

Sepsis in 2018: “ED, ICU, Surgical Perspectives”

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Disclosures

- Protocol writing committee and study planning committee member for VICTAS, Vitamin C, Thiamine, and Steroids in severe sepsis with cardiac or pulmonary dysfunction
- No other relevant sepsis-related disclosures

Emergency & Trauma Center



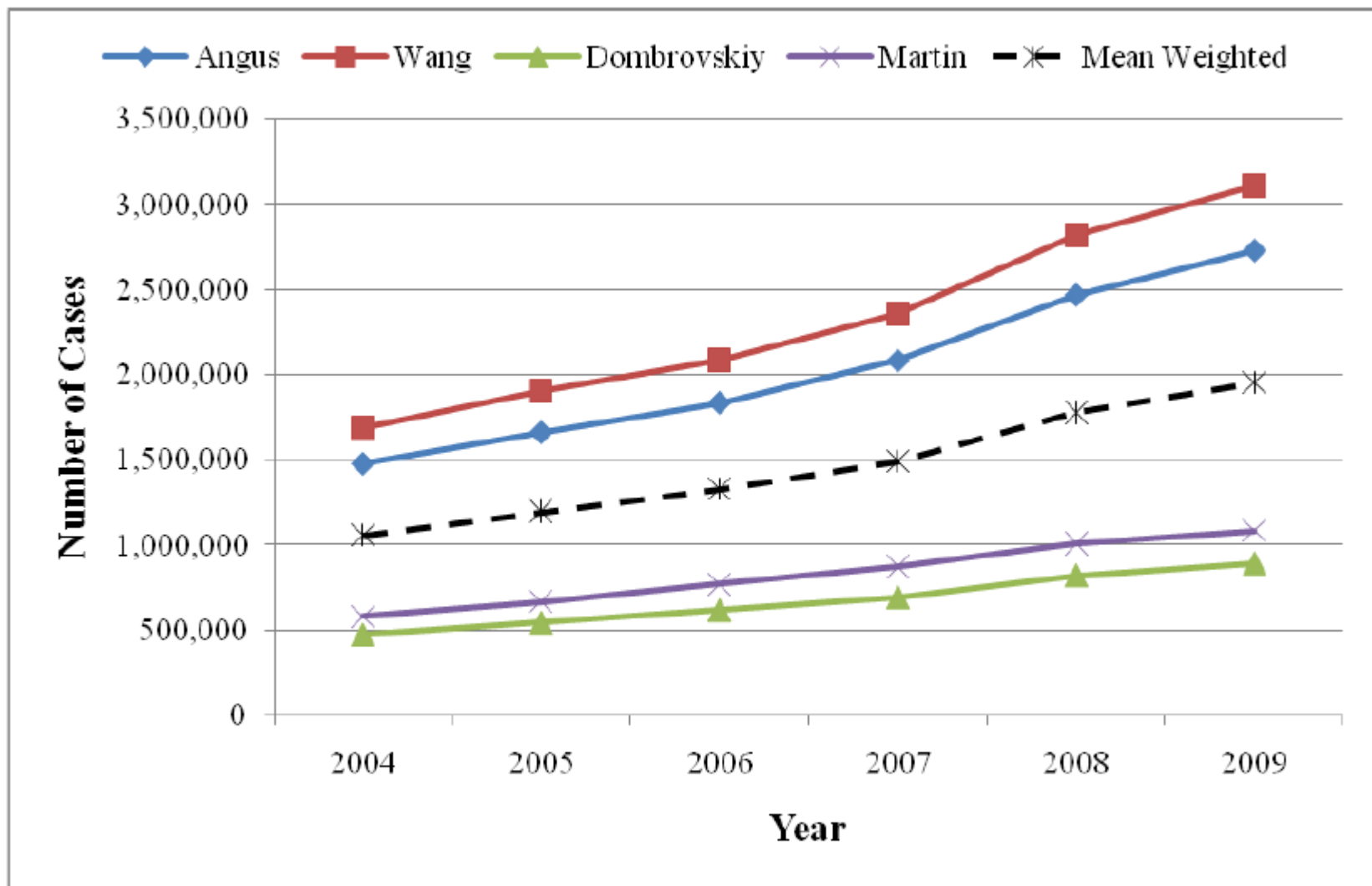


Critical Care

- Critical care is a concept not a location
- It is a way of treating patients that begins in the pre-hospital setting with EMS care, continues in the ED, and is completed in the ICU

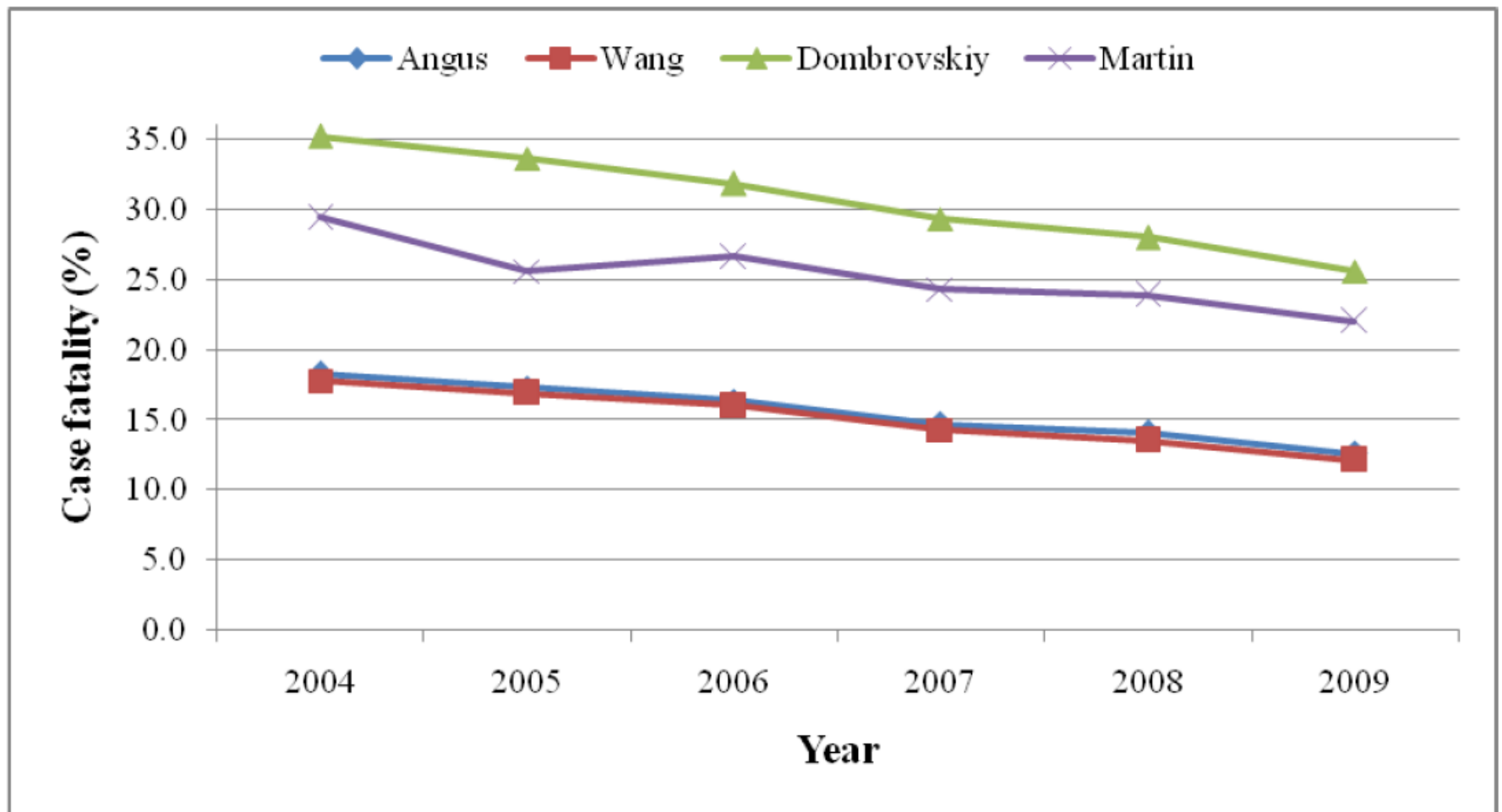


Figure 2a: Incidence of Severe Sepsis by Method Over 6-year Period¹



¹ 95% CI < 1% of total for all data points and cannot be represented graphically.

Figure 2b: In-hospital Case Fatality of Severe Sepsis by Method¹



¹ 95% CI < 1%.

The Continuum of Sepsis

SIRS

Sepsis

Severe Sepsis

Septic Shock

The Continuum of Sepsis

SIRS Sepsis Severe Sepsis Septic Shock

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Systemic Inflammatory Response Syndrome

SIRS criteria

- Temp $< 96.8^{\circ}$ or $> 100.4^{\circ}$ F
- HR > 90
- RR > 20 or $PCO_2 < 32$
- WBC < 4 or > 12 or bands $> 10\%$

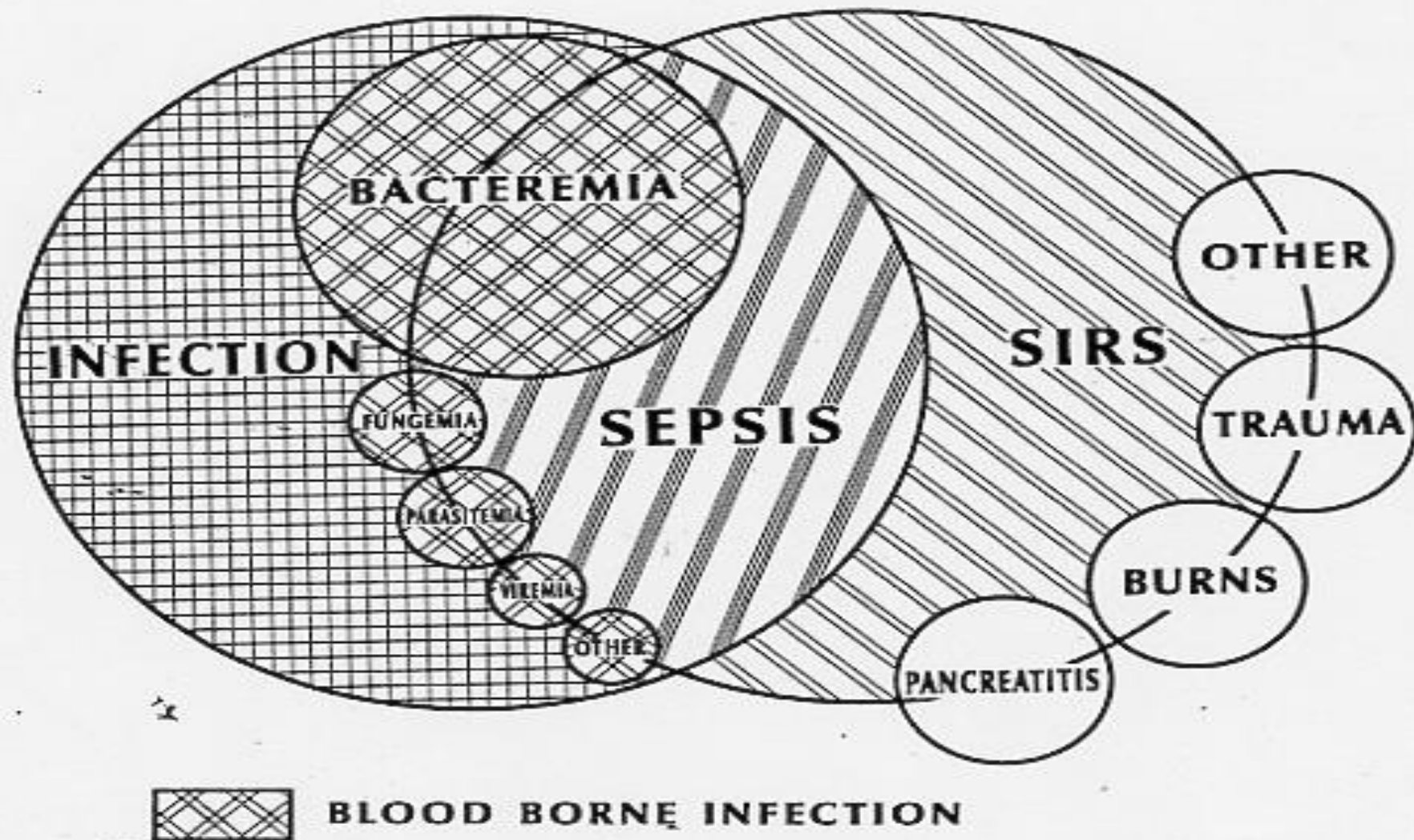


FIGURE 1. The interrelationship between systemic inflammatory response syndrome (SIRS), sepsis, and infection.

The Continuum of Sepsis

SIRS

Sepsis

Severe Sepsis

Septic Shock



Sepsis plus Organ Dysfunction

- Elevated Creatinine
- Elevated INR
- Altered Mental Status
- Elevated Lactate
- Hypotension that responds to fluid

The Continuum of Sepsis

SIRS Sepsis Severe Sepsis Septic Shock



Cryptic Shock

- Normotensive
- Lactate ≥ 4

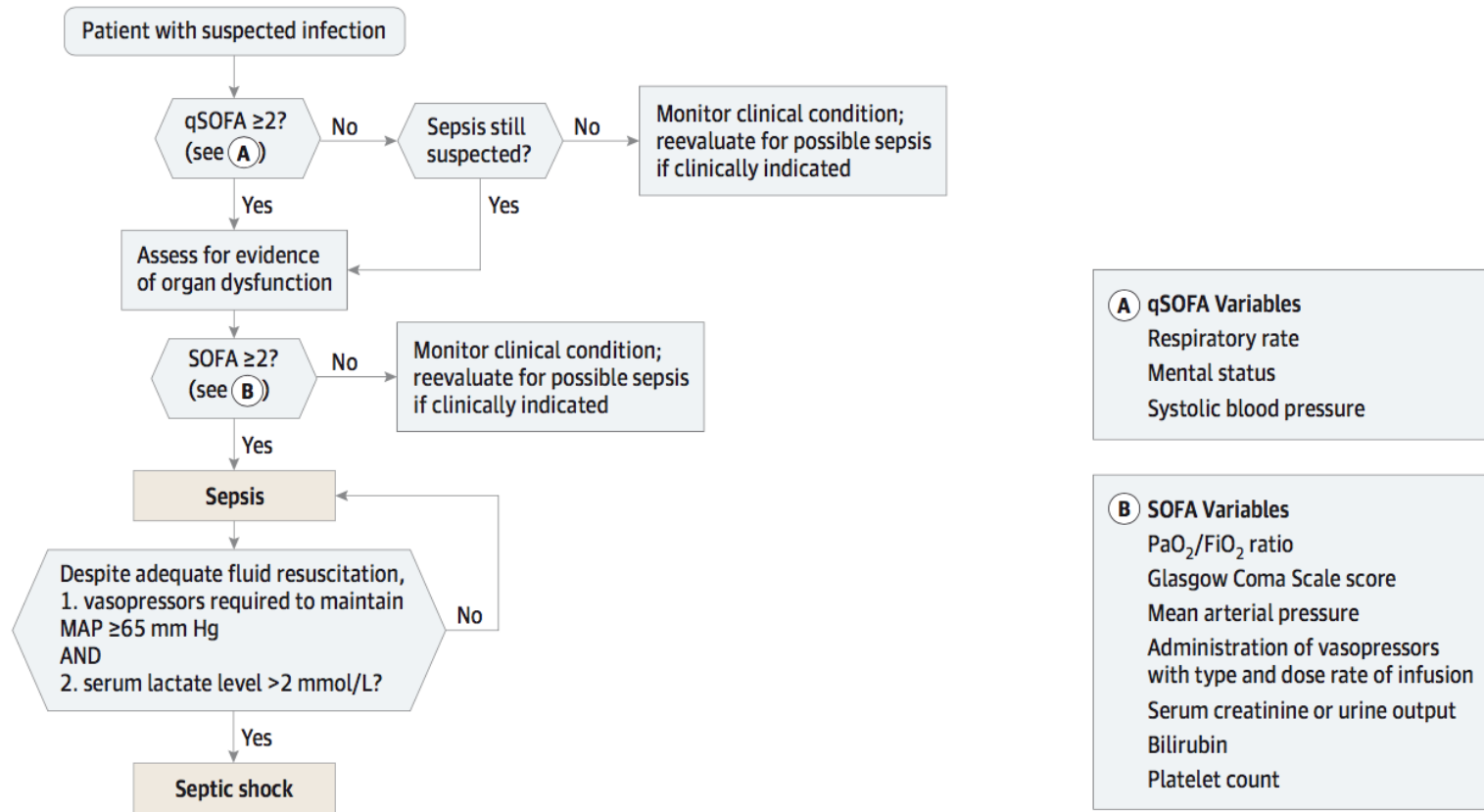
Severe Sepsis and Hypotension

- Hypotension that does NOT respond to fluid (30 cc/kg bolus)

New Sepsis Definition, 2016

- Sepsis is now defined as “life-threatening organ dysfunction caused by a dysregulated host response to infection”
- No more SIRS!
- Organ dysfunction: acute change in total SOFA score ≥ 2 points due to the infection
- A SOFA score ≥ 2 reflects an overall mortality risk of approximately 10%

Figure. Operationalization of Clinical Criteria Identifying Patients With Sepsis and Septic Shock



The baseline Sequential [Sepsis-related] Organ Failure Assessment (SOFA) score should be assumed to be zero unless the patient is known to have preexisting (acute or chronic) organ dysfunction before the onset of infection. qSOFA indicates quick SOFA; MAP, mean arterial pressure.

Sensitivity vs. Specificity

Most common keywords related to septic patients' symptom presentation

- Association between keywords and in-hospital mortality
 - abnormal/ suspected abnormal T° (64.1.%)
 - pain (38.4%)
 - acute altered mental status (38.2%)
 - weakness of the legs (35.1%)
 - breathing difficulties (30.4%)
 - loss of energy (26.2%)
 - gastrointestinal symptoms (24.0%)

Diagnosis (%)†

Medical condition	93.3	90.6
Pneumonia	39.5	38.5
Urosepsis	27.7	25.6
Peritonitis	4.2	3.4
Other	21.9	23.1
Surgical condition	6.7	9.4
Intraabdominal process	5.9	7.7

Source of sepsis — no. (%)

Pneumonia	140 (31.9)	152 (34.1)	151 (33.1)
Urinary tract infection	100 (22.8)	90 (20.2)	94 (20.6)
Intraabdominal infection	69 (15.7)	57 (12.8)	51 (11.2)
Infection of unknown source	57 (13.0)	47 (10.5)	66 (14.5)
Skin or soft-tissue infection	25 (5.7)	33 (7.4)	38 (8.3)
Catheter-related infection	11 (2.5)	16 (3.6)	11 (2.4)
Central nervous system infection	3 (0.7)	3 (0.7)	4 (0.9)
Endocarditis	1 (0.2)	3 (0.7)	3 (0.7)
Other	28 (6.4)	31 (7.0)	26 (5.7)

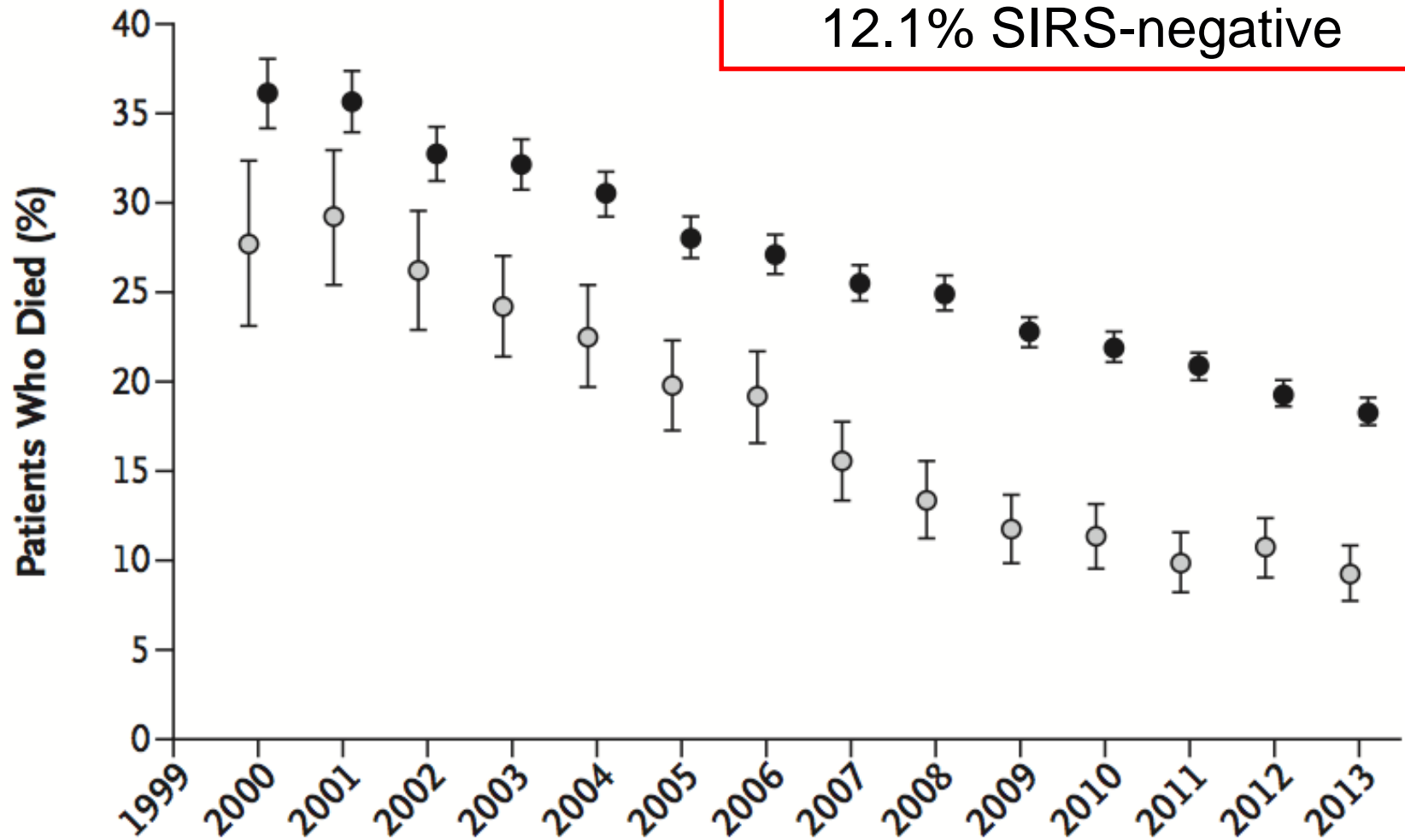
Pneumonia	18 (38)	19 (40)
Urosepsis	11 (23)	10 (21)
Primary bacteremia	7 (15)	7 (15)
GI/biliary	6 (13)	6 (13)
Other	5 (11)	5 (11)

Early Recognition

● SIRS-positive sepsis ○ SIRS-negative sepsis

A Unadjusted Annual Mortality

87.9% SIRS-positive
12.1% SIRS-negative



tqSOFA

	Triage qSOFA<2 (n=2337)	Triage qSOFA≥2 (n=508)	p value
Age (yr)	56.2 ± 17.7	62.2 ± 17.8	<0.01
Male	53% (1243)	51% (261)	ns
Time to Antibiotics (min) (n=2796)	197 ± 162	125 ± 114	<0.01
Total IVF (mL) (n=2746)	2405 ± 1732	2750 ± 1857	<0.01
Mortality			
In hospital (n=2845)	11.7% (273)	26.4% (134)	<0.01
28 days (n=2459)	15.2% (308)	36.6% (159)	<0.01
ICU Admission, (Y) (n=2845)	70.7% (1651)	78.2% (397)	<0.01
Intubated (ED), (Y) (n=2836)	5.6% (130)	21.0% (106)	<0.01
ALI (SF ratio<452), (Y) (n=2845)	53.6% (1252)	77.8% (395)	<0.01
Vasopressor(s), (Y) (n=2844)	5.6% (131)	14.4% (73)	<0.01

- tqSOFA≥2 for In-hospital mortality:
- Sens= 33%; Spec= 87%
- AUC, tqSOFA: 0.57 (95% CI: 0.55-0.59)

qSOFA

	qSOFA<2 (n=1478)	qSOFA≥2 (n=1362)	p value
Age (yr)	54.8 ± 17.7	60.0 ± 17.6	<0.01
Male	54.3% (802)	51.4% (700)	ns
Time to Antibiotics (min) (n=2791)	204 ± 167	162 ± 141	<0.01
Total IVF (mL) (n=2763)	2172 ± 1524	2785 ± 1934	<0.01
Mortality			
In hospital (n=2840)	8.5% (126)	20.6% (280)	<0.01
28 days (n=2457)	11.7% (150)	27.1% (316)	<0.01
ICU Admission, (Y) (n=2840)	64.7% (956)	80.0% (1090)	<0.01
Intubated (ED), (Y) (n=2830)	3.4% (50)	13.8% (187)	<0.01
ALI (SF ratio<452), (Y) (n=2839)	45.2% (668)	71.5% (974)	<0.01
Vasopressor(s), (Y) (n=2839)	2.5% (37)	12.3% (167)	<0.01

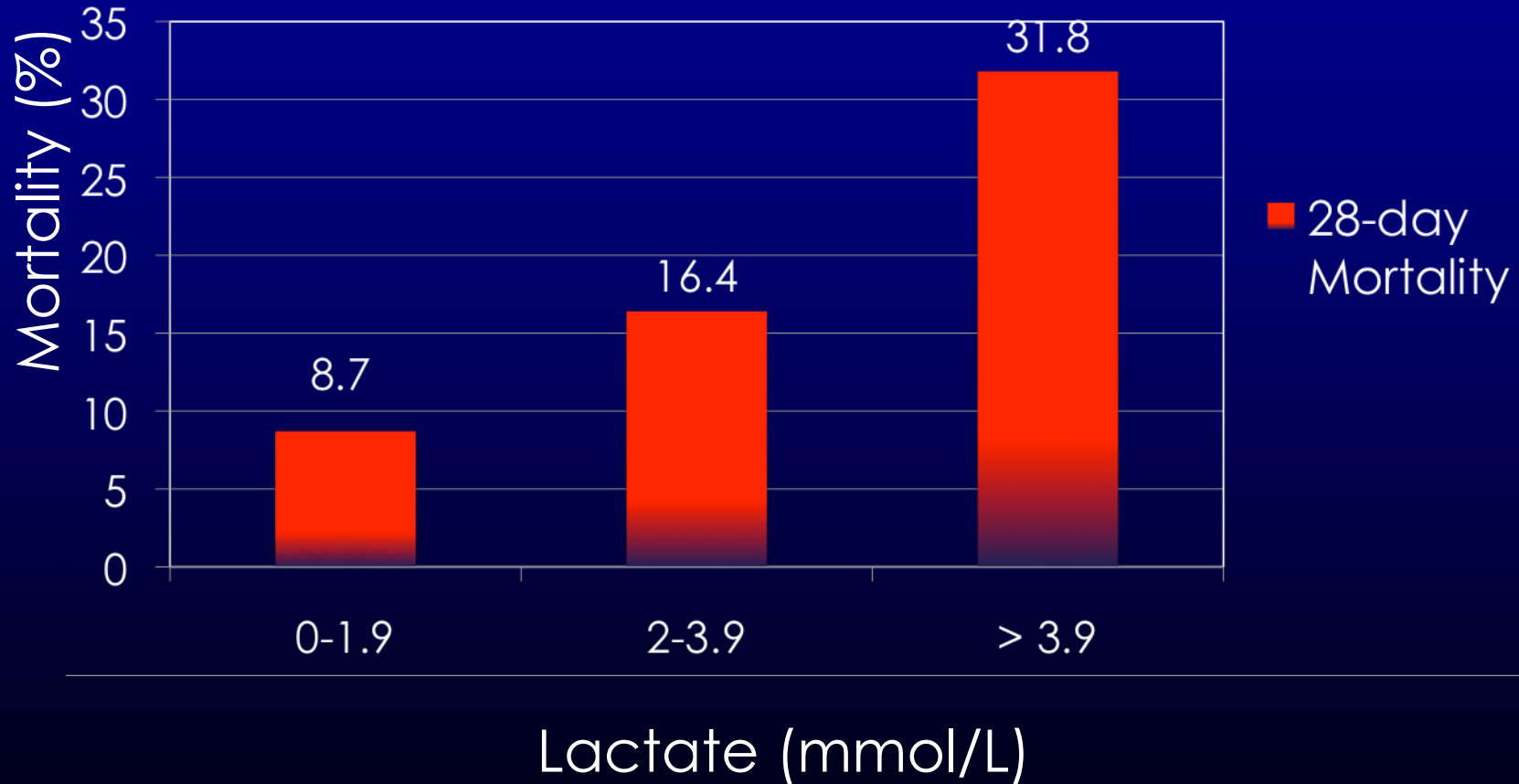
- qSOFA≥2 for In-hospital mortality:
- Sens= 70%; Spec= 56%
- AUC, qSOFA: 0.56 (95% CI: 0.55-0.57)

Organ Dysfunction?



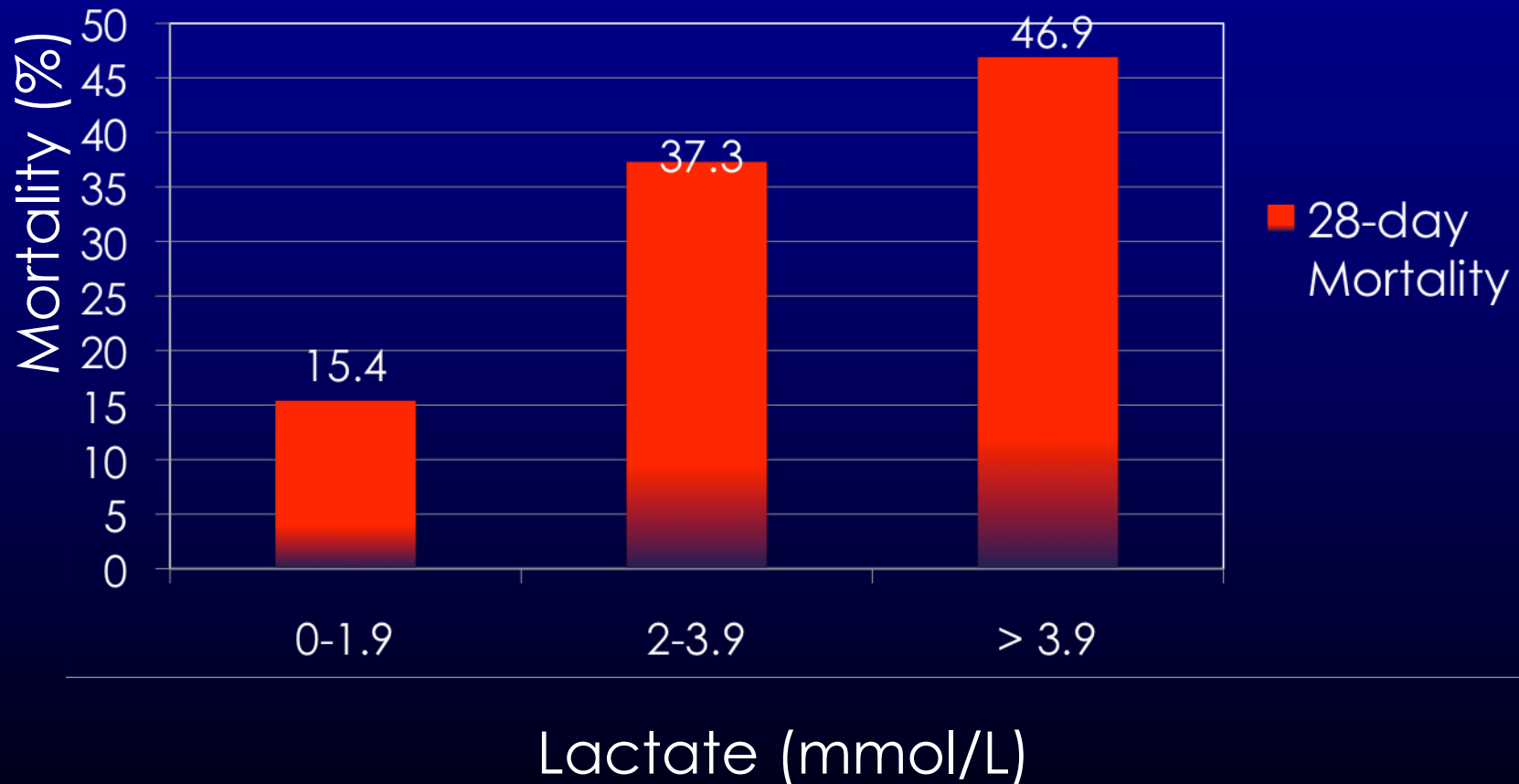
ED Lactate in Severe Sepsis

Normotensive

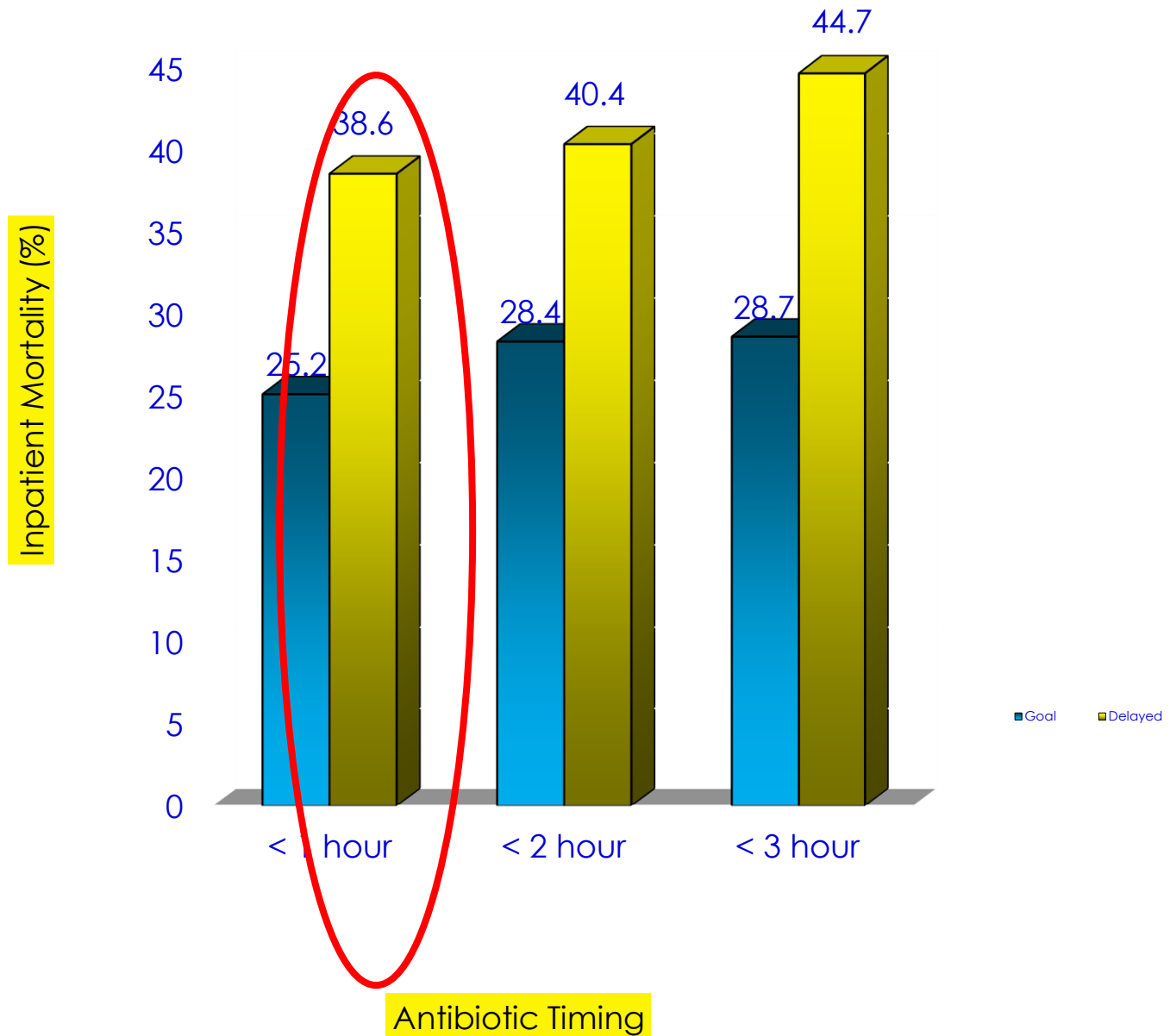


ED Lactate in Severe Sepsis

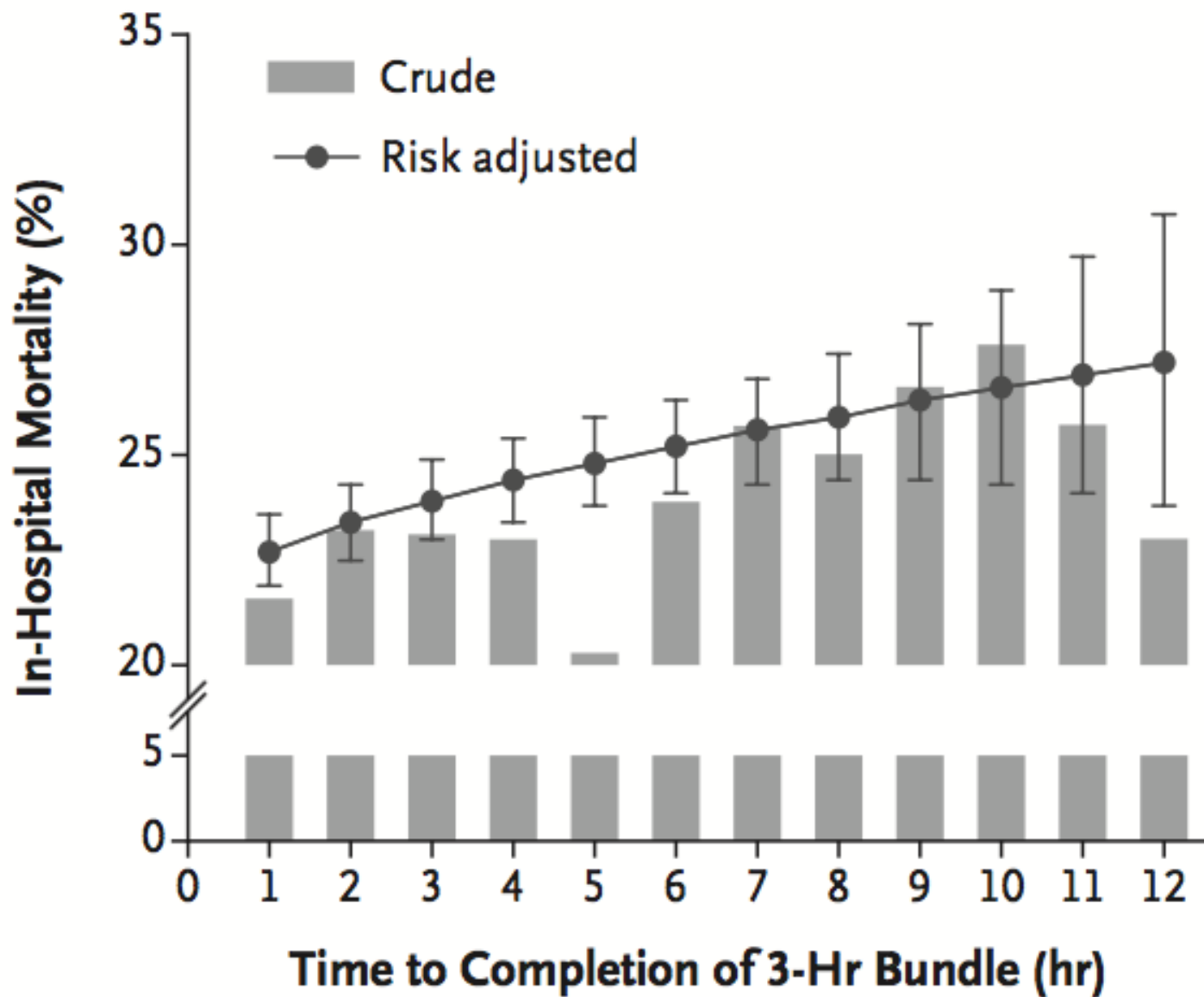
Hypotensive



Time to Antibiotics



A 3-Hr Bundle





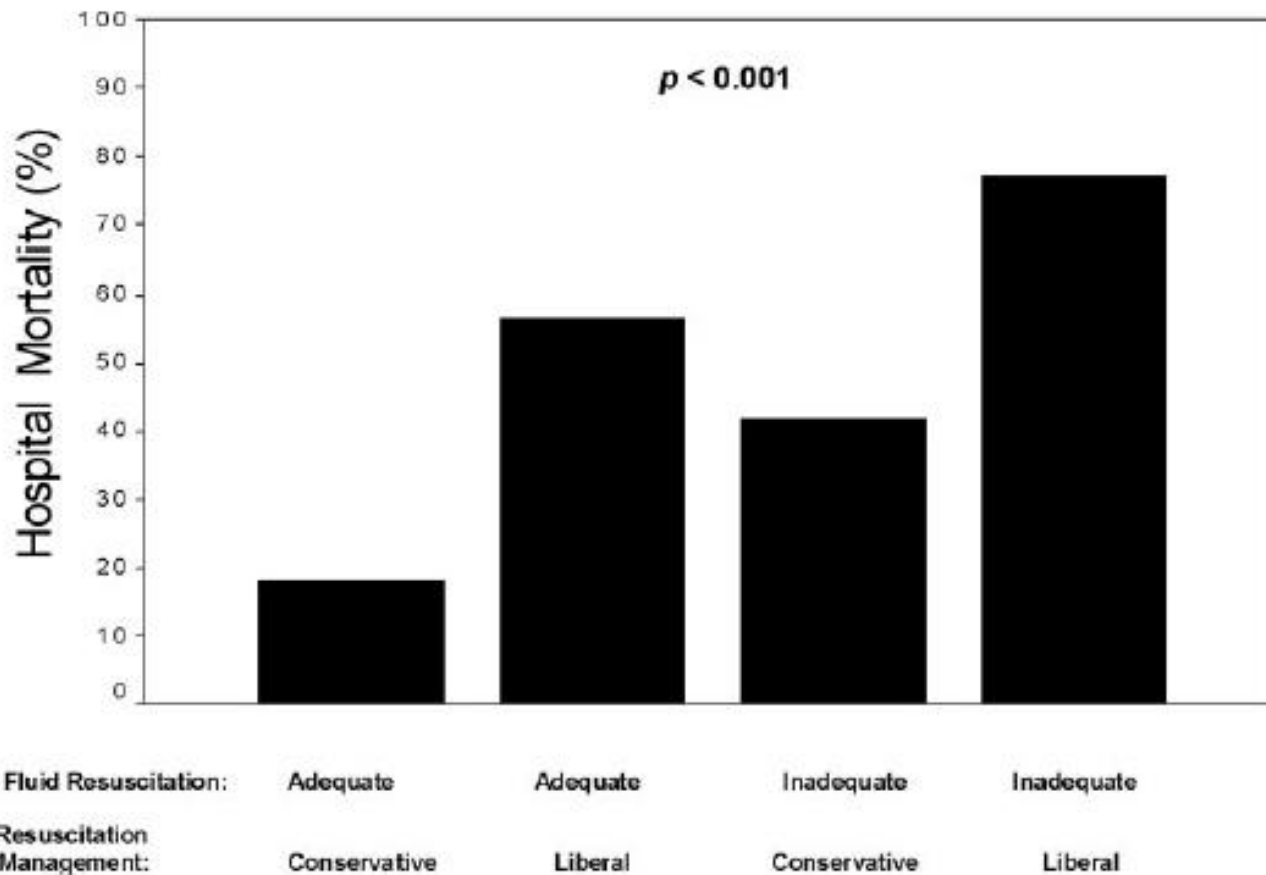


FIGURE 3. Hospital mortality according to whether or not patients achieved AIFR, CLFM, both, or neither.

AIFR: Adequate Initial Fluid Resuscitation
 CLFM: Conservative Late Fluid Management

