



# The StO<sub>2</sub> Non-Invasive Tissue Hypoperfusion Monitor as a Screening Tool for Early Sepsis Detection in the Emergency Department

Zachary Kopelman, BA; James Zhou, BA; Alexandra Dattilo, BA; Eric Boccio, BA; Sandra Schneider, MD; Mary Frances Ward, RN, MS, ANP; John D'Angelo, MD; Jason D'Amore, MD.



Department of Emergency Medicine, North Shore University Hospital, Manhasset, New York  
Feinstein Institute for Medical Research, North Shore-LIJ Health System, Manhasset, New York

## INTRODUCTION

- Early recognition of patients with sepsis induced tissue hypoperfusion (SITH) remains a clinical challenge.
- Non-Invasive tissue oxygenation saturation (StO<sub>2</sub>) monitors have been developed to provide a rapid, low-cost, and non-invasive bedside assessment of tissue oxygenation extraction.
- Use of StO<sub>2</sub> monitors has not been well validated as an initial screening tool for sepsis in the ED

## OBJECTIVES

- To assess the efficacy of initial bedside StO<sub>2</sub> readings in the early identification of patients with SITH and to compare StO<sub>2</sub> readings with lactate levels.
- We hypothesize that patients with significantly abnormal StO<sub>2</sub> readings will have a higher sepsis mortality and higher lactate levels.

## METHODS

- We performed an IRB-approved, prospective, observational pilot study of a convenience sample of ED patients presenting with a sepsis continuum diagnosis.
- The study was conducted at an urban, tertiary care center with 90,000 visits per year
- A portable In-Spectra 'Spot Check' StO<sub>2</sub> monitor was used to take a StO<sub>2</sub> reading at the thenar eminence.
- We defined an abnormal StO<sub>2</sub> as <80% or >91% based on consultations with the device manufacturer
- Sensitivity/Specificity, Likelihood ratios, and NPV/PPV were calculated with 95% confidence intervals where appropriate.
- **Inclusion:** Patients with a suspected new infection confirmed by the attending physician and at least 2 SIRS (systemic inflammatory response syndrome) criteria.
- **Exclusion:** Patients <18 years of age or patients with no suspicion of infection.

## RESULTS

### Enrollment Statistics

79 patients enrolled  
-Mean Age: 63 (21-96)  
61 patients were admitted

### Lactate vs. Abnormal StO<sub>2</sub>

16/20 (80%) w/Lactate >2.3 had an abnormal StO<sub>2</sub>  
7/8 (88%) w/Lactate >3.0 had an abnormal StO<sub>2</sub>  
3/3 (100%) w/Lactate >4.0 had an abnormal StO<sub>2</sub>

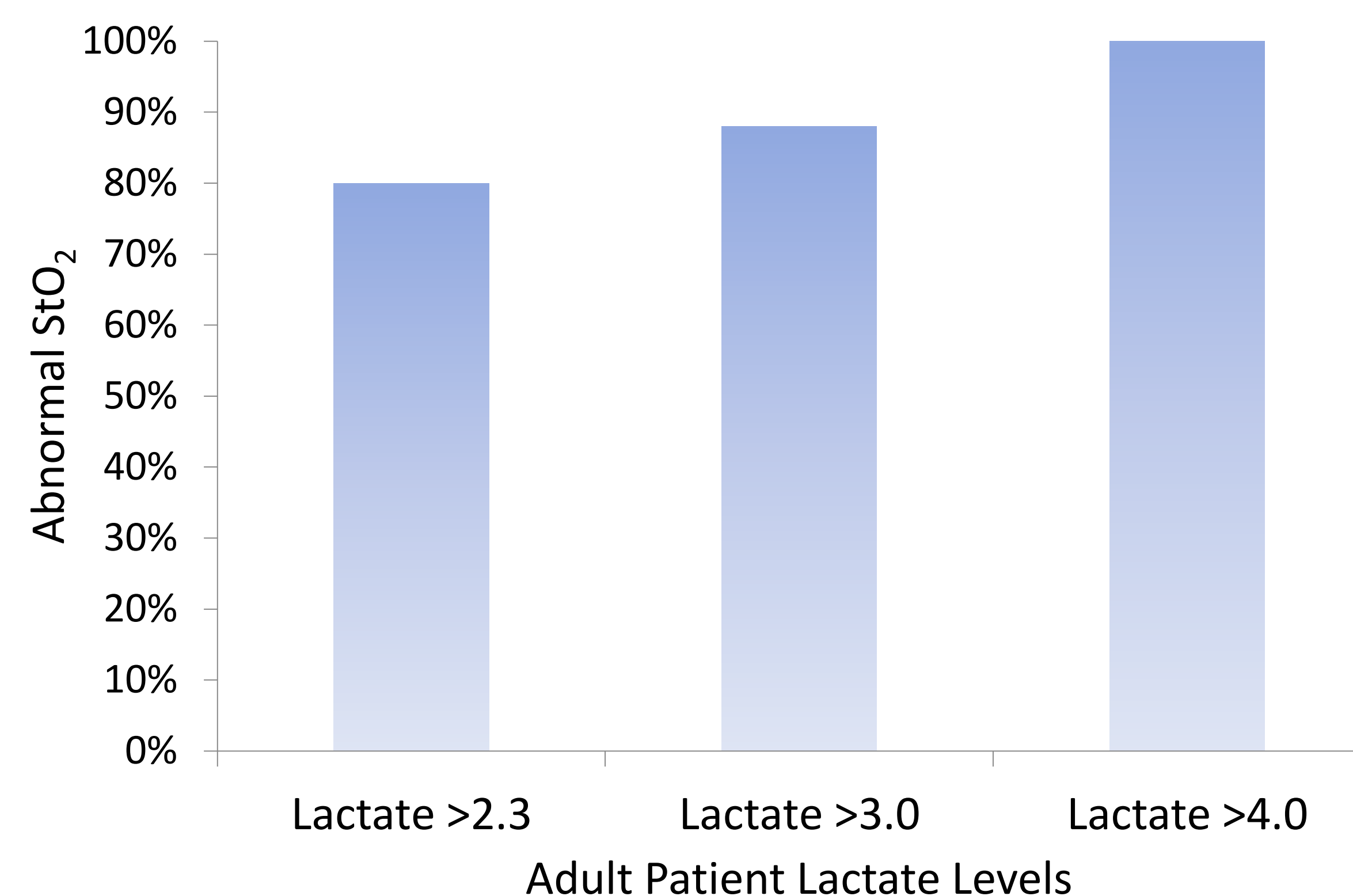


Figure 1. Percentage of study patients with abnormal StO<sub>2</sub> readings at varying lactate levels

### ICU Admissions, Mortality, and MAP vs. Abnormal StO<sub>2</sub>

5/5 (100%) admitted to the ICU had an StO<sub>2</sub> <74%  
3/3 (100%) of mortalities had an StO<sub>2</sub> < 72%  
3/3 (100%) with a MAP < 70 had an StO<sub>2</sub> < 70%

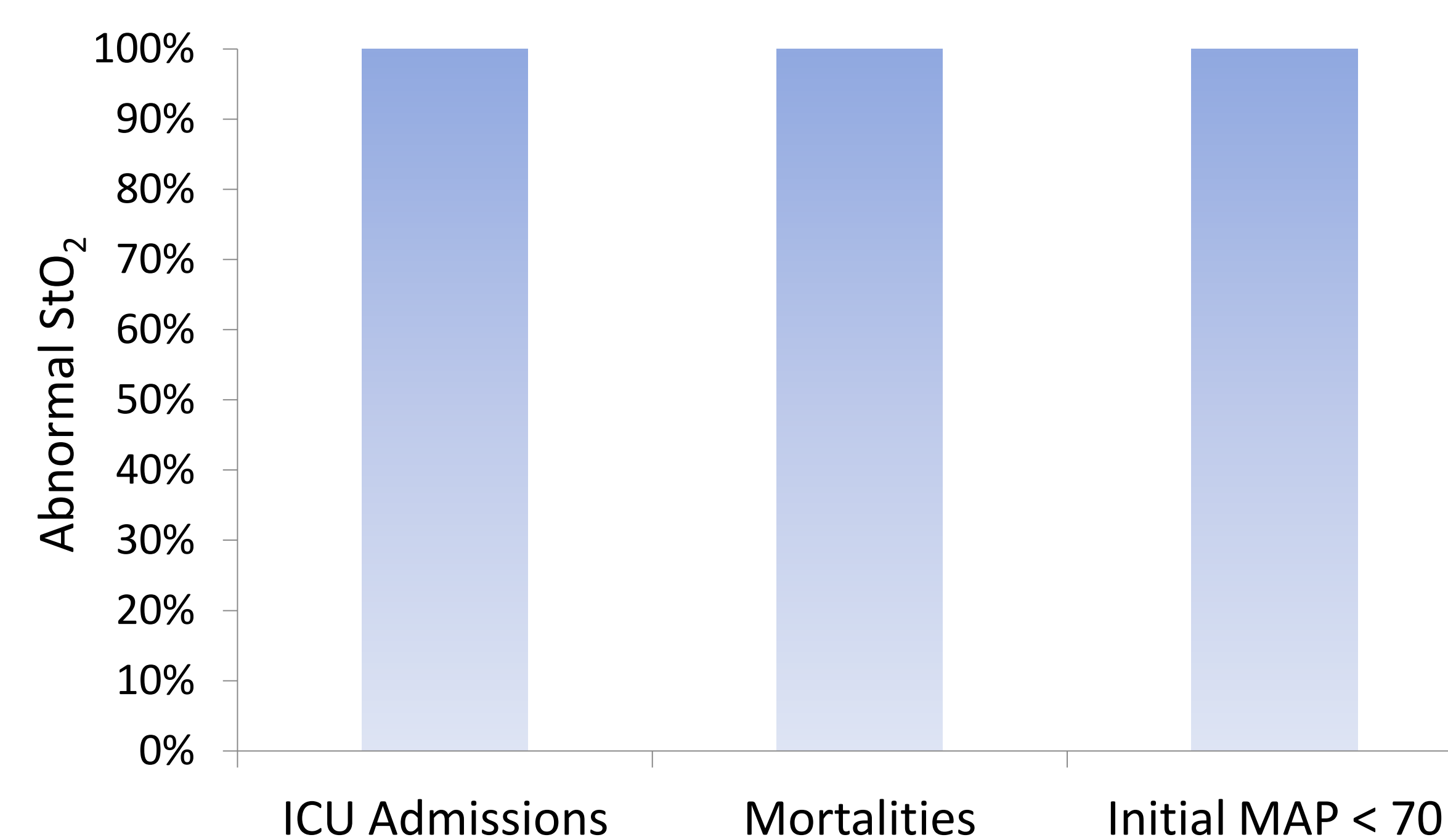


Figure 2. Percent of patients with abnormal StO<sub>2</sub> readings compared with various demographics

## RESULTS

Statistical Analysis for any initial Sepsis Induced Tissue Hypoperfusion (SITH):

Statistical Test	Statistical Value	95% Confidence Interval
Sensitivity	92.0%	(77.5%-98.2%)
Specificity	82.2%	(67.9%-92.0%)
PPV	80.5%	(65.1%-91.2%)
NPV	92.5%	(80.0%-98.3%)
+LR	5.2	(2.7-9.7)
-LR	0.1	(0.03-0.3)

## CONCLUSIONS

- There was a strong correlation between poor patient outcomes and abnormal StO<sub>2</sub> levels as well as a strong correlation between high lactate levels and abnormal StO<sub>2</sub> levels.
- StO<sub>2</sub> may be a useful, rapid, low cost, and non-invasive bedside screening tool for SITH in the ED.
- StO<sub>2</sub> is particularly effective with severely ill patients.
- A reliable bedside tissue oxygenation monitor will allow physicians and nurses to provide sepsis treatment closer to time zero.
- Further studies are needed to determine StO<sub>2</sub>'s ability to predict mortality and assess response to therapy.
- We will be looking at a subset of severe sepsis/septic shock patients using a constant monitoring StO<sub>2</sub> monitor

## CONTACT

PI: Jason D'Amore, MD – jdamore@nshs.edu

Presenter: Zachary Kopelman, BA– zkopelman@nshs.edu

Authors have no financial conflicts of interest to disclose.

