

Sepsis in 2016: “Every Patient: Anytime, Anywhere”

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STOPPING SEPSIS
Saving Lives in Pennsylvania



Disclosures

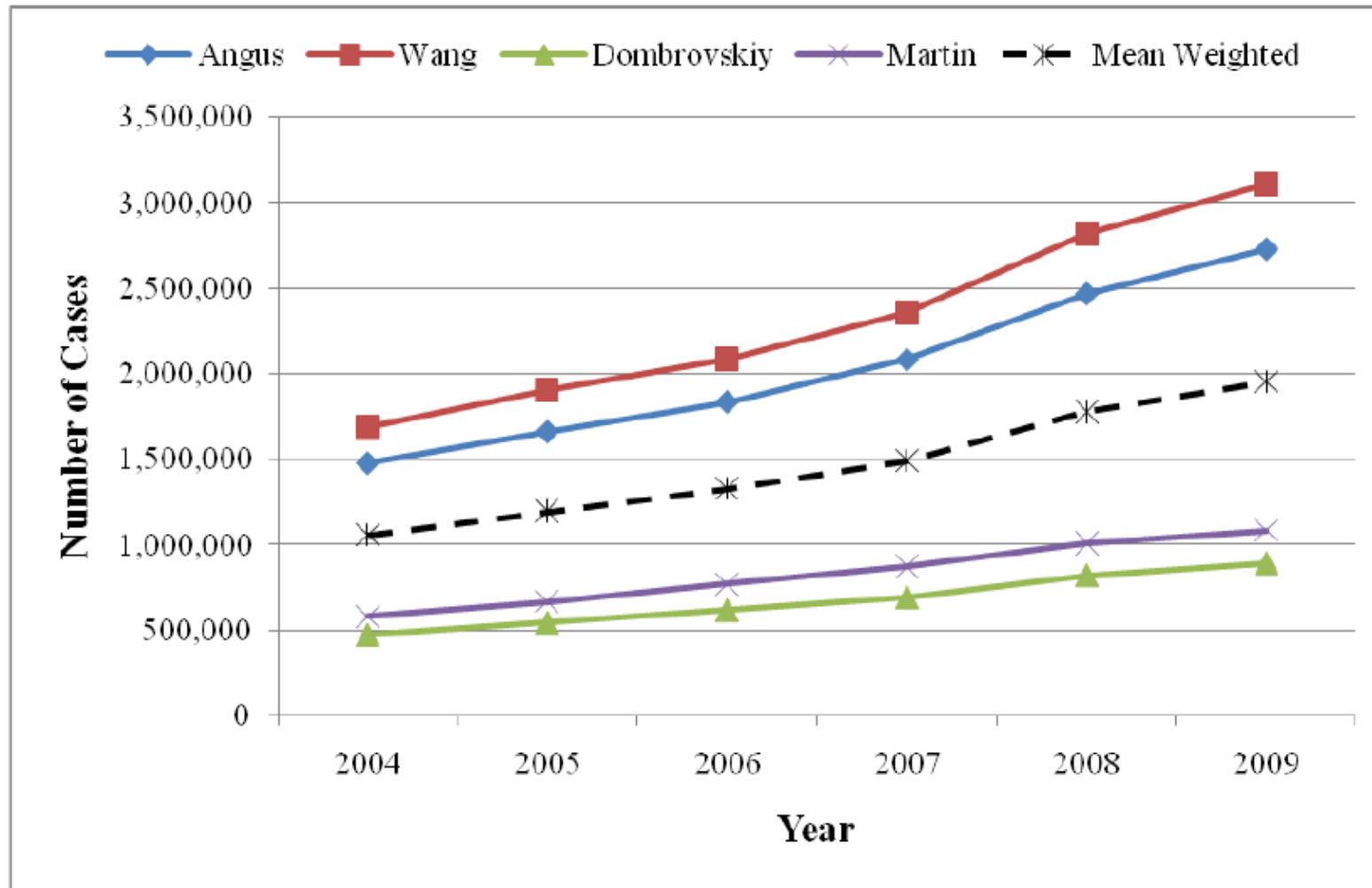
- Bard Medical Division—research funding to investigate temperature burden in patients with severe sepsis
- No other relevant sepsis-related disclosures

Outline

- Epidemiology of Sepsis
- A Case
- Need for Early Recognition:
 - SIRS, qSOFA, Lactate
- Modern Protocolized Care
- Conclusions

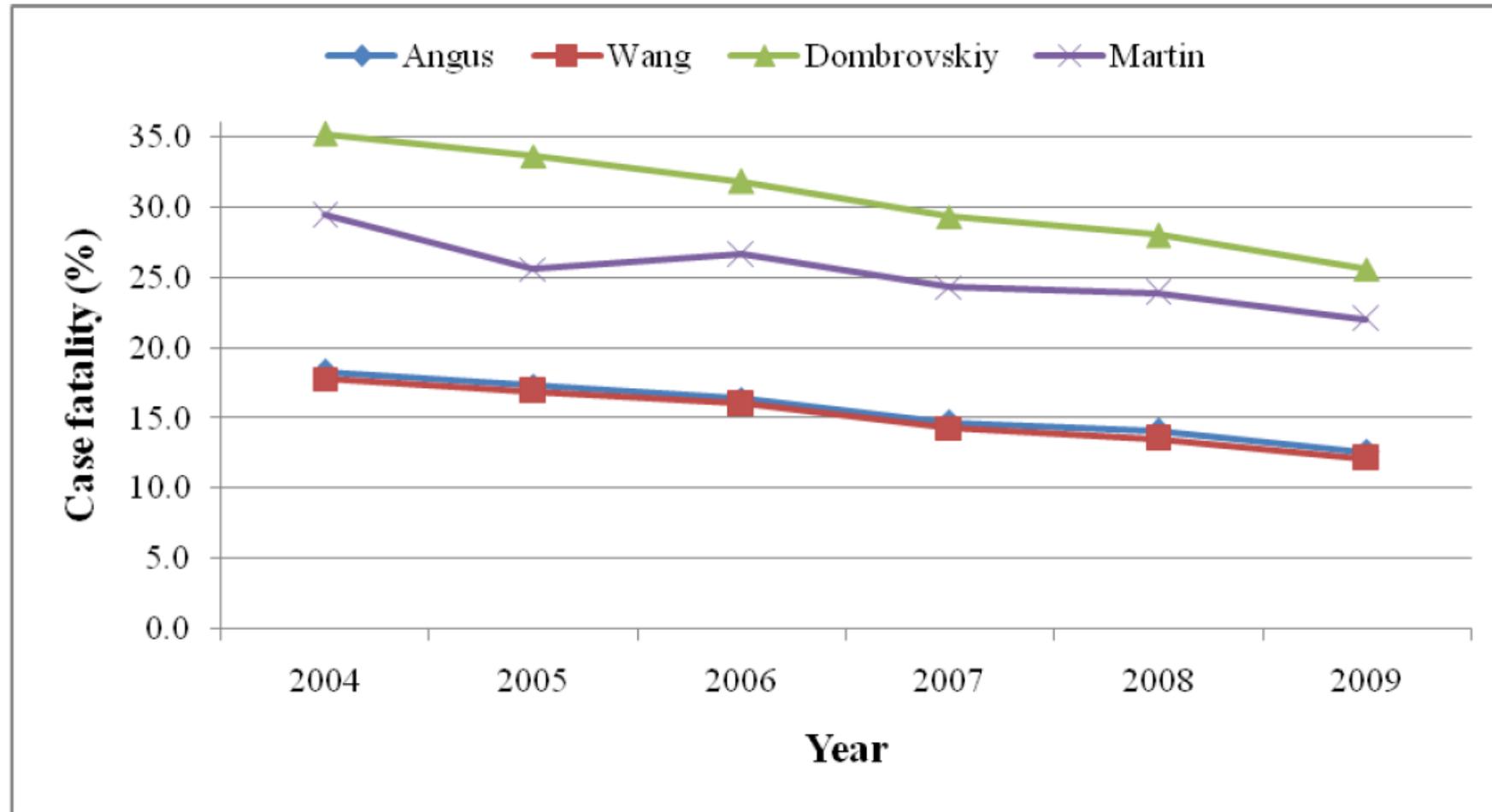
Epidemiology of Sepsis

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%.

A Case: Initial Presentation

Case Vignette

- 54 year-old male w/ PMHx of HTN, PAF, HL
- Brought to ED by wife in private car
- Chief complaint: abdominal pain
 - Began 3 days ago after eating dinner
 - Stuttering since then
 - More severe/constant \approx 6 hours before ED arrival
- 2 days of nausea
- 1 episode of vomiting 4 hours ago
- T=101.5° F, 4 hours prior, treated w/ APAP
- Registration: 11:10; Triage: 11:25

Case Vignette

- Allergies: NKDA
- Meds: ASA, metoprolol, amlodipine, statin
- Triage VS:
 - T°, 100.5° F
 - BP, 128/78 mm Hg
 - HR, 88 beats per minute
 - RR, 21 breaths per minute
 - O₂ sat, 96% on RA
 - Pain, 6/10
 - GCS: 15
- Triaged as ESI 3 patient—abdominal pain
- To waiting room along with 15 other patients

SIRS	Criteria:	n:
• 2	• 1	0
	qSOFA points	1

Challenge of sepsis patients

- This is a typical potential sepsis patient
 - Presumed infection (likely intra-abdominal process) + inflammatory response (fever, tachypnea)
- Challenge for clinicians:
 - How sick is he?
 - Does he have a time-sensitive infection?
 - How aggressive does his treatment need to be?
- On initial presentation:
 - no obvious signs of end organ dysfunction
 - Does not obviously have sepsis
 - What does this mean?

Need for Early Recognition

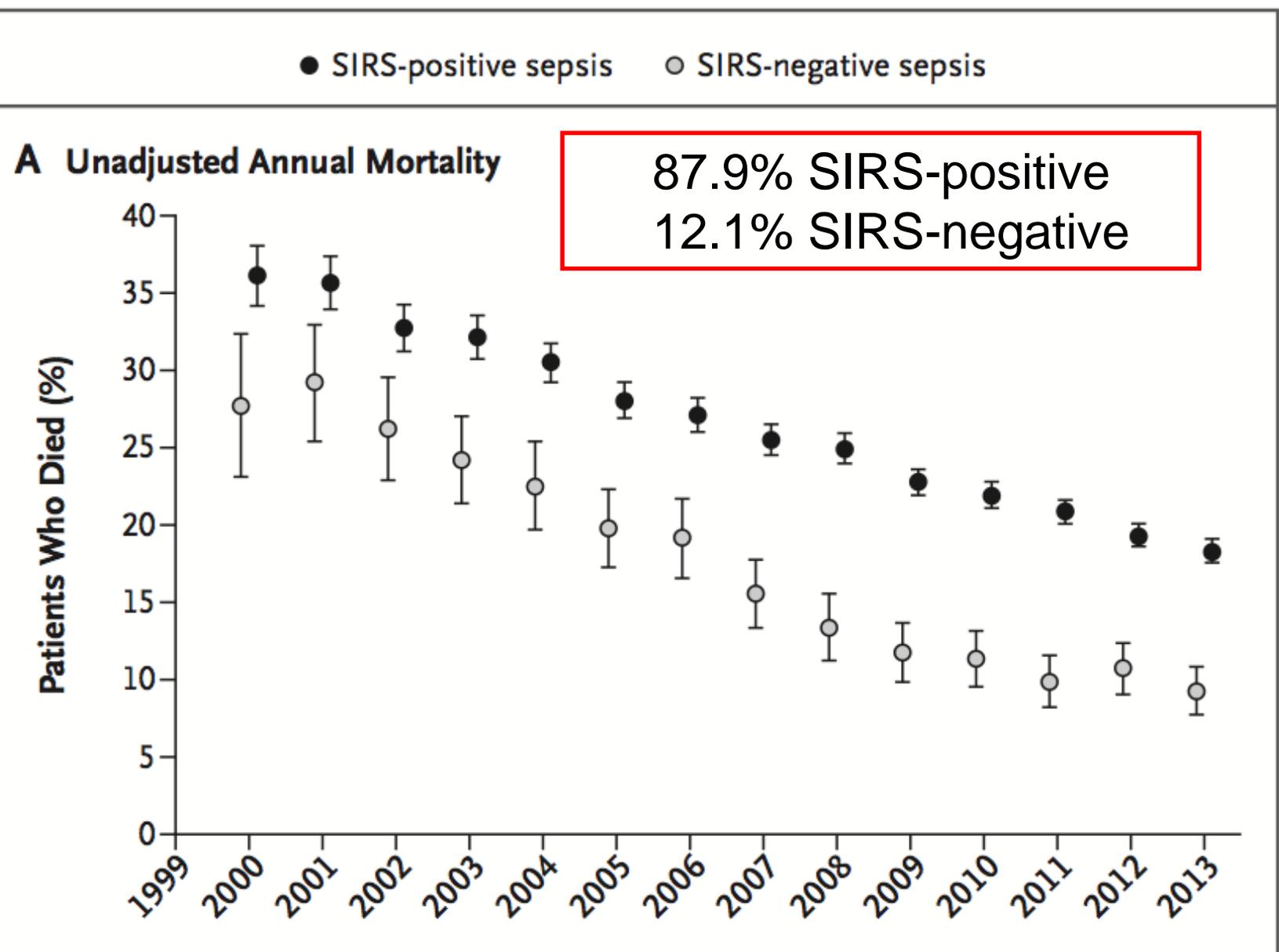
Recognition

Emergency Department = 36			Rapid Care = 4				Waiting Room					
Time	UnAd	PT	Gender	Complaint	C	Age	BP	Temp	Pulse	O2Sat	Resp	Re
13:43 01/28	51		Male	Inj, Stool	2	56 Years	157/100	97.9	99		14	14
13:59 01/28	84		Male	CP	2	51 Years	153/90	96.4	106	96	14	14
14:22 01/28	10		Female	HTN	2	77 Years	197/89	96.4	87		14	15
14:26 01/28	33		Female	Abcess	2	77 Years	128/49	96.1	81		14	15
15:27 01/28	17		Female	CO	2	20 Years	128/77	96.8	72	99	14	
15:34 01/28	11		Female	Sr Thrt	2	21 Years	117/81	96.5	86		14	
12:56 01/28	169		Female	HyperG	3	57 Years	172/89	99.1	94		14	14
13:02 01/28	72		Female	NV	3	18 Years	113/68	96.7	70		14	14
13:05 01/28	72		Male	HTN	3	45 Years	151/88	97.8	64		14	14
15:20 01/28	23		Male	Ha	3	39 Years	138/88	97.7	80		14	
15:41 01/28	5		Female	GYN	3	28 Years	117/81	101.6	105		14	
15:44 01/28	1		Female	Dizzy	3	29 Years	135/99	96.8	82		14	
14:52 01/28	54		Male	Pain, Back	4	58 Years	147/97	97.9	85		14	

SIRS: Systemic Inflammatory Response Syndrome

SIRS criteria and systolic
blood pressure ≤ 90 mm Hg
or lactate ≥ 4 mmol/liter

- How helpful are the SIRS criteria?



qSOFA

- Proposed bedside screen for high risk patients
- Analyzes 3 organ systems without lab values
 - CNS, Pulmonary, Circulatory
- 3 criteria:
 - CNS: Altered mental status (GCS < 15)
 - Pulmonary: RR > 22
 - Circulatory: SBP < 100
- Mortality associated with criteria:
 - 0=<1%; 1=2-3%; 2=8%; 3=>20%
- If qSOFA $\geq 2 \rightarrow$ high risk patient
 - overall mortality of 10%
 - Increased likelihood of spending ≥ 3 days in ICU

Our patient: No Protocol—1st Outcome

- 11:30: Patient waits to be seen
- 13:12: Treatment Room: Reassessment
- Repeat VS:
 - T^o, 99.5° F
 - BP, 88/58 mm Hg
 - HR, 108 beats per minute
 - RR, 23 breaths per minute
 - O₂ sat, 93% on RA
 - Pain, 6/10
 - GCS: 14 (confused)
- Sepsis patients are dynamic, tenuous

SIRS Criteria: Definition:
• 2 SIRS
qSOFA Criteria: Definition:
• 3 qSOFA points

Our patient: Lactate Protocol

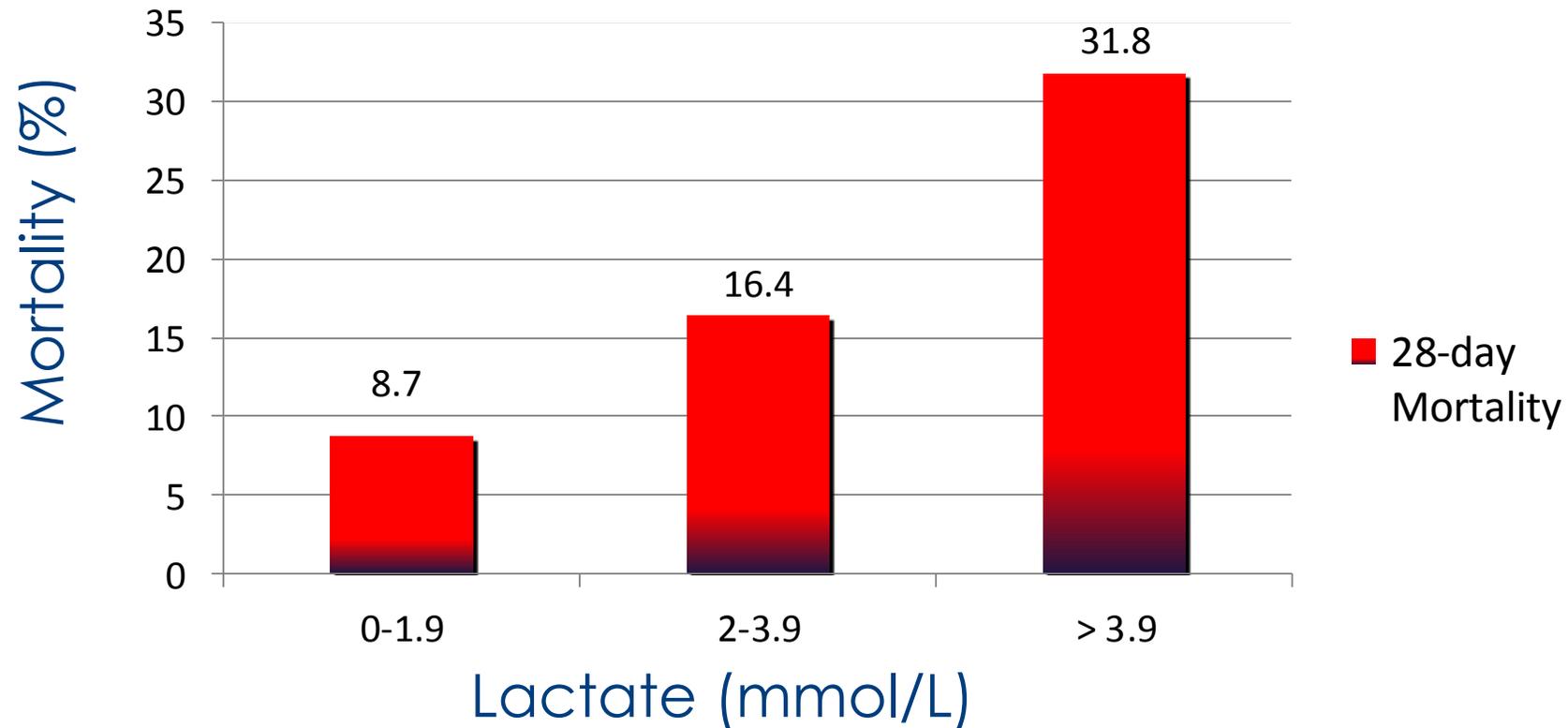
- Easily obtainable data to clarify urgency?
 - What if serum lactate is 1.4 mmol/L?
 - What if it is 4.1 mmol/L?
- How would this inform “safety of waiting in triage?”
- EMR algorithm utilizes CC + VS to generate an automatic order for a serum lactate
- 11:40: Drawn by EMT 10 minutes after triage
- Sent to the critical care laboratory for analysis

SIRS criteria and systolic
blood pressure ≤ 90 mm Hg
or lactate ≥ 4 mmol/liter

Utilizing Lactate

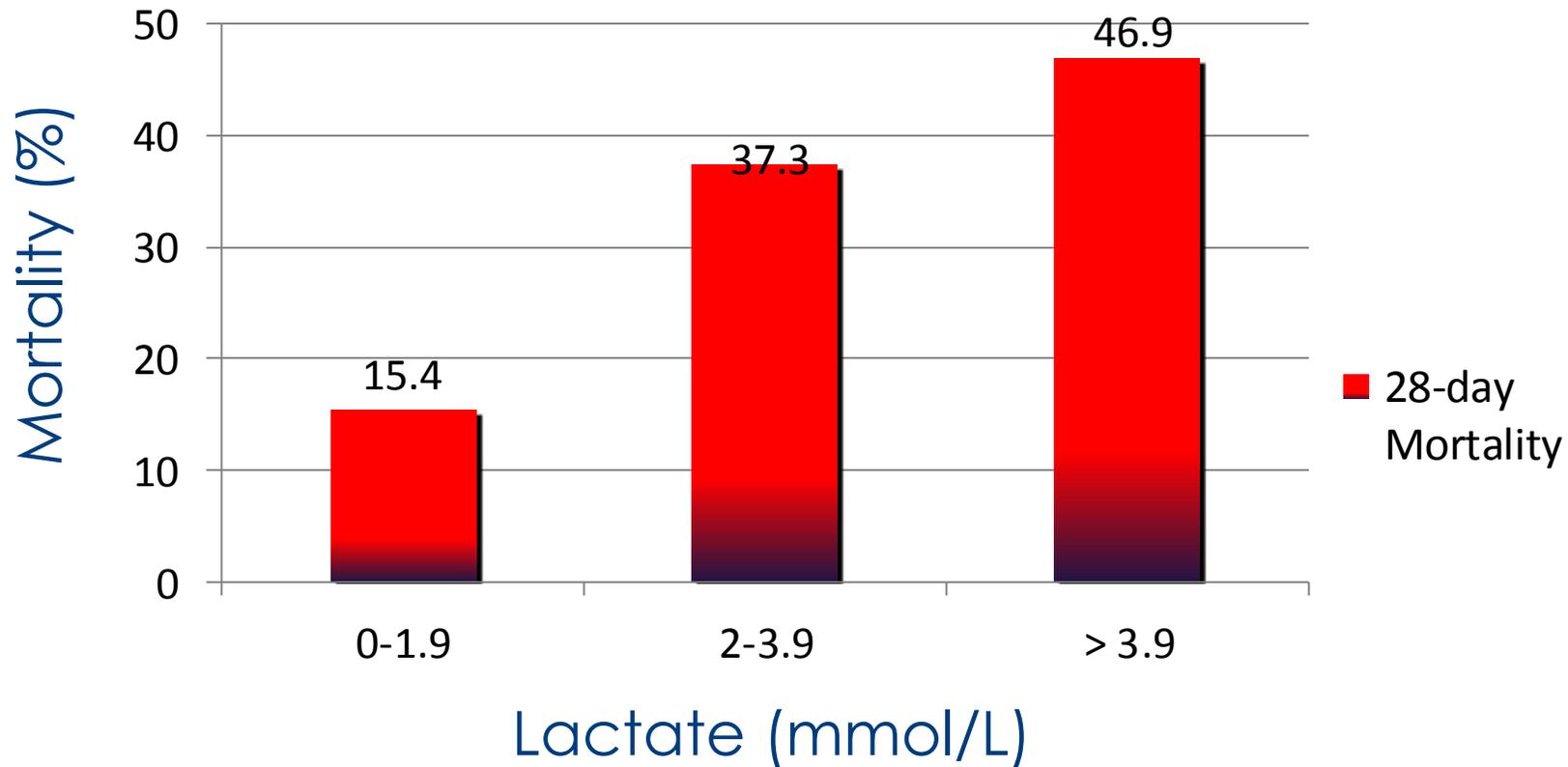
ED Lactate in Severe Sepsis

Normotensive



ED Lactate in Severe Sepsis

Hypotensive



Our patient: Lactate Protocol

- 11:55: Lactate (15 min p sent)= 5.4 mmol/L
- Immediately transfer to a treatment room
 - Repeat VS: no significant change
- 12:04: 2 18 gauge IVs placed
- 13:04: 3 L NSS were infused in 1 hr
- 13:10: WBC=16.5; HCO₃⁻=18; Tbili=2.7; Alk phos=235; AST/ALT 335/284; lipase 650

Patient Vignette: Lactate Protocol

- Bedside ultrasound:
 - Gallstones
 - GBWT
 - Dilated intrahepatic ducts
- Bedside ECHO:
 - Under-filled RV
 - > 50% IVC collapse
- 13:15: Repeat VS: BP 128/82; HR 84; RR 24
- No urine output
 - Continue IVF resuscitation, close monitoring
- Antibiotics ordered; surgery consulted

Adapt resuscitation strategy to your hospital's resources and your setting (ED, ward, clinic)

Our patient: Inclusive Protocol

- 11:30: “Potential sepsis protocol patient”
 - “Sepsis Alert” activated
- 11:40: Placed in treatment room, met by “team”
 - Immediate evaluation and treatment
- Repeat VS: No significant change
- 11:50: IVs placed, labs drawn, exam complete, fluid bolus started and US performed
- 11:55: Lactate (POC device)= 5.4 mmol/L

Our patient: Inclusive Protocol

- 12:32: Bolus complete, Labs back, US done
- 12:35: Repeat VS
 - T°, 99.5° F
 - BP, 132/76 mm Hg
 - HR, 80 beats per minute
 - RR, 18 breaths per minute
 - O₂ sat, 96% on RA
 - Pain, 2/10
 - GCS: 15
- 12:45: Repeat lactate: 3.2mmol/L
- 13:55: Antibiotics complete; surgery consulted

SIRS Criteria: Definition:
• 0 qSOFA points

Our patient: No Protocol—2nd Outcome

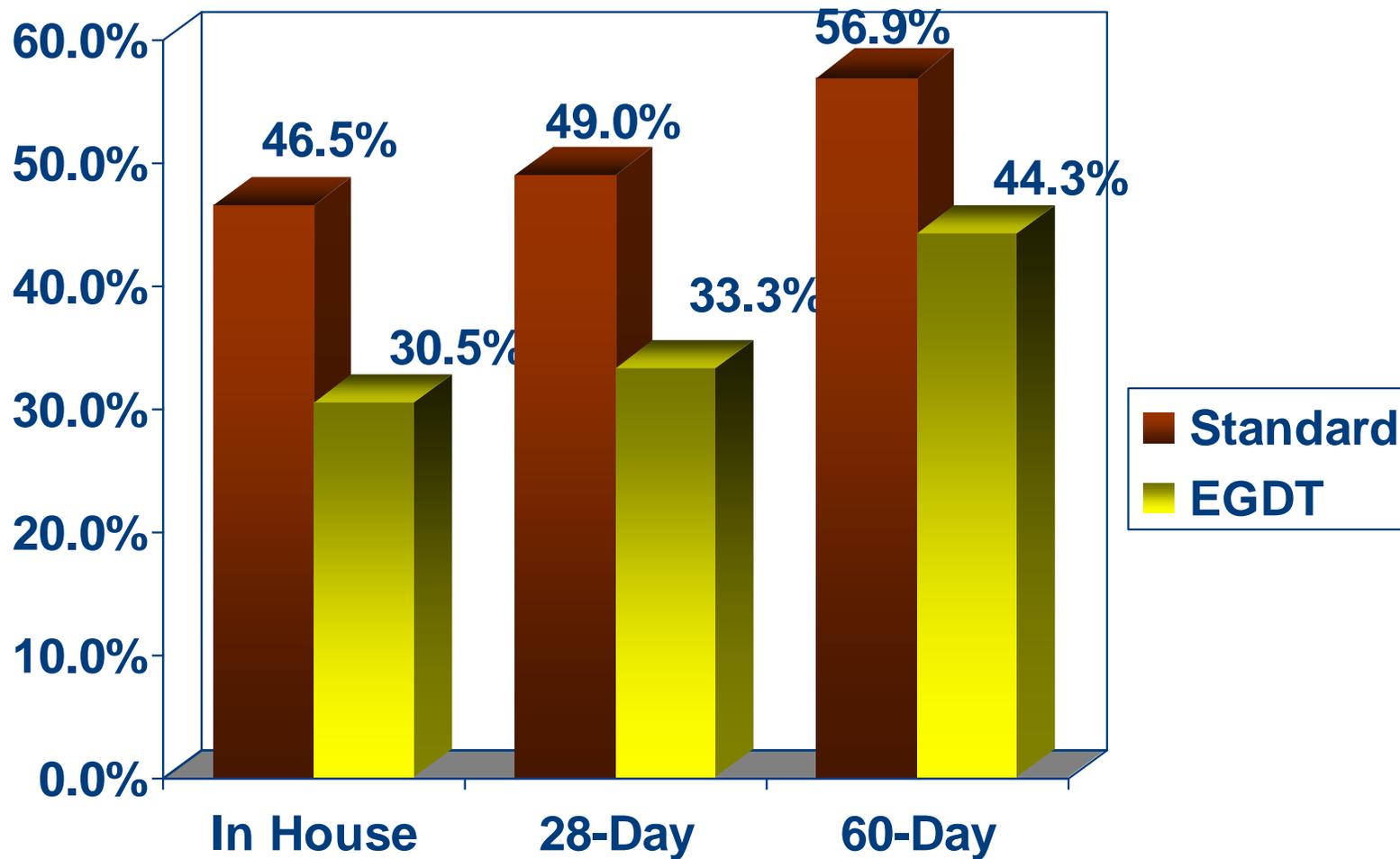
- 11:30: Patient waits to be seen
- 11:52: OHCA to Resuscitation Bay
- 12:18: Trauma Code to Resuscitation Bay
- 14:00: Wife informs triage nurse “husband is confused”
- 14:08: Taken by Wheelchair to Treatment Room

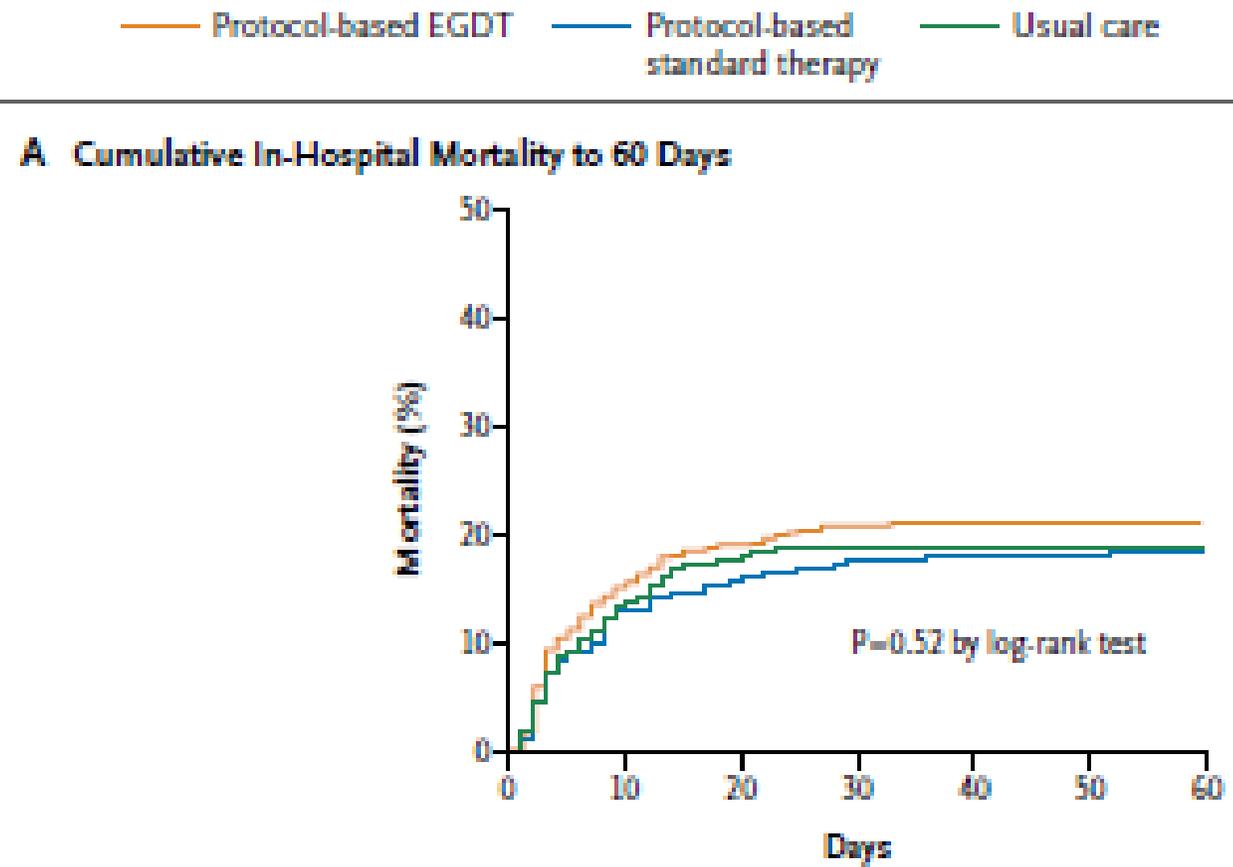
Our patient: No Protocol—2nd Outcome

- VS unstable
- O₂ sat 86% on RA → NRB placed
- IV placed → fluid bolus started
- Lactate: 8.7mmol/L
- Increased confusion → RSI
- Sudden cardiovascular collapse:
 - PEA; no ROSC
 - Time of death: 15:13

Modern Resuscitation: from EGDT to ProCESS, ProMISe, ARISE

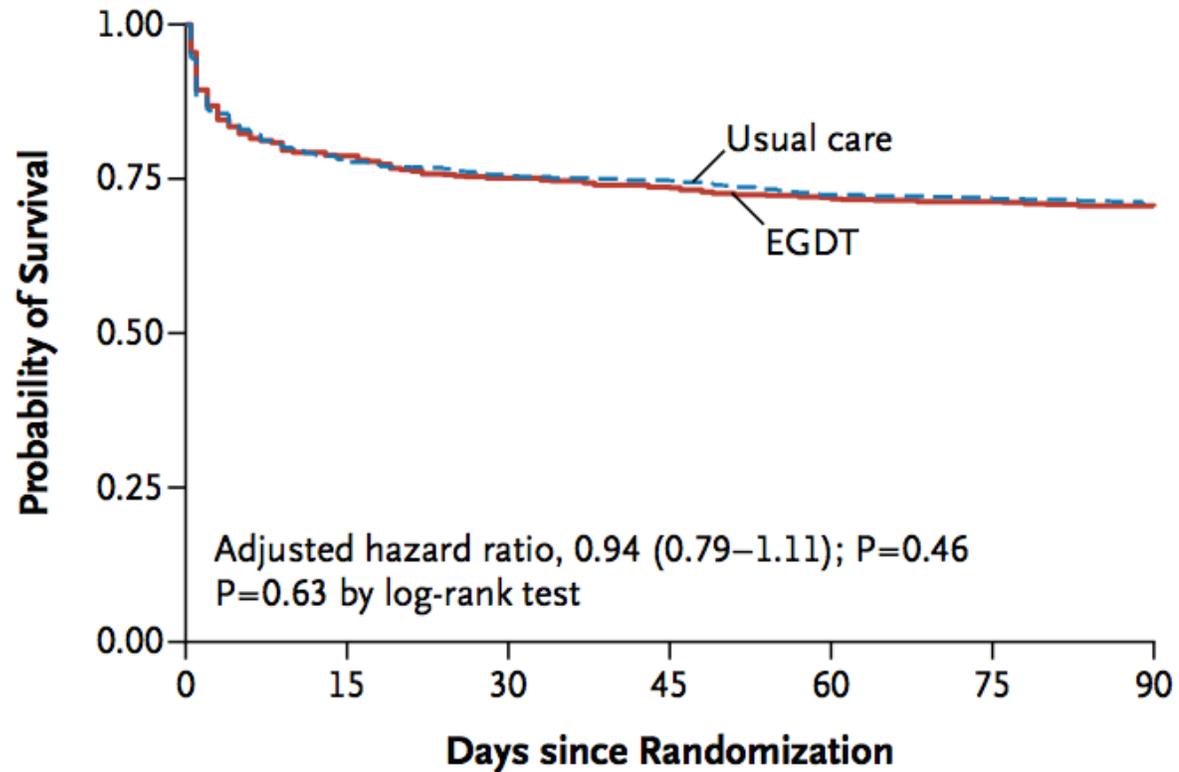
EGDT Mortality





No. at Risk

Protocol-based EGDT	439	373	356	348	347	347	347
Protocol-based standard therapy	446	389	376	368	366	366	365
Usual care	456	396	376	371	371	371	370



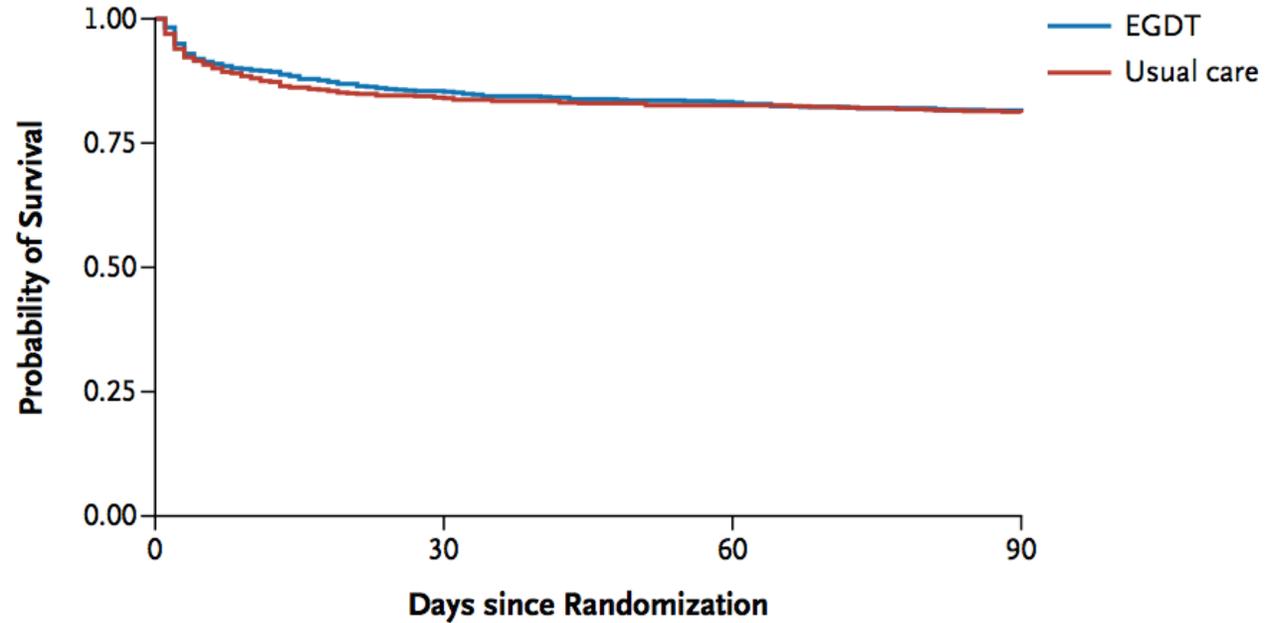
No. at Risk

EGDT	625	492	470	461	449	445	440
Usual care	626	487	469	464	448	445	439

Figure 2. Kaplan–Meier Survival Estimates.

ARISE

A Survival



No. at Risk

EGDT	792	677	660	646
Usual care	796	670	657	646

Patient Vignette: Lactate Protocol

- 13:15: Vancomycin and Pip-Tazo ordered
 - 13:25: 1st antibiotic started 120 minutes after triage
- MAP: 55 mmHg
- A-line placed in L femoral artery
- CVC placed in the R IJ vein w/ US guidance
- Further fluid boluses
- Repeat lactate 14:30: 2.6 mmol/L
- After 4 L NSS was infused
 - Input: 4550cc; Output 20cc
 - Started on norepinephrine

Case Conclusion

- Evaluated by ESS
- Went to IR for a percutaneous drain
- E. coli in blood cultures and drainage fluid
- On NE and DOBUT for 3 days
- Clinically stabilized
- Delayed cholecystectomy
- Discharged in good condition on HD-17
 - Prevent post-sepsis neurocognitive decline
 - Prevent post-sepsis readmissions

Anytime, Anywhere, 2016-1

- Huge epidemiologic burden of sepsis
- Recognition: major hurdle
 - SIRS: Helpful but not infallible
 - Lactate: Screening tool and risk stratifier
 - qSOFA → Will it be helpful?
- Screen in ED, on wards for early recognition
- Recognize syndrome = start care without delay
- In 2016, “standard care” = a protocol that fits your institution’s resources

Anytime, Anywhere, 2016-2

- Minimum care: ABCs, fluids, antibiotics, source control
- New definitions: new insights, new questions
- Complications of sepsis continue post-d/c
 - Post-discharge interventions to minimize neurocognitive decline
 - Follow up protocols to prevent readmission
- Details always changing
- Further research needed