

# Thoughts on Improving Sepsis Care

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University of Kansas



# The Hierarchy of Authorities



**Sepsis is a health security risk to the nation.**

**Sepsis must be solved.**



When it comes to sepsis, remember  
**IT'S ABOUT TIME™**. Watch for:



**TEMPERATURE**  
higher or lower  
than normal



**INFECTION**  
may have signs  
and symptoms of  
an infection



**MENTAL DECLINE**  
confused, sleepy,  
difficult to rouse



SM

**EXTREMELY ILL**  
“I feel like I might  
die,” severe pain  
or discomfort

Watch for a combination of these symptoms. If you suspect sepsis, see a doctor urgently, CALL 911 or go to a hospital and say, “**I AM CONCERNED ABOUT SEPSIS.**”

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**SEPSIS.ORG**



SEPSIS ALLIANCE

[www.sepsis.org](http://www.sepsis.org)



# Our Overall Aim

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- Our Aim - Fewer people die or are maimed by sepsis
- Our Goal – national level being established
  - Mortality rate; time frame
- To achieve our aim, we need better diagnosis, better treatment, and organized, standard care



# Lecture Objectives

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1. Describe severe sepsis treatments and improvement in delivery of care
2. Discuss rural sepsis care
3. Identify community resources through EMS partnerships
4. Recognize and evaluate post-operative sepsis care
5. Develop sepsis driver diagram, process map



# General Issues



# Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016

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1. Sepsis-3 diagnostic definition
2. No recommendations based on Sepsis-3
3. Recommend vs. Suggest
4. Recognition of sepsis and septic shock as emergencies; treatment should begin immediately
5. Recommends organized QI including diagnosis and treatments
6. More attention to antibiotic stewardship



*(Crit Care Med 2017; 3:00–00)*

# Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016

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7. Recommends frequent hemodynamic assessment
8. Target MAP 65 mm/Hg
9. Recommends 30 mL/kg fluid bolus, but no CVP monitoring; treatment to normalize lactate
10. Recommendation for dynamic measures of volume status, rather than static
11. Vasopressors: start with NE, add either Epi or Vasopressin



*(Crit Care Med 2017; 3:00–00)*

# Treatment



# The Timing of Early Antibiotics and Hospital Mortality in Sepsis

Vincent X. Liu<sup>1</sup>, Vikram Fielding-Singh<sup>2</sup>, John D. Greene<sup>1</sup>, Jennifer M. Baker<sup>1</sup>, Theodore J. Iwashyna<sup>3,4</sup>, Jay Bhattacharya<sup>5</sup>, and Gabriel J. Escobar<sup>1</sup>

Model	Odds Ratio for Hospital Mortality, per Elapsed Hour until Antibiotic Administration	95% CI	P Value
Unadjusted	0.89	0.86–0.91	<0.001
+ Sepsis severity strata	0.96	0.93–0.99	0.013
+ Severity of illness	1.08	1.04–1.12	<0.001
+ Demographics	1.09	1.05–1.13	<0.001
Fully adjusted model, in each subgroup			
Sepsis only	1.09	1.00–1.19	0.046
Severe sepsis only	1.07	1.01–1.24	0.014
Septic shock only	1.14	1.06–1.23	0.001

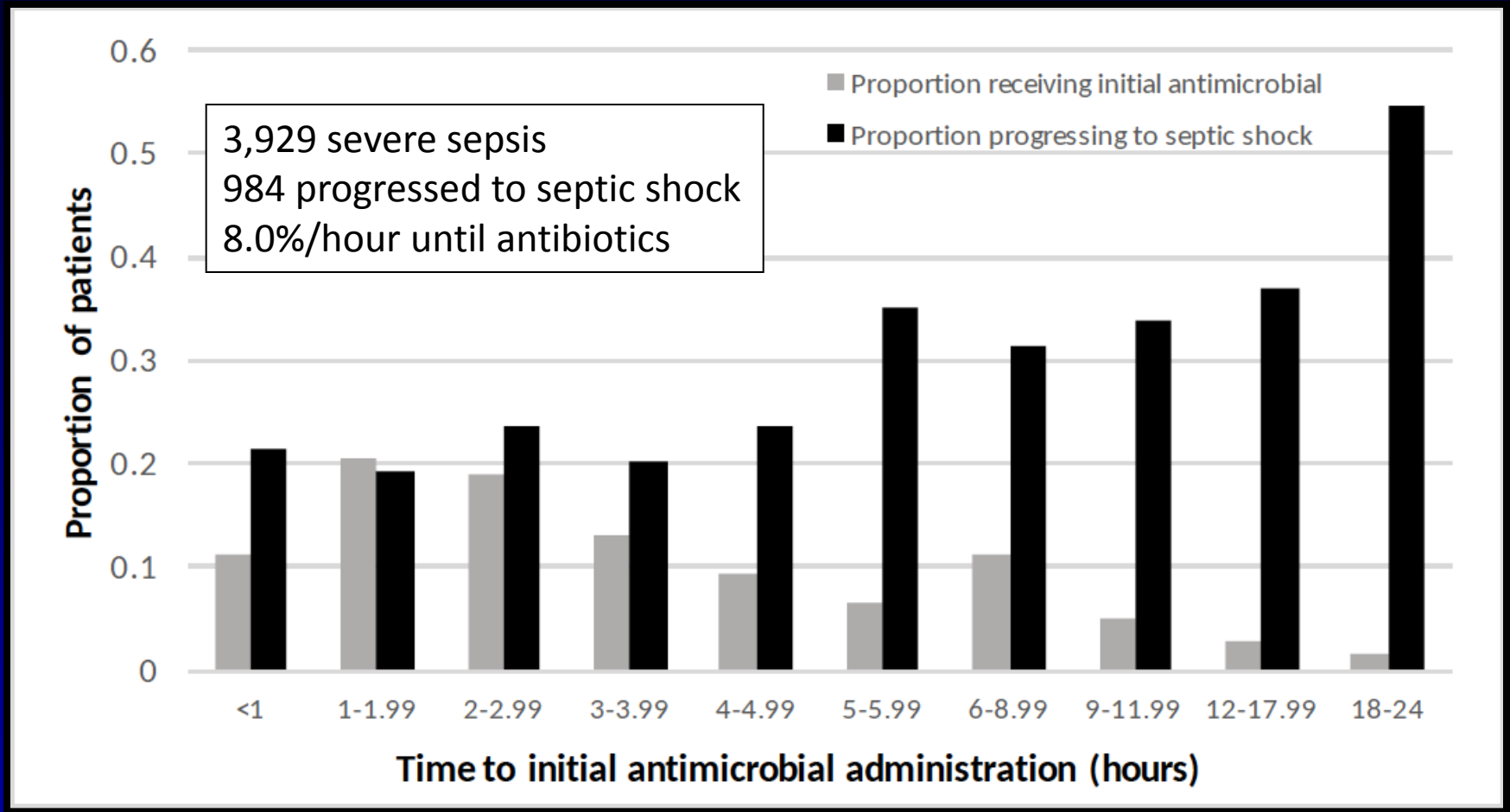
Observational, retrospective: 35,000 patients

Presentation to antibiotic admin; outcome mortality



Am J Respir Crit Care Med Vol 196, Iss 7, pp 856–863, Oct 1, 2017

# Antibiotics and Sepsis Progression

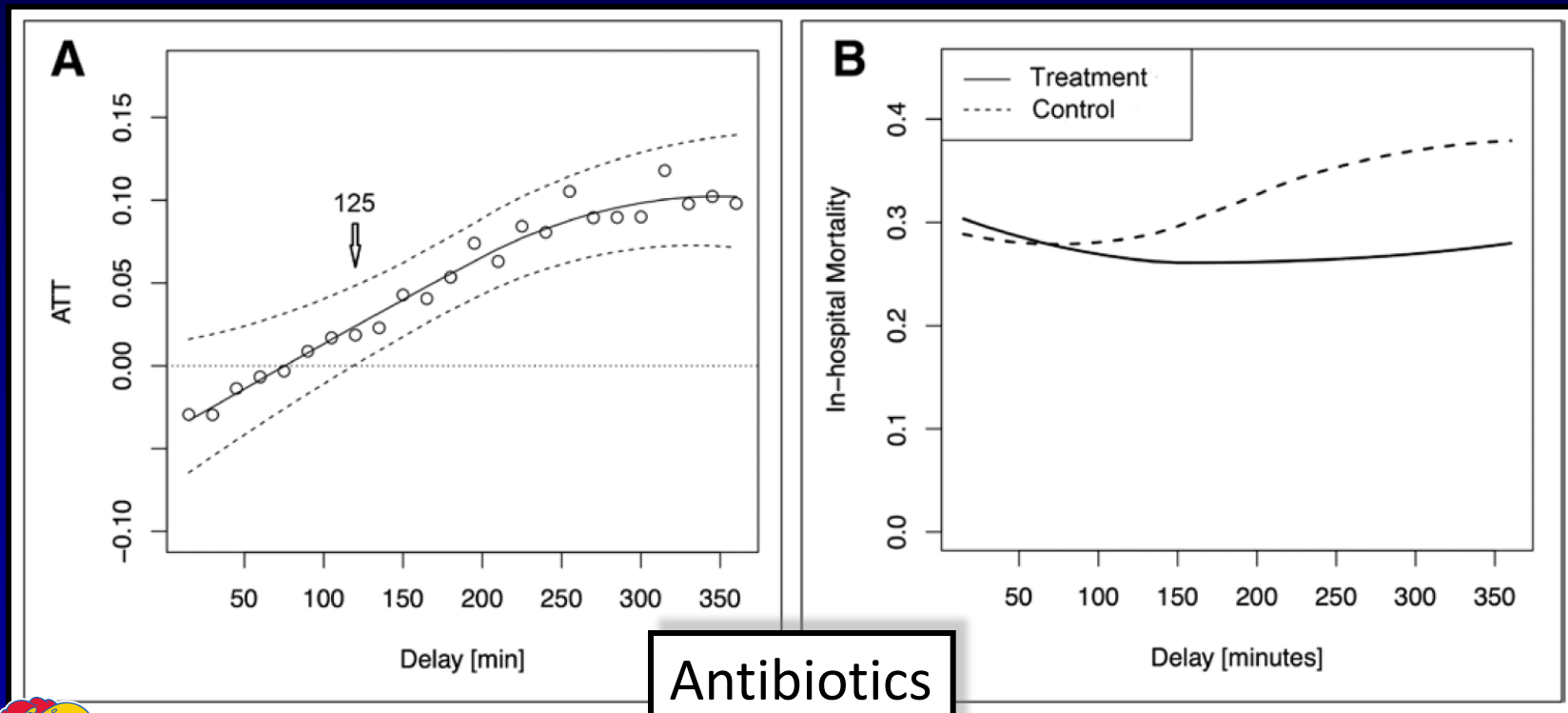


Whiles, et al. Critical Care Medicine 45:623 – 629, 2017.



# Delay Within the 3-Hour Surviving Sepsis Campaign Guideline on Mortality for Patients With Severe Sepsis and Septic Shock

Lisiane Pruinelli, PhD, RN<sup>1</sup>; Bonnie L. Westra, PhD, RN, FAAN, FACMI<sup>1,2</sup>; Pranjul Yadav, PhD<sup>3</sup>; Alexander Hoff<sup>3</sup>; Michael Steinbach, PhD<sup>3</sup>; Vipin Kumar, PhD<sup>3</sup>; Connie W. Delaney, PhD, RN, FAAN, FACMI<sup>1,2</sup>; Gyorgy Simon, PhD<sup>2,4</sup>



Antibiotics

Critical Care Medicine 2018 – online ahead of print



# Surviving Sepsis Campaign Bundles

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To be completed within 3 hours:

1. Measure serum lactate level
2. Obtain blood cultures prior to administration of antibiotics (1C)
3. Administer broad spectrum antibiotics (1B, 1C)
4. Administer 30 mL/kg crystalloid for hypotension or lactate  $\geq 4$  mmol/L



# Surviving Sepsis Campaign Bundles\*

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To be completed within 6 hours

1. Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation) to maintain a mean arterial pressure (MAP)  $\geq 65$  mm Hg
2. In the event of persistent arterial hypotension despite volume resuscitation (septic shock) or initial lactate  $\geq 4$  mmol/L (36 mg/dL)
  - Measure central venous pressure (CVP)\*
  - Measure central venous oxygen saturation (ScvO2)\*
3. Re-measure lactate if initial lactate was elevated\*

\*2012 edition

Targets are: CVP 8 mm Hg, ScvO2  $> 70\%$ , lactate normal



# CMS Core Measures: Simply Complicated

## Within 3 hours of Presentation of Severe Sepsis

1. Initial lactate level measurement
2. Broad spectrum antibiotics administered
3. Blood cultures drawn prior to antibiotics
4. Crystalloid fluid initiated

Did hypotension  
persist after fluid  
given?

NO

YES, continue on

Core Measure goals met, re-measure  
lactate within 6hrs

## Within 3 hours of Presentation of Septic Shock

1. Resuscitation with 30ml/kg crystalloid fluids
2. Evaluate the need for vasopressors

## After fluid resuscitation, but within 6 hours of Presentation of Septic Shock

### Re-assessment of volume status and tissue perfusion

A focused exam including

- Vital signs
- Cardiopulmonary exam
- Capillary refill evaluation
- Peripheral pulse evaluation
- Skin examination

Must be performed and documented by a Physician, ARNP, or PA

OR

2 out of 4 from the following:

CVP

Bedside Cardio US

ScvO<sub>2</sub>

Passive Leg Raise or Fluid Challenge

# Diagnosis



# Our Overall Aim

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- Our Aim - Fewer people die or are maimed by sepsis
- Our Goal – national level being established
  - Mortality rate; time frame
- To achieve our aim, we need both better diagnosis and better treatment
- Physicians are confused about how to diagnose sepsis



Special Communication | CARING FOR THE CRITICALLY ILL PATIENT

# The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)

Mervyn Singer, MD, FRCP; Clifford S. Deutschman, MD, MS; Christopher Warren Seymour, MD, MSc; Manu Shankar-Hari, MSc, MD, FFICM; Djillali Annane, MD, PhD; Michael Bauer, MD; Rinaldo Bellomo, MD; Gordon R. Bernard, MD; Jean-Daniel Chiche, MD, PhD; Craig M. Coopersmith, MD; Richard S. Hotchkiss, MD; Mitchell M. Levy, MD; John C. Marshall, MD; Greg S. Martin, MD, MSc; Steven M. Opal, MD; Gordon D. Rubenfeld, MD, MS; Tom van der Poll, MD, PhD; Jean-Louis Vincent, MD, PhD; Derek C. Angus, MD, MPH



*JAMA*. 2016;315(8):801-810. doi:10.1001/jama.2016.0287

# The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)

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Definition:

Sepsis is life threatening organ dysfunction caused by a dysregulated host response to infection

Drops the term “severe sepsis”

Drops the use of SIRS and infection + SIRS



JAMA. 2016;315(8):801-810. doi:10.1001/jama.2016.0287



# The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)

Condition	Sepsis-2	Sepsis-3
Sepsis	Infection + SIRS	Infection + $\Delta$ SOFA $\geq 2$
Severe Sepsis	Infection + SIRS + organ dysfunction	NON-EXISTENT
Septic Shock	Infection + Unresponsive Hypotension*	Infection + Unresponsive Hypotension* + Serum Lactate > 2 mmol/L



\*Hypotension that does not respond to volume infusion and requires vasopressor administration

SOFA Score	1	2	3	4
<b>Respiration</b> PaO <sub>2</sub> /FiO <sub>2</sub>	< 400	< 300	< 200 With respiratory support	< 100 with respiratory support
<b>Cardiovascular</b> Hypotension	MAP < 70 mm Hg	Dopamine ≤ 5 or dobutamine, any dose	Dopamine > 5 or epinephrine or norepinephrine ≤ 0.1	Dopamine > 15 or epinephrine or norepinephrine > 0.1
<b>Liver</b> Bilirubin (mg/dL)	1.2 – 1.9	2.0 – 5.9	6.0 – 11.9	> 12.0
<b>Renal</b> Creatinine (mg/dL) or urine output	1.2 – 1.9	2.0 – 3.4	3.5 – 4.9 or < 500 mL/24 hr	≥ 5.0 or < 200 mL/24 hr
<b>Coagulation</b> Platelets x 10 <sup>3</sup> /mm <sup>3</sup>	< 150	< 100	< 50	< 25
<b>CNS</b> Glasgow Coma Scale	13 - 14	10 - 12	6 - 9	< 6

# Glasgow Coma Scale

Response	Scale	Score
<b>Eye Opening Response</b>	Eyes open spontaneously	4 Points
	Eyes open to verbal command, speech, or shout	3 Points
	Eyes open to pain (not applied to face)	2 Points
	No eye opening	1 Point
<b>Verbal Response</b>	Oriented	5 Points
	Confused conversation, but able to answer questions	4 Points
	Inappropriate responses, words discernible	3 Points
	Incomprehensible sounds or speech	2 Points
	No verbal response	1 Point
<b>Motor Response</b>	Obeys commands for movement	6 Points
	Purposeful movement to painful stimulus	5 Points
	Withdraws from pain	4 Points
	Abnormal (spastic) flexion, decorticate posture	3 Points
	Extensor (rigid) response, decerebrate posture	2 Points
	No motor response	1 Point



**Minor Brain Injury** = 13-15 points; **Moderate Brain Injury** = 9-12 points; **Severe Brain Injury** = 3-8 points

# Quick SOFA

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- Also known as qSOFA
- Any two of:
  - Glasgow Coma Scale  $< 15$
  - Respiratory rate  $\geq 22/\text{min}$
  - Systolic blood pressure  $\leq 100 \text{ mm Hg}$



# New Sepsis Criteria

## A Change We Should Not Make

*Steven Q. Simpson, MD, FCCP*

# SIRS in the Time of Sepsis-3

*Steven Q. Simpson, MD, FCCP*

CHEST 2018; 153(1):34-38

## qSOFA does not replace SIRS in the definition of sepsis

Jean-Louis Vincent<sup>1\*</sup>, Greg S. Martin<sup>2</sup> and Mitchell M. Levy<sup>3</sup>

Vincent *et al. Critical Care* (2016) 20:210



# The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)

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“The current use of 2 or more SIRS criteria to identify sepsis was unanimously considered by the task force to be unhelpful.”



*JAMA.* 2016;315(8):801-810.



What do you do?

P – 75

R – 10

T – 37°

P – 110

R – 20

T – 39.5°

NOW, what do you do?



# Why did you choose something different?

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Because you recognize that the latter circumstance – infection with systemic manifestations (SIRS) – is something more than a simple infection.





“A local lesion, heated by humor  
afflux, makes the  
whole body become feverish. One  
can die because of this, especially on  
odd numbered  
days”

Hippocrates

BTW, today is the 15th



# Defining Sepsis

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Life threatening organ dysfunction due  
to a dysregulated host response to  
infection



# Diagnosis

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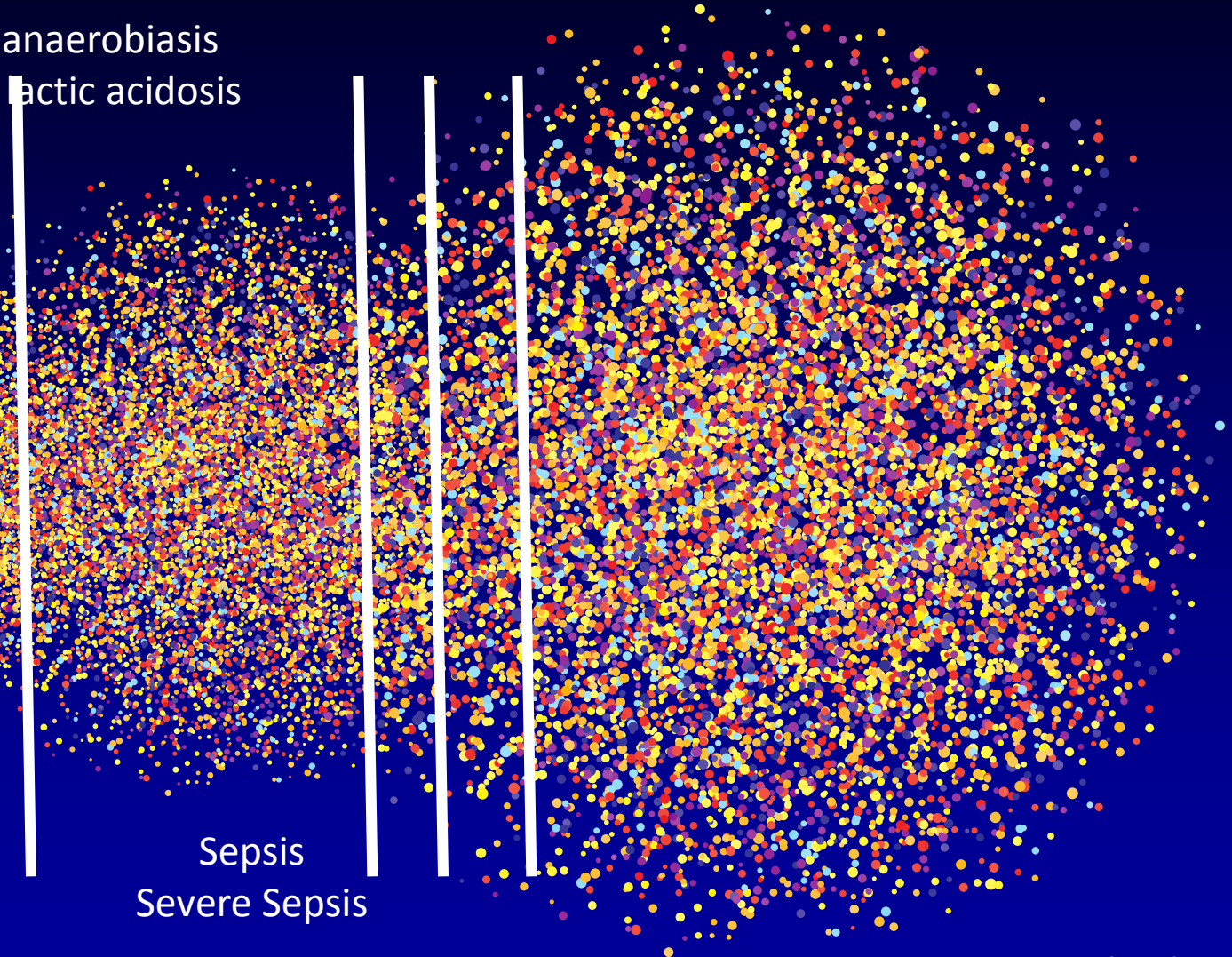
Everything is vague to a degree you  
do not realize til you have tried to  
make it precise.

Bertrand Russell (1872 – 1970)



# Severity of Infection and Sepsis

Inflammatory cells  
Cytokines  
Vascular leak  
Vasoplegia  
anaerobiasis



Infection  
SIRS

Sepsis  
Severe Sepsis

Septic Shock



# Sepsis: What Are We Talking About?

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Roger C. Bone, MD

- ICD-9: “septicemia”
- Positive blood cultures
- Multiple positive blood cultures
- Positive blood cultures + hypotension
- Syndrome: how shall we define it?



# Misconceptions About SIRS

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- The emphasis has shifted from inflammation to organ dysfunction.
- Requiring SIRS to diagnose sepsis misses cases of infection-induced organ dysfunction
- It's not specific to sepsis – “I climb a set of stairs and I get SIRS”



“The emphasis has shifted from  
inflammation to organ  
dysfunction”



# Sepsis syndrome: A valid clinical entity

ROGER C. BONE, MD; CHARLES J. FISHER, JR, MD; TERRY P. CLEMMER, MD; GUS J. SLOTMAN, MD;

8 previously reported (4, 5). Briefly, the sepsis syndrome was defined by a systemic response to sepsis which is evidenced by hypothermia (temperature  $<96^{\circ}\text{F}$ ), or fever ( $>101^{\circ}\text{F}$ ), tachycardia ( $>90$  beat/min), tachypnea ( $>20$  breath/min), clinical evidence of an infection site and

**inadequate organ perfusion or dysfunction**

tion, hypoxemia ( $\text{PaO}_2 <75$  torr), elevated plasma lactate, or oliguria (urine output  $<30$  ml/h or  $0.5$  ml/kg body weight  $\cdot$  h without corrective therapy). The inclusion and exclusion criteria are shown in Tables 1 and 2.



Critical Care Medicine 17:389, 1989.





## accp/sccm consensus conference

### Definitions for Sepsis and Organ Failure and Guidelines for the Use of Innovative Therapies in Sepsis

#### THE ACCP/SCCM CONSENSUS CONFERENCE COMMITTEE:

*Roger C. Bone, M.D., F.C.C.P., Chairman*

*Robert A. Balk, M.D., F.C.C.P.*

*Frank B. Cerra, M.D.*

*R. Phillip Dellinger, M.D., F.C.C.P.*

*Alan M. Fein, M.D., F.C.C.P.*

*William A. Knaus, M.D.*

*Roland M. H. Schein, M.D.*

*William J. Sibbald, M.D., F.C.C.P.*

“The original consensus conference was set up for

Infection + SIRS was INTENDED to prompt  
the examination for organ dysfunction

patients who were being missed and if possible at the  
earliest possible stage.”

Charles Sprung

Personal communication, 2016

Chest 101:1644 – 55, 1992.



Requiring SIRS to diagnose  
sepsis misses cases of infection-  
induced organ dysfunction



# Systemic Inflammatory Response Syndrome Criteria in Defining Severe Sepsis

Kirsi-Maija Kaukonen, M.D., Ph.D., Michael Bailey, Ph.D., David Pilcher, F.C.I.C.M.,  
D. Jamie Cooper, M.D., Ph.D., and Rinaldo Bellomo, M.D., Ph.D.

Sensitivity of  $\geq 2$  SIRS for  
infection-induced organ dysfunction  
87.9%

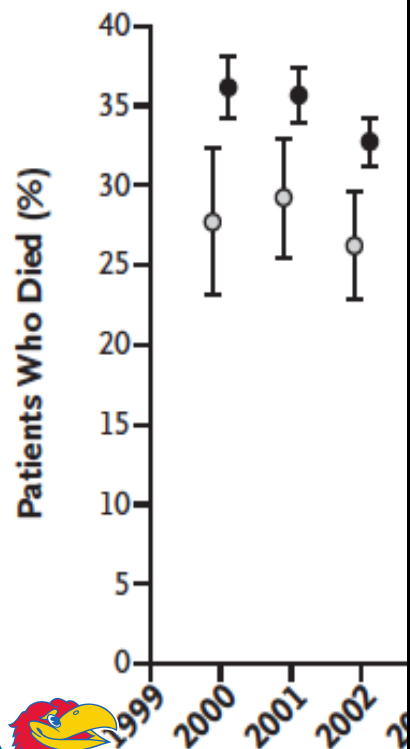


N Engl J Med 2015;372:1629-38.

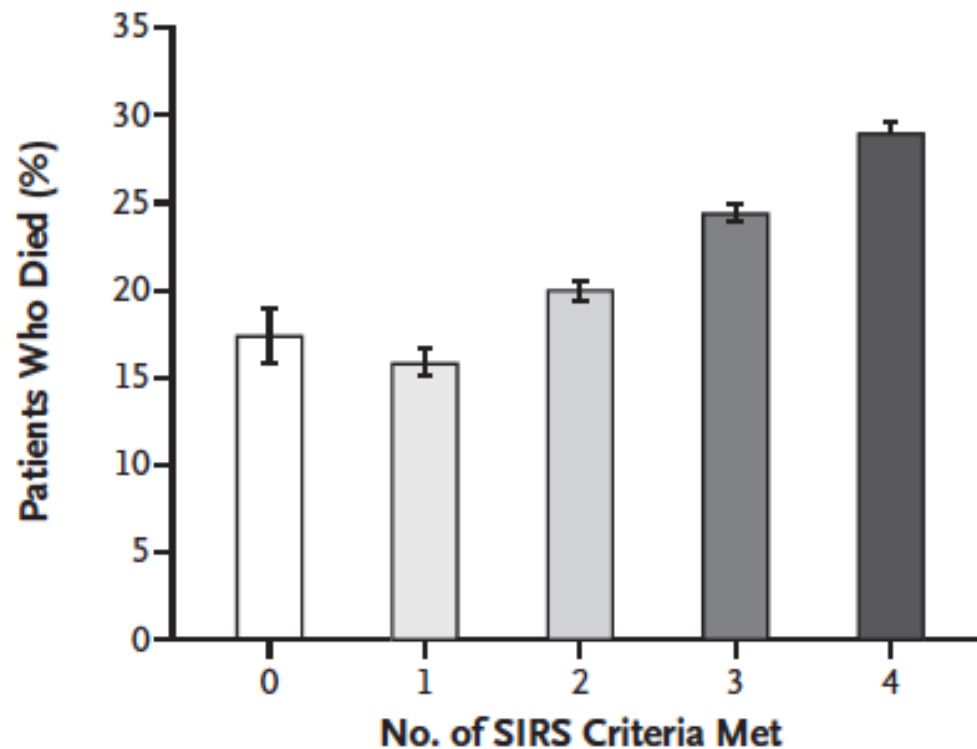
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D. Jamie Cooper, M.D., Ph.D., and Rinaldo Bellomo, M.D., Ph.D.

**A Unadjusted Annual Mortality**



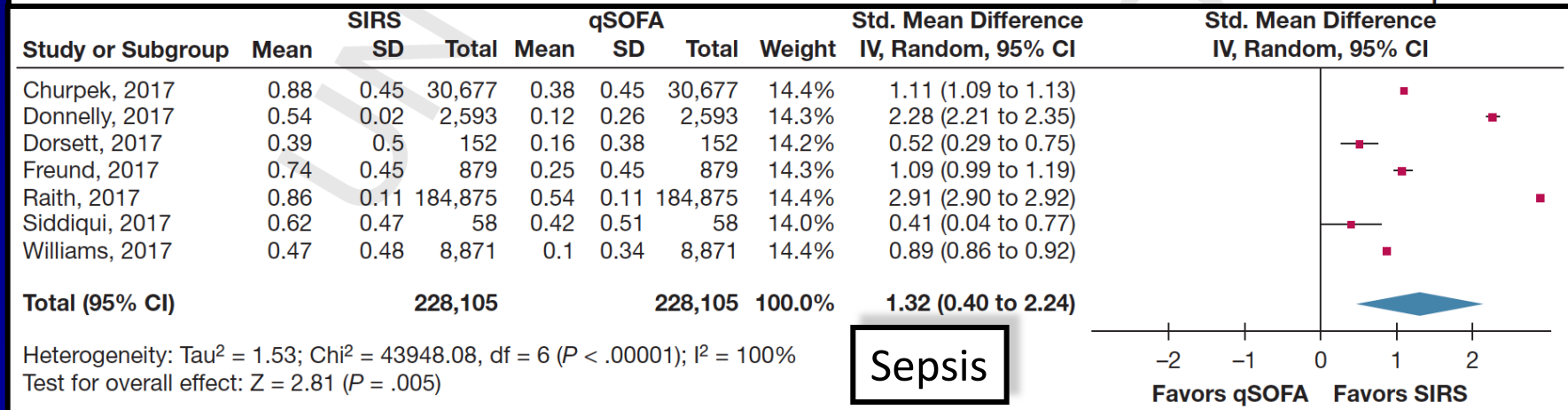
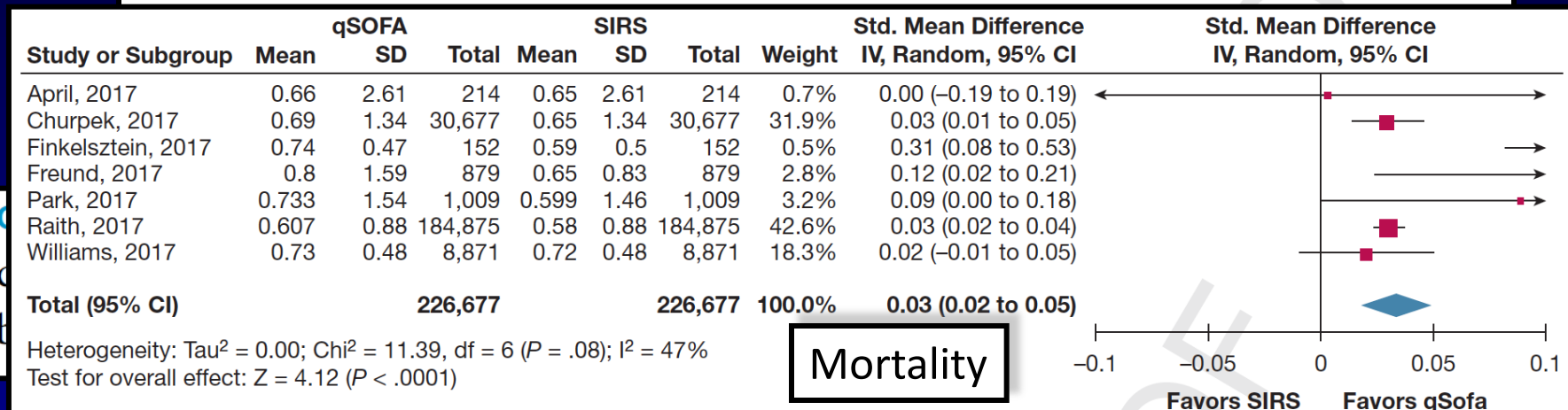
**A Unadjusted Mortality**



N Engl J Med 2015;372:1629-38.

# A Comparison of the Quick-SOFA and Systemic Inflammatory Response Syndrome Criteria for the Diagnosis of Sepsis and Prediction of Mortality

## A Systematic Review and Meta-Analysis



Requiring SIRS to diagnose  
sepsis misses cases of infection-  
induced organ dysfunction

Agreed

But then, who ever actually did/does that?



It's not specific to sepsis –  
“I climb a set of stairs and I get  
SIRS”

Again, no argument.



# Don't Forget Bayes' Theorem

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$$p(B|A) = \frac{p(A|B)p(B)}{p(A)}$$

$$P_{\text{sepsis}} | \text{SIRS} \cong \frac{P_{\text{SIRS}} | \text{sepsis} \times P_{\text{sepsis}} \text{ in group}}{P_{\text{SIRS}}}$$



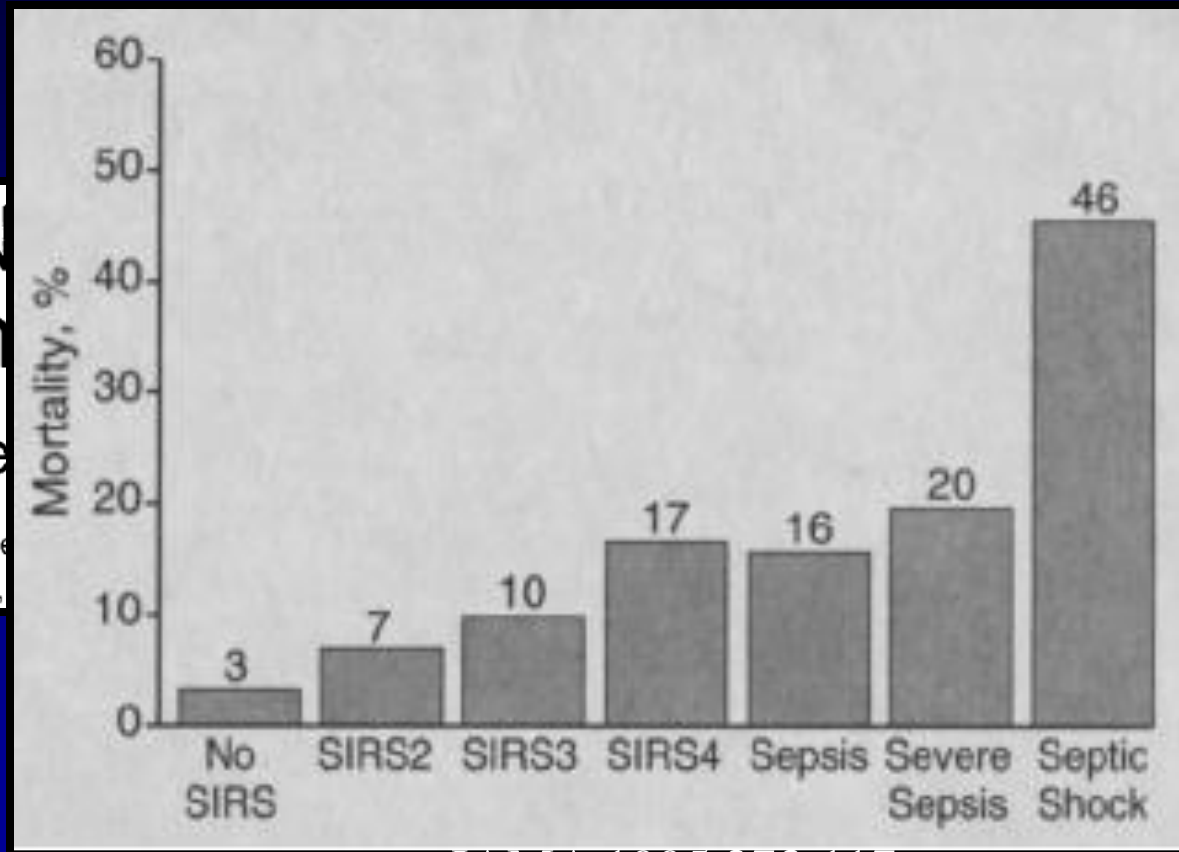


# SIRS Does Add Mortality Information

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Inflam

A Prospe

M. Sigfrido Range  
Charles S. Davis,

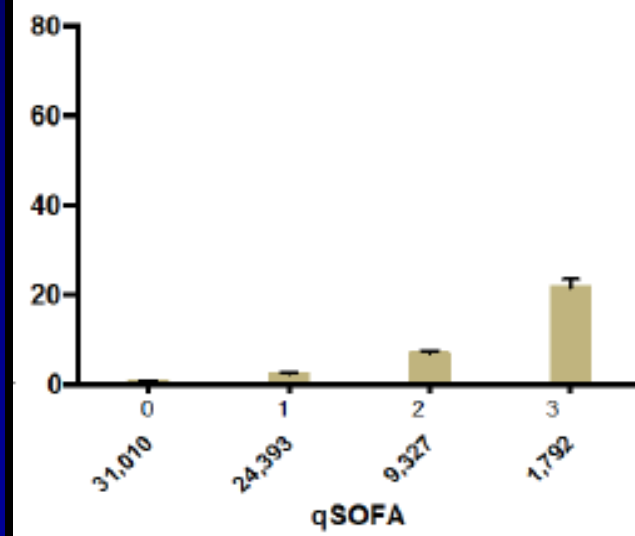
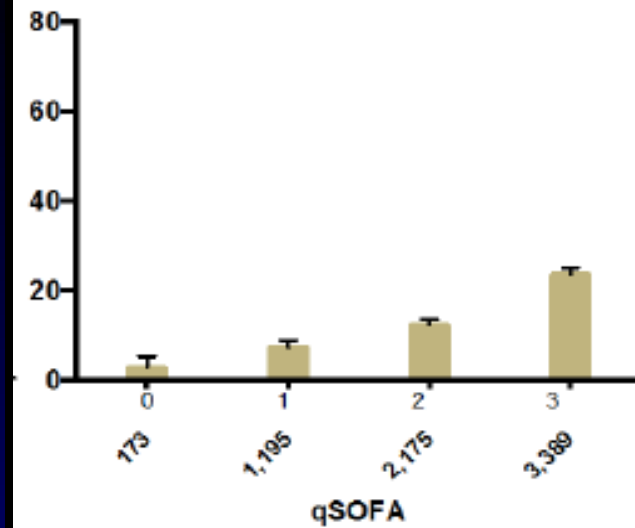
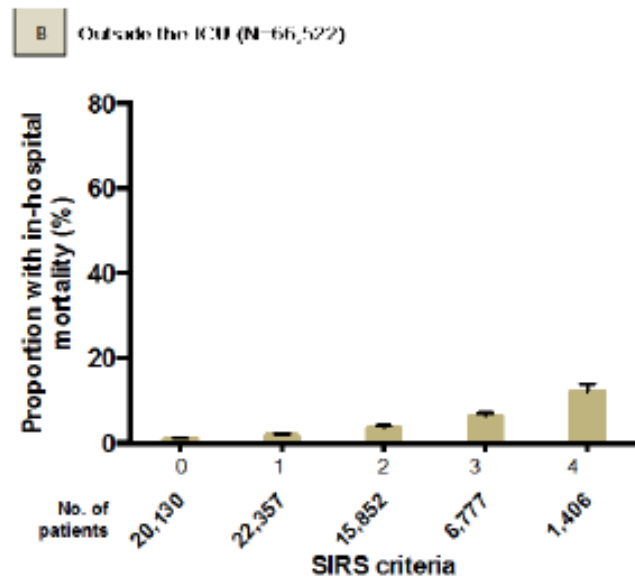
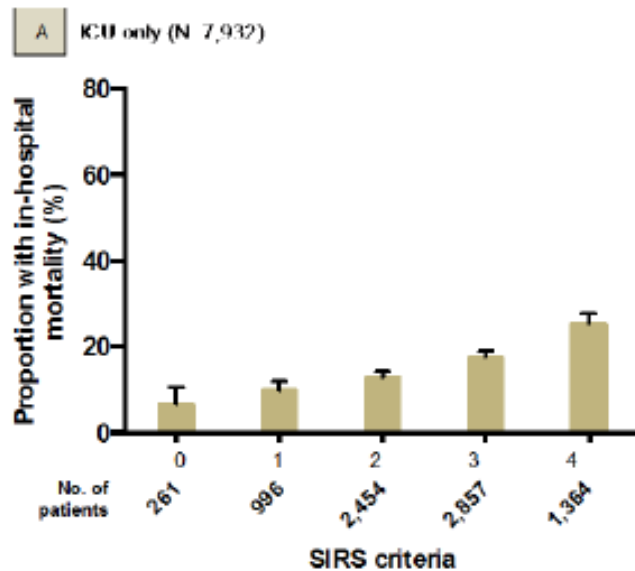


RS)

JAMA 1995

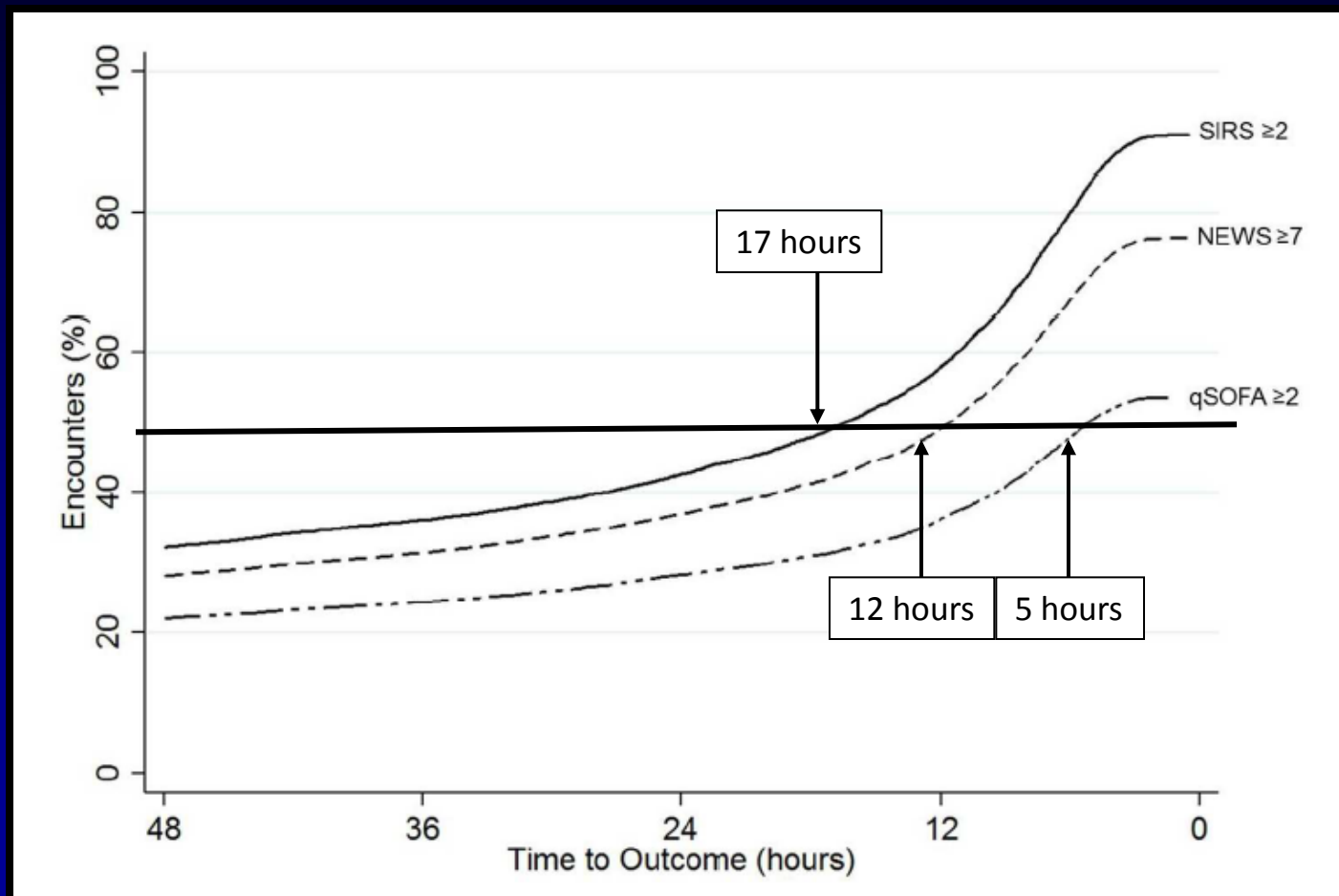
JAMA 1995 273:117.





**JAMA. 2016;315(8):762-774.**

# SIRS Does Add Meaning



# How to Proceed?

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Look for the infection - remember that neither SIRS nor qSOFA identifies infection

Infection + SIRS – treat and look for organ dysfunction

Infection + qSOFA – treat and look for organ dysfunction



# Sepsis in Rural Hospitals



# [www.mwcritcare.org](http://www.mwcritcare.org)

Midwest Critical Care Collaborative

Search this site

## Navigation

- Home
- Our Guiding Principles
- Participating Hospitals
- Shared ICU Quality Improvement Files
- MW Crit Care Meetings
- Evidence of Improvement
- Kansas Sepsis Project
  - Instructions - Kansas Sepsis Project
  - Copies of Severe Sepsis Data Collection Forms
- H1N1 Tracking Form
- Links to Important Critical Care and Quality Improvement Sites

## Home

Our mission - to ensure that all critically ill midwesterners receive intensive care of the highest achievable quality, by sharing our best practices with one another, with the best available medical evidence as our guide. Have a look at our [guiding principles](#).

Check out the [MWCritCare Blog](#) for thoughts and comments related to critical care improvements and discussions around our meetings.

One of our large scale cross-disciplinary projects is the [Kansas Sepsis Project](#), which is intended to reduce the mortality from severe sepsis in that state. However, you do not have to be a Kansas practitioner to participate. [Click](#) for details, and feel free to sign up.

If you're interested in participating in our monthly meetings, being on the email list, and helping us to fulfill our mission, please fill out this [form](#) to tell us who you are and give us your email address. Although we are a collaborative, we don't demand anything of our members, and active participation is voluntary. But it is thrilling to share one's victories, large and small, with others who can appreciate them. And nothing beats the feeling of having someone else be successful with ideas or techniques that are based on your own experience. Please, give it a try!

If you linked to our page from [Project Check](#), you'll find info about the daily quality checklist on the [Shared ICU Quality Improvement Files](#) page.



Chrome File Edit View History Bookmarks Window Help

Jennifer Brull, M.D. - Active S... For Providers Capture a Screen Shot with US States: Area and Ranking List of U.S. states and territo Our Guiding Principles - Mid

www.mwcritcare.org/our-guiding-principles

Read Later KU Access Campus Connect MW Crit Care Google Apps GME Office Keystroke Shortcuts EIJ Other Bookmarks Search this site

## Our Guiding Principles

**Calendar of Events**

- Home
- Our Guiding Principles
- Participating Hospitals
- Shared ICU Quality Improvement Files
- MW Crit Care Meetings
- Evidence of Improvement
- Kansas Sepsis Project
  - Instructions - Kansas Sepsis Project
  - Copies of Severe Sepsis Data Collection Forms
- H1N1 Tracking Form
- Links to Important Critical Care and Quality Improvement Sites
- MWCCC Calendar of Events
- Sitemap

- 1) The outcomes that we care about, we will measure and share with one another, so that we can effect changes that have a measurable impact on our patients lives.
- 2) We recognize that our own individual autonomy of decision making must, at times, take a back seat to what is safe and effective for our patients. We will proceed according to the best scientific evidence available and standardize our approach to achieve the most benefit for the most patients.
- 3) When something works for any of us we will share it with the entire collaborative, so that it might work for someone else. To borrow a phrase from the Institute for Healthcare Improvement, we will share selflessly and steal shamelessly to make things happen for our patients.
- 4) Physicians alone cannot do this. We need the commitment of our hospital administrators and our nursing and ancillary colleagues. We recognize our administrative and other personnel as equal partners in our collaboration and appreciate the energy and ideas that they have to devote to better care of our patients.
- 5) We will function as a group, and as a group we will decide what issues need our attention and how to approach them.
- 6) As we make improvements in the care we are delivering, we will actively seek the means to help spread our improvements to smaller hospitals across the region that do not have the benefit of on site critical care trained physicians and nurses.

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# Kansas: Exemplar of Rural America



Data from 2009 STAT Report – Kansas Hospital Association



# Critical Access Hospitals

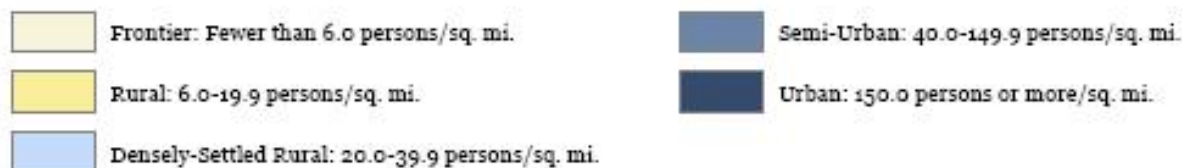
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- 25 beds or fewer
- 35 miles from nearest hospital
- 24-7 emergency services
  - staff on site or on call and < 30 minutes to respond
  - staff may be MD, DO, NP, PA, clinical nurse specialist
- Must have agreements for transfer with an acute care hospital





## Office of Local and Rural Health



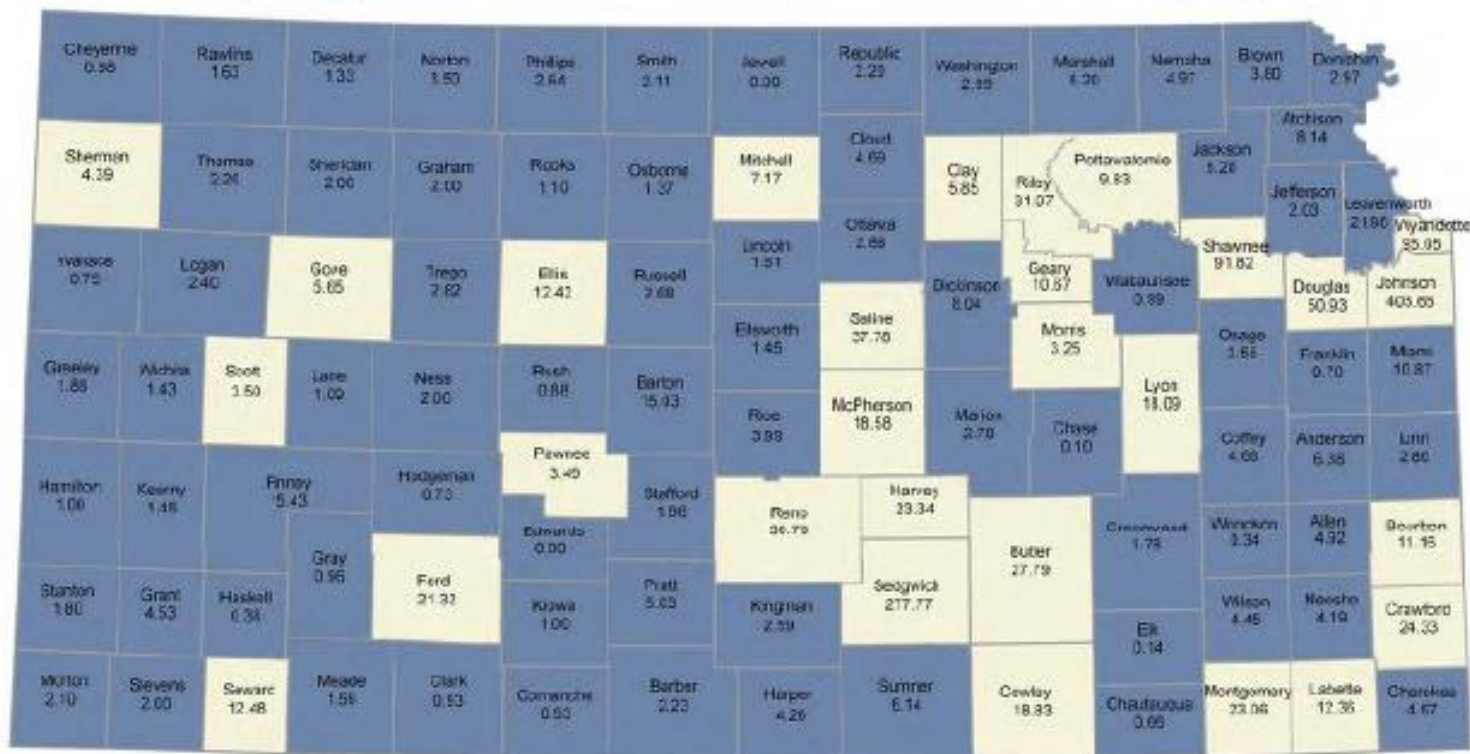


# KANSAS PHYSICIAN SHORTAGE/ MEDICALLY UNDERSERVED AREAS

## KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT

### Office of Local and Rural Health

*(Use only for the establishment or continued operation of Rural Health Clinics (RHCs))*

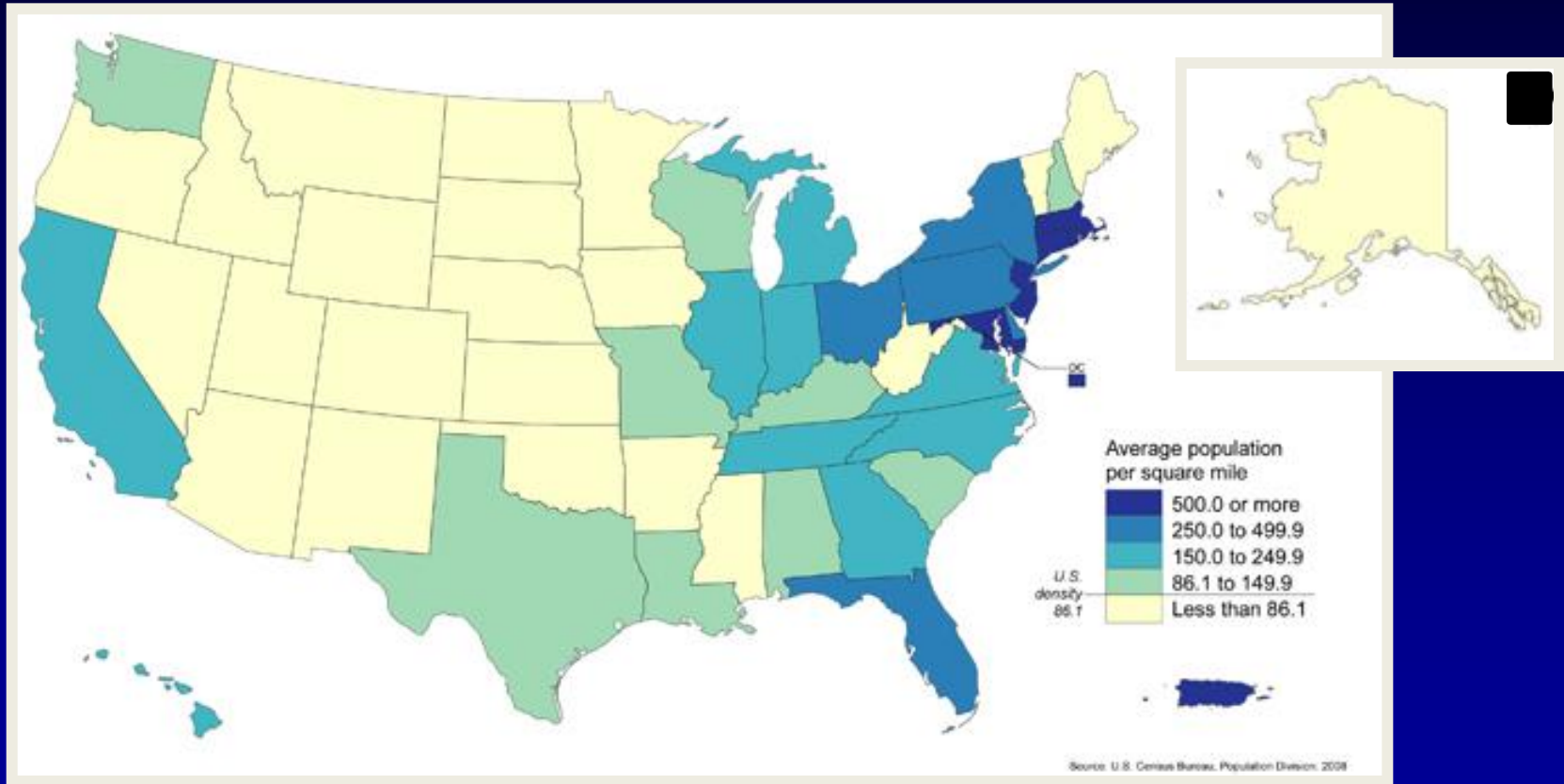


\*The values in each county represent the total FTE for that county based on 2006 data.

- Kansas Physician Shortage Area (Medically Underserved Area) Ratio equal to or greater than 2,695 persons per primary care physician
- Not eligible for certification as a Kansas Physician Shortage Area



# States with Similar Population Density



US Census Bureau 2008



## RSVP

to Elizabeth Wenske, PhD  
eawenske@ku.edu  
(o) 913-588-4493  
(f) 913-588-4486

Walk-ins welcome



### Planning Committee

Simpson, Steven, MD, Course Director, Professor of Medicine, Division of Pulmonary and Critical Care Medicine, University of Kansas, Chair, KUMC Sepsis Team, Kansas City, KS

Pitts, Lucas, MD, Assistant Professor of Medicine, Division of Pulmonary and Critical Care Medicine, University of Kansas Medical Center, Kansas City, KS

Warren, Mary Beth, BSN, MS, Statewide Area Health Education Director, Pittsburg, KS

Radford, Linda, PhD, RN, Senior Research Associate, Landon Center on Aging, University of Kansas Medical Center, Kansas City, KS

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Brul, Jon, MD, Family Medicine, Prairie Star Family Practice, Plainville, KS

Bjornsted, Stephanie, RN, BSN, Quality Coordinator / Risk Manager, Rook Health Center, Plainville, KS

### Faculty Involved

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McNeil, Jennifer, RN, BSN, CCRN, Unit Educator, Medical and Intensive Care, The University of Kansas Hospital

Burnside, Katie, MS, PharmD, BCPS, Pharmacy Clinical Manager/Trauma Pharmacist, Stormont-Vail HealthCare, Topeka, KS

## SEPSIS FACTS

- 1 Severe sepsis affects more than 10,000 Kansans every year.
- 2 The mortality rate for severe sepsis in most hospitals in Kansas is approximately 50%.
- 3 Severe sepsis kills as many people in Kansas as acute MI.
- 4 With specific plans for recognition and treatment, the mortality rate can be lowered to below 20%.

## COURSE OBJECTIVES

### PARTICIPANTS WILL:

- 1 Recognize cardinal features of severe sepsis.
- 2 Initiate rapid, organized care for severe sepsis.
- 3 Be able to initiate a performance improvement program.
- 4 Be able to participate in the Kansas Sepsis Project.

## WORKSHOP AGENDA

### September 10th

#### CONTINENTAL BREAKFAST



Provided by  
University of Kansas CME

7:30 a.m.

#### WORKSHOP



Lunch Provided

Stopping Sepsis in Kansas:  
The Kansas Sepsis Project

8:00 a.m. - 3:00 p.m.

- 1 What is severe sepsis? Why it is missed and how to avoid missing it?
- 2 Aggressive treatment of severe sepsis - heading off septic shock at the pass.
- 3 How one Critical Access Hospital in Kansas is recognizing and treating severe sepsis aggressively and improving the level of care.
- 4 What antibiotics should you use, and why? Hitting hard and backing off.
- 5 Quality improvement: How it applies to medical care. Principles and practices that any provider can use successfully.
- 6 Why interdisciplinary teams are necessary for quality improvement, and how nursing plays an essential role.
- 7 Using the Kansas Sepsis Project to tie it all together.

## TARGET AUDIENCE

This workshop is designed for physicians, mid levels, and nurses, particularly those working in hospitals or healthcare facilities.

## ACCREDITATION

All participants are required to sign attendance rosters. A certificate of completion will be provided to all activity participants based on documentation of actual attendance time.

**Physicians:** The University of Kansas Medical Center Office of Continuing Medical Education is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians.

The KU Medical Center Office of Continuing Medical Education designates this live activity for a maximum of 7 AMA PRA Category 1 Credits TM. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

**Nurses:** The University of Kansas Medical Center Area Health Education Center East, as an approved provider of continuing education by the Kansas State Board of Nursing, presents this offering for a maximum of 7.5 contact hours credit applicable for relicensure of RNs, LPNs and LMHTs. Kansas Provider Number LT0056-0749.

Continuing education credit will be prorated according to documented attendance.

CME and CNE credit will be awarded for attending the workshop. In addition, CME and CNE are available for participation in the Kansas Sepsis PI project.





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## Kansas Sepsis Project

The Kansas Sepsis Project and its participating physicians seeks to cut the mortality from severe sepsis in the state of Kansas by 10% by the end of 2015. Our mission is to teach physicians, extenders, and nurses in all specialties and in hospitals of every size to recognize severe sepsis, to realize that it is an emergency, and to take rapid, organized steps to treat severe sepsis aggressively and successfully. We also hope to teach all participants skills in performance improvement that can be translated to every aspect of their practices. Physicians, nurse practitioners, physicians assistants, and registered nurses are eligible for continuing education credit by participating in our severe sepsis quality improvement initiatives.

Here are some facts regarding severe sepsis:

- Severe sepsis affects more than 10,000 Kansans every year.
- The mortality rate for severe sepsis in most hospitals in Kansas is approximately 50%.
- Severe sepsis kills as many people in Kansas as acute MI.
- With specific plans for recognition and treatment, the mortality rate can be lowered to below 20%.

If you participate in the Kansas Sepsis Project you will:

- Recognize cardinal features of severe sepsis.
- Initiate rapid, organized care for severe sepsis.
- Evaluate your own data for recognizing and caring for severe sepsis patients.
- Be able to initiate a performance improvement program.
- Improve the outcomes, especially survival, of your patients with severe sepsis.

**Get Started >>**

**Enroll in the Kansas Sepsis Project to complete your registration process:**

**Enroll Now**



[www.kansassepsisproject.org](http://www.kansassepsisproject.org)



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## Patients

Hospital:		University of Kansas Medical Center ▾		+ Add New Patient	
	Identifier ▾	Date of Data Entry ▾	Created ▾	Assigned Doctor ▾	
▴	U-3257	9/23/2013	9/23/2013	Doctor Test	<a href="#">✎ Edit</a> <a href="#">✕ Delete</a>
		Tracker		Status	
		Patient Pre-Screener			<a href="#">Select</a>
		Patient Tracker			<a href="#">Select</a>
		Patient Outcome			<a href="#">Select</a>
▸	U-3128	8/12/2013	8/12/2013	Doctor Test	<a href="#">✎ Edit</a> <a href="#">✕ Delete</a>
▸	U-394	7/17/2013	7/17/2013	Doctor Test	<a href="#">✎ Edit</a> <a href="#">✕ Delete</a>
▸	U-385	7/2/2013	7/2/2013	Doctor Test	<a href="#">✎ Edit</a> <a href="#">✕ Delete</a>
<a href="#">⏪</a> <a href="#">⏴</a> <b>1</b> <a href="#">⏵</a> <a href="#">⏩</a>		10 ▾ items per page		1 - 4 of 4 items <a href="#">↻</a>	



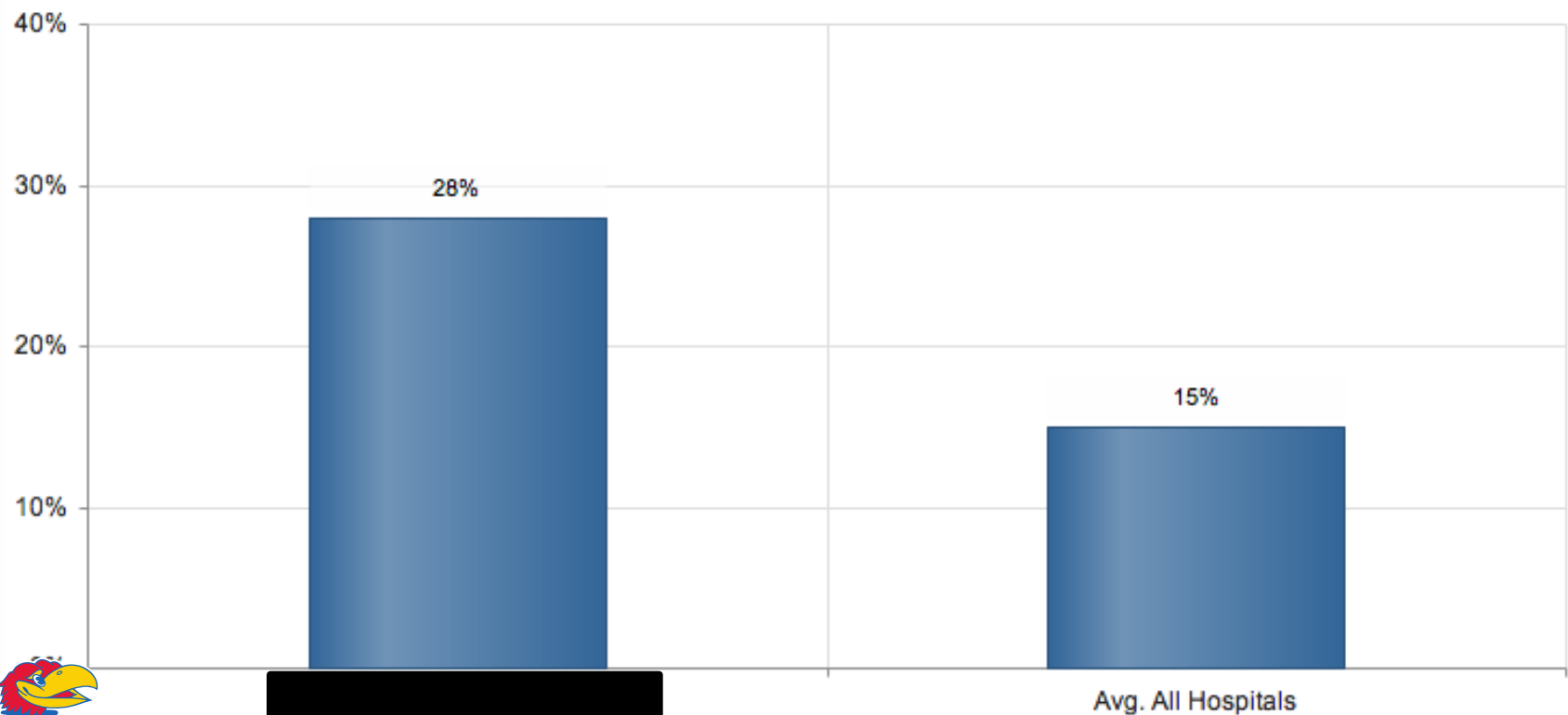
# Hospital Admin Patient Data Reports

Report Type: Hospital compared to all Hospitals ▼

Hospital: [REDACTED] ▼

Summary: Accuracy of Severe Sepsis or Septic Shock diagnosis based on chart review ▼

Accuracy of Severe Sepsis or Septic Shock diagnosis based on chart review



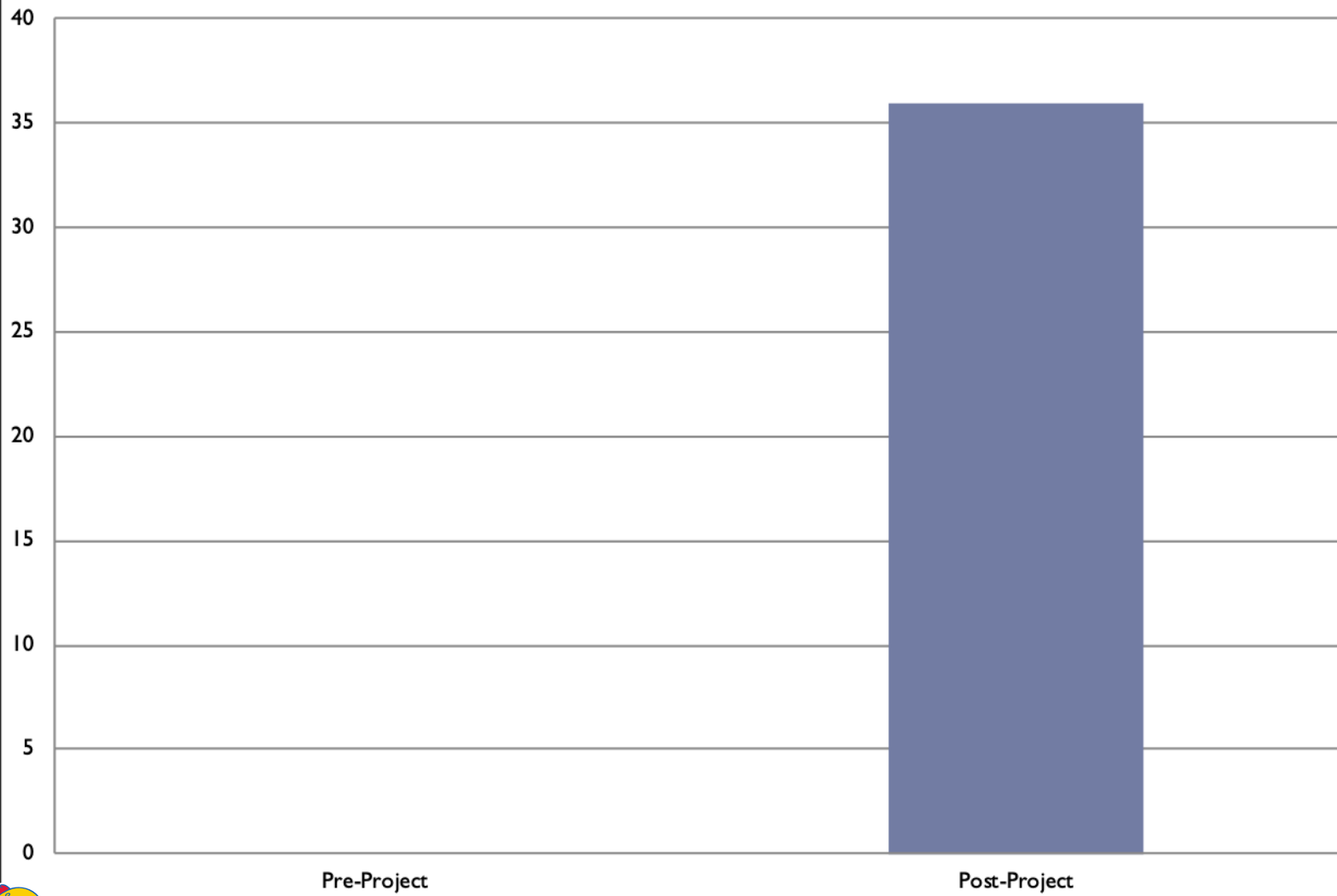


# Baseline Data – Rooks County

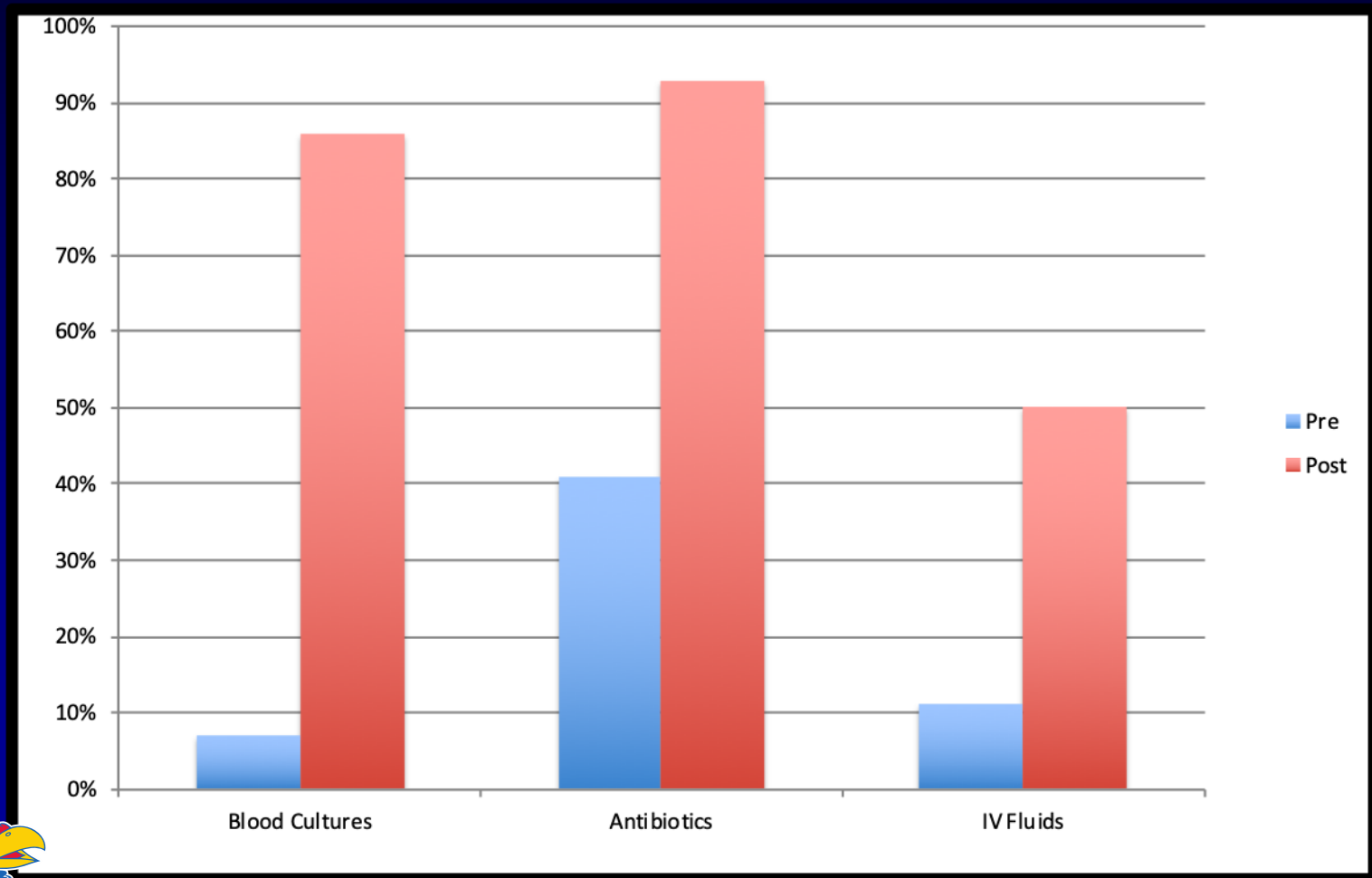
- 67 hospital charts pulled from 2009 and 2010 (criteria: infection documented as reason for admission to facility)
- 28 met criteria for sepsis
- **NONE** of the cases actually identified sepsis as a listed diagnosis!



## Sepsis Cases in Rooks County



# Initial Results



# EMS in Sepsis Care

## *Why is it Important?*



# **Severe Sepsis in Pre-Hospital Emergency Care**

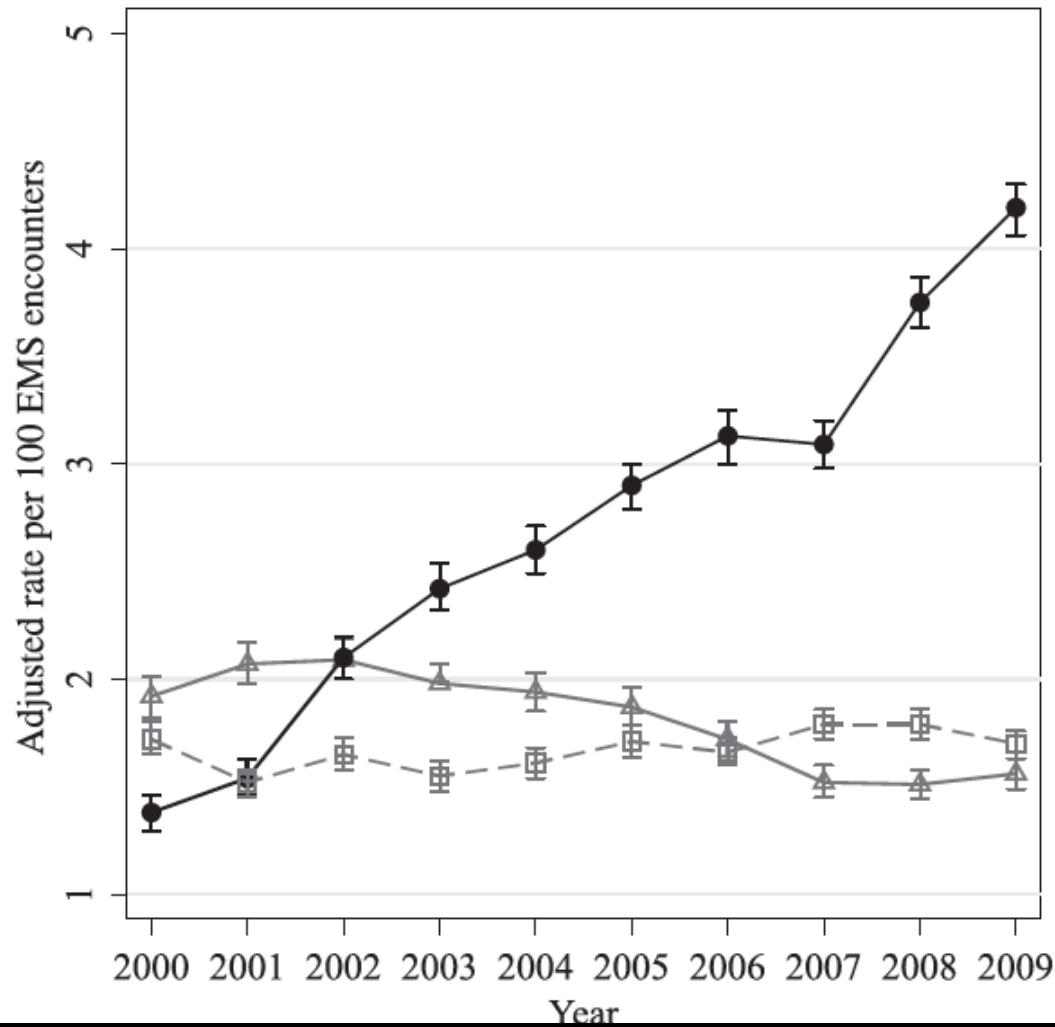
## **Analysis of Incidence, Care, and Outcome**

- King County, WA 2000 – 2009
- 883,604 total calls
- 540,351 transported to hospital
- Excluded: 128,033 pre-hospital trauma & 5142 cardiac arrest
- Total: 407,176



# Severe Sepsis in Pre-Hospital Emergency Care

## Analysis of Incidence, Care, and Outcome



**TABLE 1. PRE-HOSPITAL CHARACTERISTICS OF SEVERE SEPSIS HOSPITALIZATIONS COMPARED WITH THOSE HOSPITALIZED WITH ACUTE MYOCARDIAL INFARCTION OR STROKE**

Variable	Hospitalizations with Severe Sepsis (n = 13,249)	Hospitalizations with AMI (n = 9,069)	Hospitalizations with Stroke (n = 8,981)
Age, yr: mean (SD)	71 (16)	71 (14)	75 (14)
Female sex, no. (%)	6,149 (48)	3,863 (44)	4,826 (55)
Level of EMS care, no. (%)			
ALS + BLS	7,114 (54)	6,562 (72)	2,625 (29)
BLS only	6,135 (46)	2,507 (28)	6,356 (71)
EMS severity, no (%)*			
Life-threatening	1,822 (19)	1,566 (21)	656 (9)
Urgent	4,990 (51)	4,552 (61)	4,298 (60)
Nonurgent	2,876 (30)	1,378 (18)	2,231 (31)
Pre-hospital time interval, min: mean (SD)			
Responding to scene time	4.7 (3.6)	4.3 (3.3)	4.6 (3.4)
Total scene time	34.8 (18.3)	34.4 (17)	26.9 (14)
Scene-to-hospital time	12.6 (10.5)	12 (9.3)	13.1 (10.2)
Abnormal pre-hospital vital signs, no. (%)			
Systolic blood pressure $\leq$ 90 mm Hg	2,485 (21)	938 (12)	285 (4)
Respiratory rate $>$ 36 breaths/min	1,790 (16)	681 (9)	152 (2)
Glasgow Coma Scale score $\leq$ 11	1,699 (14)	381 (4)	1,048 (12)
SaO <sub>2</sub> $<$ 88%	1,369 (10.3)	378 (3)	139 (2)
Heart rate $\geq$ 120 beats/min	2,771 (24)	1,089 (14)	527 (7)
Pre-hospital critical illness risk score, mean (SD) <sup>†</sup>	2.3 (1.4)	1.71 (1.09)	1.49 (0.92)
Pre-hospital procedures, no. (%)			
Supplemental oxygen	9,520 (72)	7,670 (85)	5,888 (66)
Bag valve mask ventilation	1,538 (11.6)	405 (4)	415 (5)
Endotracheal intubation	1,968 (15)	467 (5)	511 (6)
ECG monitoring	6,872 (52)	6,468 (71)	2,543 (28)
Peripheral intravenous access <sup>‡</sup>	4,842 (37)	5,311 (59)	1,438 (16)

*Definition of abbreviations:* ALS = advanced life support; AMI = acute myocardial infarction; BLS = basic life support; EMS = emergency medical services; SaO<sub>2</sub> = arterial oxygen saturation.



**TABLE 3. COMPARISON OF OUTCOMES OF EMERGENCY MEDICAL SERVICES ENCOUNTERS HOSPITALIZED WITH SEVERE SEPSIS, ACUTE MYOCARDIAL INFARCTION, AND STROKE**

Variable	Hospitalizations with Severe Sepsis ( <i>n</i> = 13,249)	Hospitalizations with Acute MI ( <i>n</i> = 9,069)	Hospitalizations with Stroke ( <i>n</i> = 8,981)
Possible etiology of sepsis, no. (%) <sup>*</sup>			
Respiratory	8,154 (62)	—	—
Urological	5,043 (38)	—	—
Gastrointestinal	3,808 (29)	—	—
Skin, soft tissue, joint	1,579 (12)	—	—
Central nervous system	75 (1)	—	—
Cardiovascular	105 (1)	—	—
Organ failures, no. (%)			
Renal	7,232 (55)	1,148 (13)	494 (6)
Pulmonary	5,242 (40)	978 (11)	949 (11)
Cardiac	2,279 (17)	663 (7)	85 (1)
Hematologic	1,928 (15)	223 (2)	178 (2)
Neurological	708 (5)	112 (1)	129 (1)
Hepatic	277 (2)	67 (1)	13 (<1)
Total organ failures, mean (SD)	1.41 (0.75)	0.35 (0.7)	0.21 (0.49)
Charlson Comorbidity Index, mean (SD)	1.8 (1.7)	2.17 (1.32)	2.36 (1.48)
Admission to intensive care, no. (%)	6,224 (52)	4,460 (61)	2,613 (35)
Hospital length of stay, d: median (IQR)	6 (3–11)	3 (2–5)	3 (2–6)
Discharge disposition, no. (%) <sup>†</sup>			
Expired	2,596 (19.6)	932 (10)	1,076 (12)
Home	3,812 (29)	4,957 (55)	2,778 (31)
Skilled nursing facility	3,839 (29)	1,308 (14)	2,525 (28)
Long-term acute care	150 (1)	18 (<1)	32 (<1)

**Am J Respir Crit Care Med Vol 186, Iss. 12, pp 1264–1271, Dec 15, 2012**





# The impact of emergency medical services on the ED care of severe sepsis<sup>☆</sup>

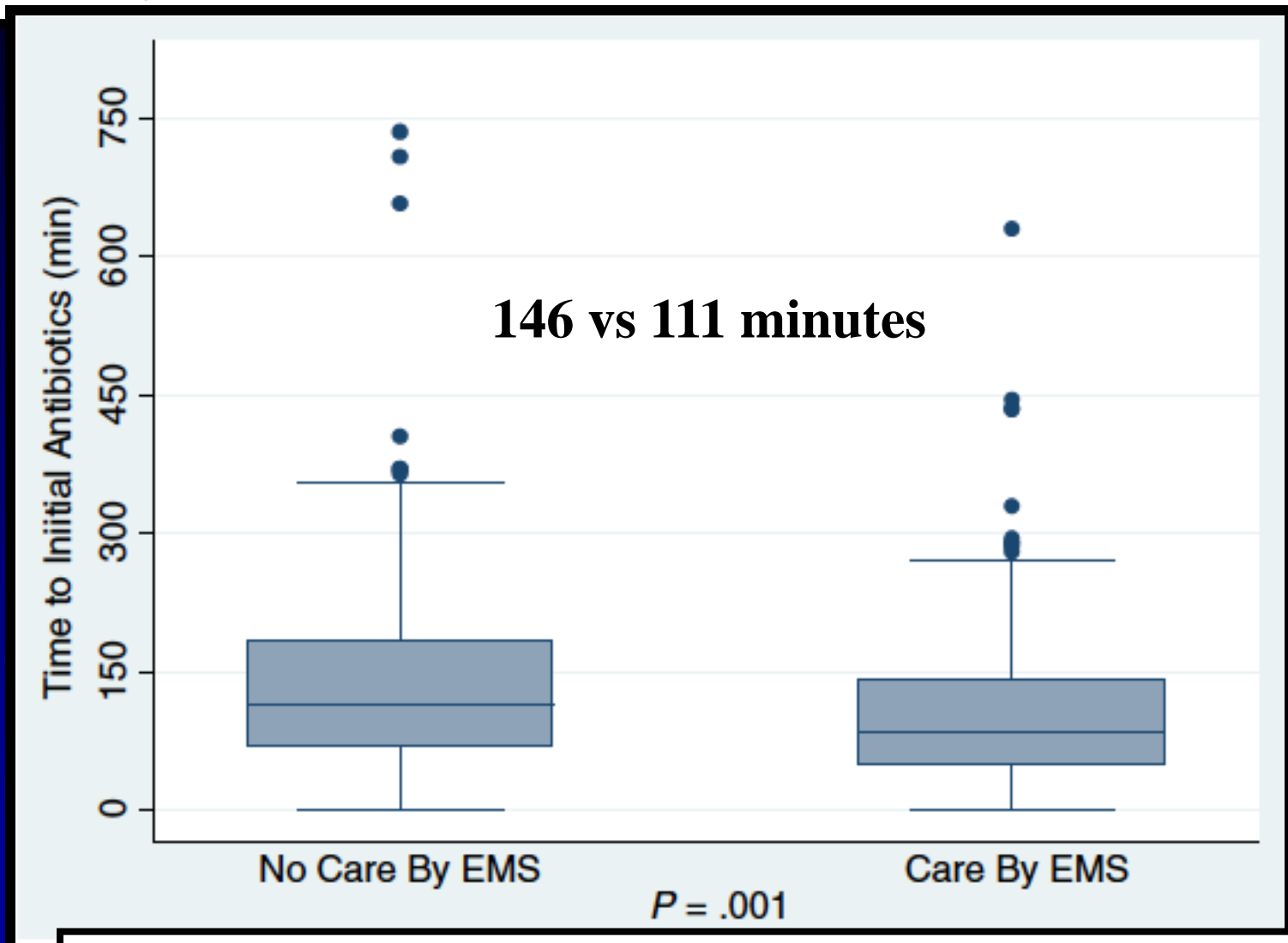
**Table 1** Clinical characteristics and demographics of the study population

Variable	Entire study population (N = 311)	Transported by EMS (n = 160)	Not transported by EMS (n = 151)
Sex			
Male	161 (48.5%)	83 (49.7%)	78 (47.3%)
Female	171 (51.5%)	84 (50.3%)	87 (52.7%)
Race			
White	176 (53.7%)	89 (54.3%)	87 (53.0%)
Nonwhite	152 (46.3%)	75 (45.7%)	77 (47.0%)
Age <sup>a</sup>	58.9 (17.4)	61.2 (58.7-63.7)	56.5 (53.7-59.3)
ED SOFA score <sup>a</sup>	6.8 (3.5)	7.2 (6.6-7.7)	6.4 (5.8-6.9)
ED minimum SBP (mm Hg)	73.3 (17.6)	71.5 (68.8-74.2)	75.1 (72.2-78.1)
ED minimum SaO <sub>2</sub> (%)	91.1 (11.7)	91.3 (89.8-92.7)	90.9 (88.5-93.2)
ED maximum HR (beats/min)	120.3 (24.9)	120.0 (116.1-124.0)	120.7 (116.7-124.7)
ED maximum RR <sup>*</sup> (breaths/min)	29.7 (11.0)	31.1 (29.1-33.0)	28.2 (26.6-29.9)
Maximum temperature (°F)	99.7 (9.4)	99.2 (97.6-100.8)	100.1 (98.7-101.5)
Highest lactate (mmol/L)	4.4 (3.7)	4.8 (4.2-5.4)	4.0 (3.4-4.6)

American Journal of Emergency Medicine (2012) 30, 51–56

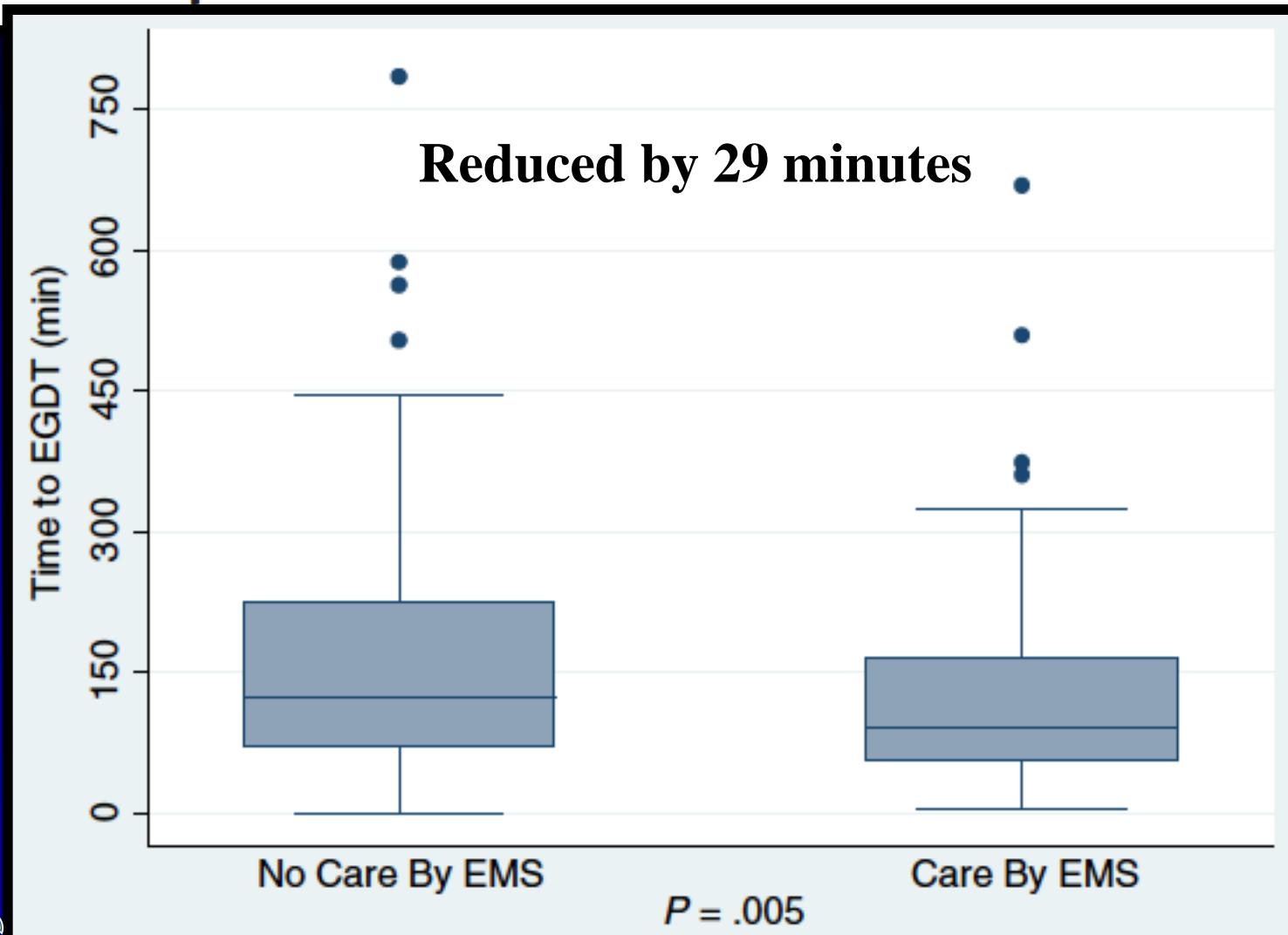


# The impact of emergency medical services on the ED care of severe sepsis☆



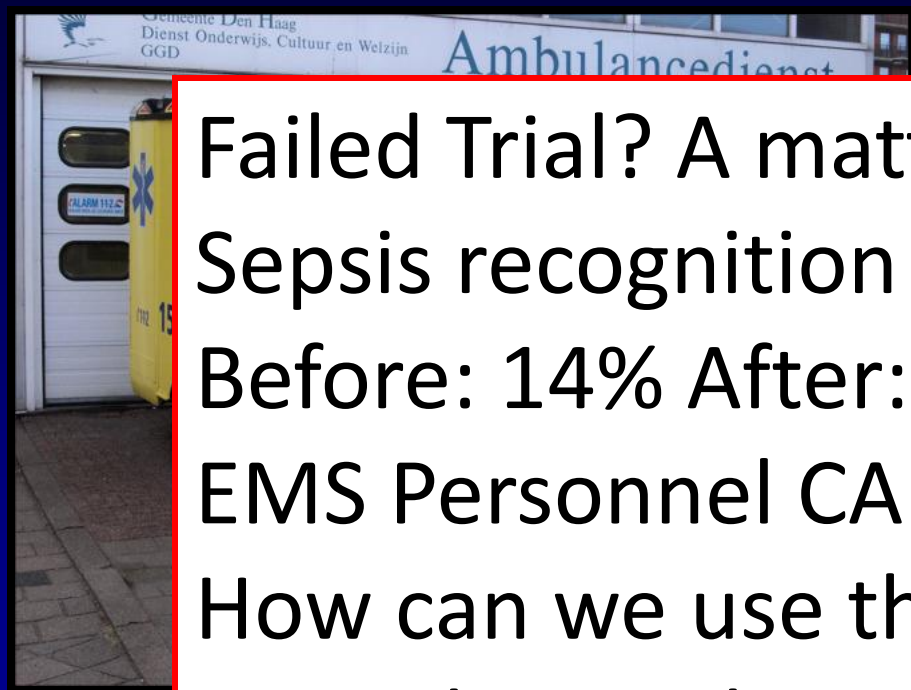
American Journal of Emergency Medicine (2012) 30, 51–56

# The impact of emergency medical services on the ED care of severe sepsis☆



American Journal of Emergency Medicine (2012) 30, 51–56

# Prehospital antibiotics in the ambulance for sepsis: a multicentre, open label, randomised trial



Failed Trial? A matter of perspective  
Sepsis recognition by EMS personnel  
Before: 14% After: 41%  
EMS Personnel CAN recognize sepsis  
How can we use that?  
Does this apply to the US?

Mean  
40 minutes

admission, survival



Alam, et al. Lancet Resp Med, 2017

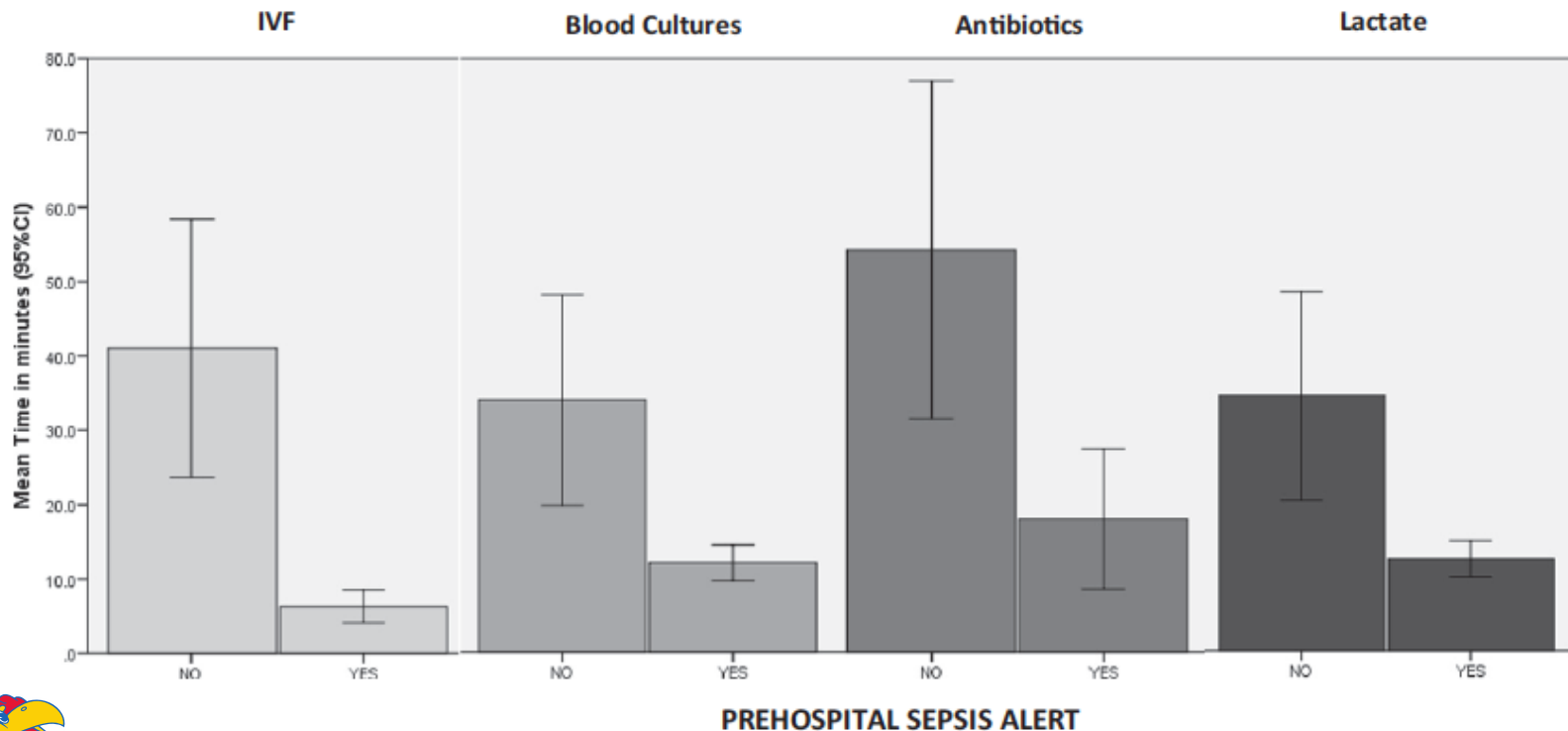


Brief Report

Prehospital sepsis alert notification decreases time to initiation of CMS sepsis core measures



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**Quality Improvement  
Organizations**

Sharing Knowledge. Improving Health Care.

*CENTERS FOR MEDICARE & MEDICAID SERVICES*

**Great Plains**



Quality Innovation Network

# **Patient, Family and Emergency Medical Service Early Recognition of Sepsis in Rural Communities: Critical to Reducing Progression of Sepsis Harm and Death**

# Interventions

- Established new relationships with EMS (new provider group for GPQIN projects)
  - Leveraged established stakeholder relationships
- Each state identified one rural geographical area
  - Recruitment of 49 rural EMS Units/Departments
    - Majority of EMS units are comprised of volunteers
- Consumer Interventions
  - Utilized existing tools, resources and toolkits (Sepsis Alliance, CDC, GPQIN Home Health Toolkit)
  - “Sepsis: Spot the Signs” magnet, poster, bookmark, and “Sepsis Stop Light” tool
  - GPQIN website and social media, including patient stories
  - Hospitals and Home Health agencies distributing magnets in admission and discharge packets
  - Health fairs, senior centers, libraries, post office, dentist, gym, rural cooperative meetings

## Comments from participating EMS Unit providers

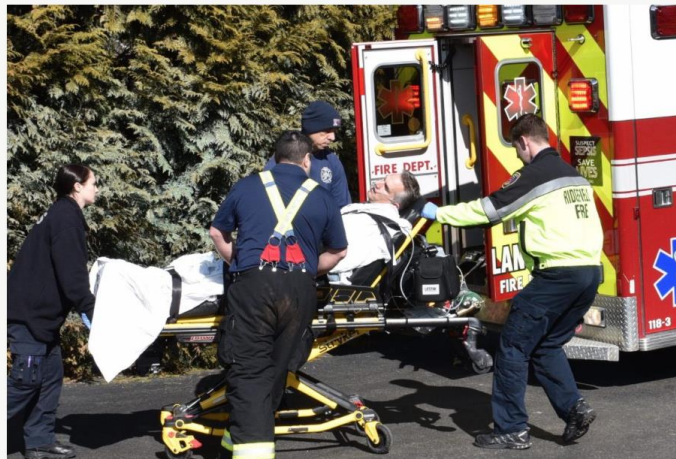
“We transported a patient from the local clinic to the tertiary hospital last fall. The patient was familiar to the EMTs on the call and chatted and visited all the way to the hospital arriving about 4:30 pm – and we actually questioned the appropriateness of the clinic calling the ambulance because the patient seemed so comfortable. The patient died at 6:15 that same day. I wish we knew then what we know now.”

– North Dakota EMT

“This project has prompted us to assess the patient more closely and obtain a better history with initial contact. I’ve seen an increase in possible sepsis symptom recognition and we are providing a better picture to the ER prior to transport and transporting with a higher urgency. Our unit’s documentation is more thorough and we are taking more oral temps. Also we are starting more IV fluids in the field. We are working on a sepsis protocol with our medical director and using the sepsis pocket card as a resource. I think it’s important to just say it....just say that we think it’s sepsis...that way the hospital is already thinking it when we arrive and they don’t start over again with their assessment.” – Nebraska Paramedic

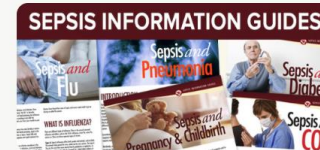
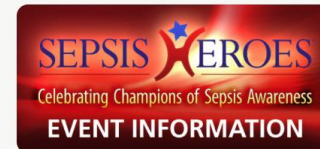


# Sepsis: First Response



## Sepsis: First Response

*Sepsis: First Response* is an educational video and training module that provides Emergency Medical Service (EMS) personnel with the tools to rapidly identify and begin treating sepsis cases in the field, as well as how to effectively coordinate with the emergency department and in-hospital colleagues.

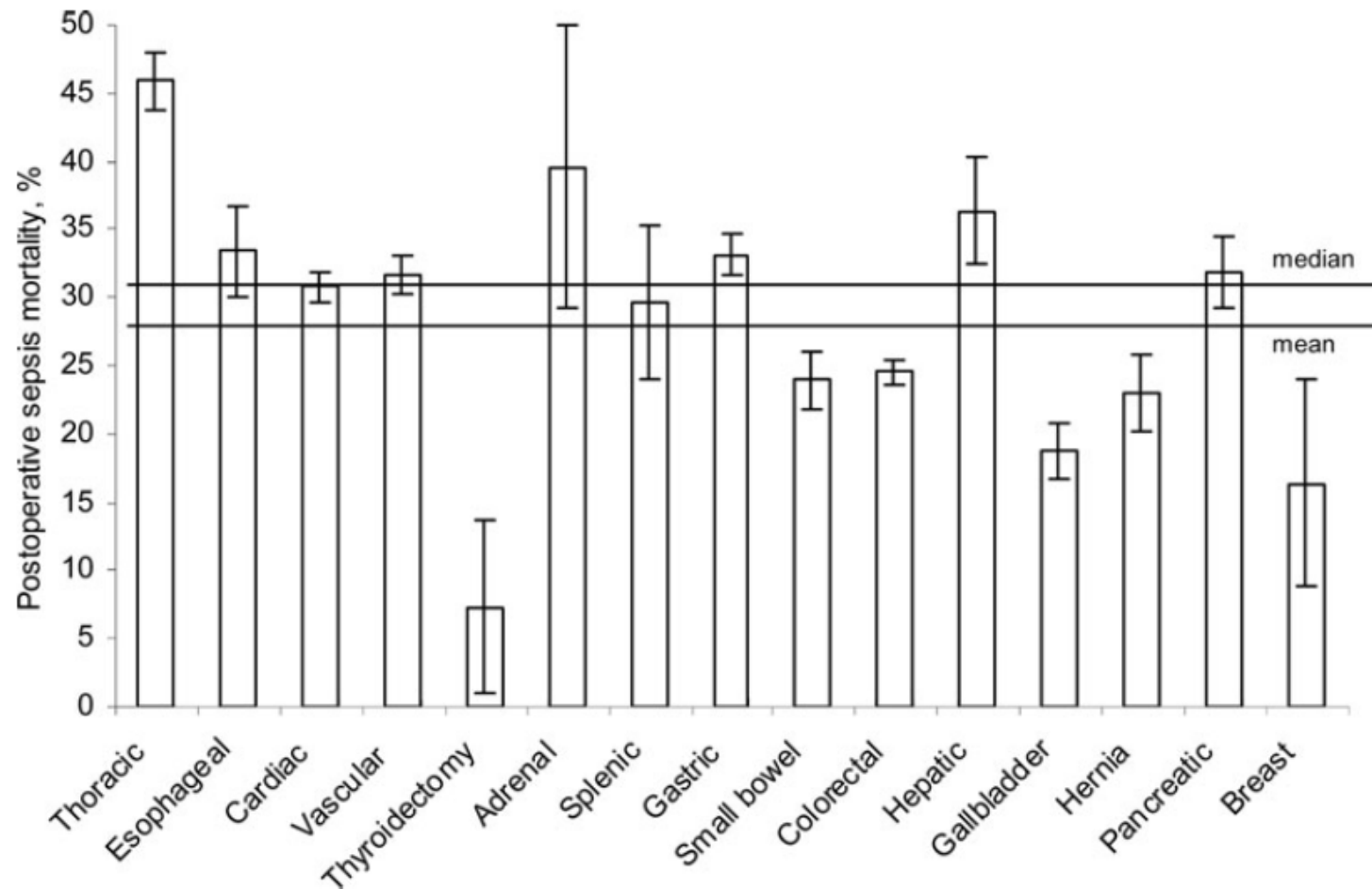


# Post-Operative Sepsis



# Postoperative Sepsis in the United States

*Todd R. Vogel, MD, MPH\*†, Viktor Y. Dombrovskiy, MD, PhD, MPH\*†, Jeffrey L. Carson, MD†, Alan M. Graham, MD\*†, and Stephen F. Lowry, MD\*†*



# Approach to Post-Op Sepsis

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- SIRS – all surgical patients come to the floor with SIRS
- Once the initial SIRS has resolved, then new fever, tachycardia, tachypnea are important
- Once anesthetic is gone, mental status change is ominous



# Summary

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- 1) There are several new things – for better or worse
- 2) We can help clear up diagnostic confusion
- 3) Standard care or standard operating procedures remain key to success
- 4) **EVERYONE** can participate
- 5) **EVERYONE** can make a difference



Thank You!

ssimpson3@kumc.edu