate order was two times faster for patients with PL >2
- A larger study is required to validate these results



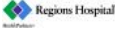
Contact information

- kurt.m.isenberger@healthpartners.com



Lactate Values PH and IH

Pre-Hospital Lactate			
Mean ± SD	-	3.3 ± 2.0	-
Q1 Median Q3	-	1.8 3.0 4.1	-
[Min, Max]	-	[1.0, 15.1]	-
<2.0	-	49	29.2%
2.0-3.9	-	76	45.2%
≥4.0	-	43	25.6%
In-Hospital Lactate			
Mean ± SD	2.2 ± 1.8	2.6 ± 2.1	0.004
Q1 Median Q3	1.2 1.7 2.5	1.4 2.2 3.3	
[Min, Max]	[0.5, 17.7]	[0.5, 21.3]	
<2.0	149	58	0.014
	58.0%	42.6%	
2.0-3.9	79	59	
	30.7%	43.4%	
≥4.0	29	19	
	11.3%	14.0%	



Cumulative Incidence Plot for Time to Repeat Lactate Order by Prehospital Lactate Status among Sepsis Patients

