American College of Emergency Physicians®
ADVANCING EMERGENCY CARE

ACEP Emergency Quality (E-QUAL) Network Sepsis Learning Collaborative 2016

Funded by the Center for Medicare & Medicaid Innovation (CMMI)

Outline

- A Case
- Epidemiology of Sepsis
- Learn Baseline
- Protocolize Care
- Need for Early Recognition:
  - SIRS, Lactate
- Time to Antibiotics
- Follow up Care
- Conclusions

American College of Emergency Physicians®

Sepsis 2016: "What's the problem? What's the solution?"

David F. Gaieski, MD, FACEP
Associate Professor, Department of Emergency Medicine
Vice Chair for Resuscitation Services
Director of Emergency Critical Care
Sidney Kimmel Medical College
Thomas Jefferson University
March 23rd, 2016

American College of Emergency Physicians®
ADVANCING EMERGENCY CARE

Presenters

Dr. Arjun Venkatesh

Dr. Jeramiah Schuur

Dr. David Gaieski

American College of Emergency Physicians®
ADVANCING EMERGENCY CARE

Objectives

- Gain a better understanding the Transforming Clinical Practice Initiative (TCPI)

- Gain a better understanding of the ACEP Emergency Quality (E-QUAL) Network Sepsis Initiative

American College of Emergency Physicians®
ADVANCING EMERGENCY CARE

Project Overview

CMS Transforming Clinical Practice Initiative: What is it?

- CMS seeks to help clinicians achieve large-scale health transformation
  - Support >140,000 clinician practices over the next 4 years
    - Sharing, adapting and further developing their comprehensive quality improvement strategies.
    - Preparing to adopt alternate payment methods

- ACEP is one of 39 health care organizations selected to participate in the CMMI TCPI
  - One of 10 Support and Alignment Networks (SAN)

American College of Emergency Physicians®
ADVANCING EMERGENCY CARE

ACEP Emergency Quality (E-QUAL) Network Focus Areas

1. Improving outcomes for patients with sepsis

2. Reducing avoidable imaging in low risk patients through implementation of ACEP's Choosing Wisely recommendations
   - Reduce use of high-cost imaging for low back pain
   - Head CT scan after minor head injury
   - Chest CT for pulmonary embolus
   - Abdominal CT for renal colic

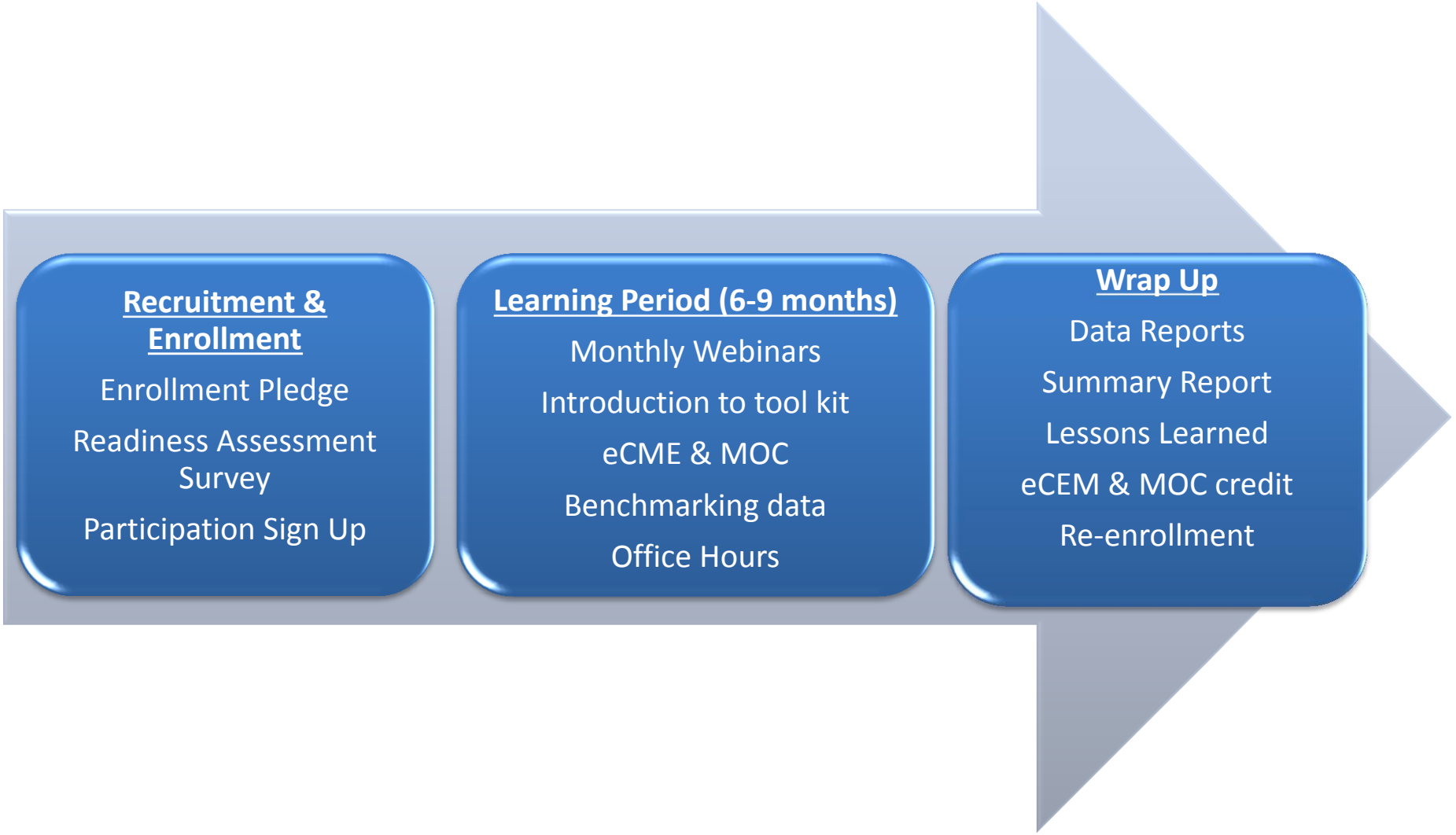
3. Improving the value of ED chest pain evaluation by reducing avoidable admissions in low risk patients with chest pain

Benefits to Participating – Why Join?

- Gain access to toolkits including best practices, and sample guidelines
- Submit and receive benchmarking data to guide local QI efforts
- Learn from expert national faculty
- Gain national recognition for your successes
- Get your clinicians access to high-quality eCME for free
- Earn ABEM MOC credit (LLSA and Part IV Activities)
- Meet CMS quality reporting requirement of the QCDR

American College of Emergency Physicians®
ADVANCING EMERGENCY CARE

What will the Learning Collaboratives provide?



American College of Emergency Physicians®
ADVANCING EMERGENCY CARE

Learning Collaborative

- Sepsis is the #1 cause of inpatient mortality
- The ED plays a key role in the early identification and treatment of patients with sepsis, and is the portal of entry to the hospital.
- E-QUAL seeks to support widespread implementation early recognition and treatment interventions that will save lives

American College of Emergency Physicians®
ADVANCING EMERGENCY CARE

Learning Collaborative

- Collaborative Goal: To improve the outcomes of ED patients with sepsis

Specific Aims:

1. To improve provider and nurse knowledge of early identification, treatment and reassessment of sepsis
2. To assist EDs in implementing best practices that support evidence-based sepsis care
3. To improve performance on metrics and meet regulatory requirement: CMS SEP-1 and CEDR sepsis measures
4. To develop expertise in the application of effective clinical and quality improvement methods

American College of Emergency Physicians®
ADVANCING EMERGENCY CARE

Who Should Participate in Learning Collaborative?

- Goal is for a small team from each participating site to participate

- Physician Lead: ED Director, QI Director, Physician champion
- Nursing Lead: Nurse Director, Nurse Educator, Nurse champion
- Administrator: assist with data gathering and dissemination to staff
- Other Providers and Staff nurses Welcome

American College of Emergency Physicians®
ADVANCING EMERGENCY CARE

Available Resources

- Monthly Webinars
  - Successful sepsis QI initiative
  - Screening/ Identification of Best Practices
  - Intervention and Implementation of Best Practices

- Tool Kit Materials
  - Getting Started - Facility preparedness
  - Screening/ Identification
  - Intervention
  - Implementation
  - Data Collection strategies and tools

- Office Hours

Sepsis Webinar Schedule

American College of Emergency Physicians®
ADVANCING EMERGENCY CARE

Date	Topic
Wednesday March 23rd 12:00pm-12:45pm EST	• TCPI Project and ACEP E-QUAL Overview • Learning Collaborative • Successful sepsis QI initiative
Wednesday April 20th 12:00pm-12:45pm EST	• Sepsis Tool Kit Review • SEP-1, CEDR Provider Measures, Collecting Data Measures
Thursday May 19th 12:00pm-12:45pm EST	• Harnessing the EHR in sepsis identification • Human elements in screening and initiation of treatment of sepsis
Wednesday June 22nd 12:00pm-12:45pm EST	• Antibiotics and Source Control • Sepsis Pitfalls and Common Barriers
Wednesday July 20th 12:00pm-12:45pm EST	• Approaches to Resuscitation (fluids, blood) • Complex patients
Wednesday August 17th 12:00pm-12:45pm EST	• Improving sepsis care in transfers and transitions (ICU and boarding) • Office Hours
Wednesday September 21st 12:00pm-12:45pm EST	• Building sustainability in your sepsis efforts • Office Hours

American College of Emergency Physicians®
ADVANCING EMERGENCY CARE

Data Collection

- One part of participation in learning collaborative is measuring improvement

- Gather Baseline Data
- Implement Changes
- Gather post-implementation data

- How gather data?
  - CEDR – ACEP's QCDR
  - Manual data collection
  - SEP-1

American College of Emergency Physicians®
ADVANCING EMERGENCY CARE

Clinical emergency data registry (CEDR)

The scope of CEDR is to accept patient data from practicing emergency physicians and clinicians on the care provided to emergency department patients. These data will inform the main goals of CEDR, which are to:

1. Provide a unified method for ACEP members to collect and submit Physician Quality Reporting System (PQRS) data, MOC, Ongoing Professional Practice Evaluation (OPPE), outcome data, and other related or applicable quality and patient safety data to meet quality improvement and regulatory requirements.
2. Promote the highest quality of emergency care for our patients.
3. Demonstrate the value of emergency care.
4. Facilitate appropriate emergency care research.

CEDR
CLINICAL EMERGENCY DATA REGISTRY

American College of Emergency Physicians®
ADVANCING EMERGENCY CARE

CEDR Sepsis Metrics

- CEDR 28-Septic shock: lactate level measurement
- CEDR 30-Septic shock: Antibiotics ordered
- CEDR 31-Septic shock: Fluid resuscitation
- CEDR 32-Septic shock: Repeat lactate level
- CEDR 33-Septic shock: Lactate clearance rate ≥10%

American College of Emergency Physicians®
ADVANCING EMERGENCY CARE

Next Steps

- We need you to do 3 things!

1. Gather your team

1. Sign up – take the online Readiness Assessment
    1. Need each participating site to fill out one survey
    2. Required of ACEP by CMS

2. Look for upcoming email with tools and data collection strategies

American College of Emergency Physicians®
ADVANCING EMERGENCY CARE

For More Information

- ACEP E-QUAL Network Resources and More Information: www.acep.org/equal

- Contacts
  - Nalani Tarrant: (Project Manager) ntarrant@acep.org
  - Jay Schuur: (co-PI) jschuur@partners.org
  - Arjun Venkatesh: (co-PI) arjun.venkatesh@yale.edu

Sepsis 2016: "What's the problem? What's the solution?"

David F. Gaieski, MD, FACEP
Associate Professor, Department of Emergency Medicine
Vice Chair for Resuscitation Services
Director of Emergency Critical Care
Sidney Kimmel Medical College
Thomas Jefferson University
March 23rd, 2016

Disclosures

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

Outline

- A Case
- Epidemiology of Sepsis
- Learn Baseline
- Protocolize Care
- Need for Early Recognition:
  - SIRS, Lactate
- Time to Antibiotics
- Follow up Care
- Conclusions

Case Vignette

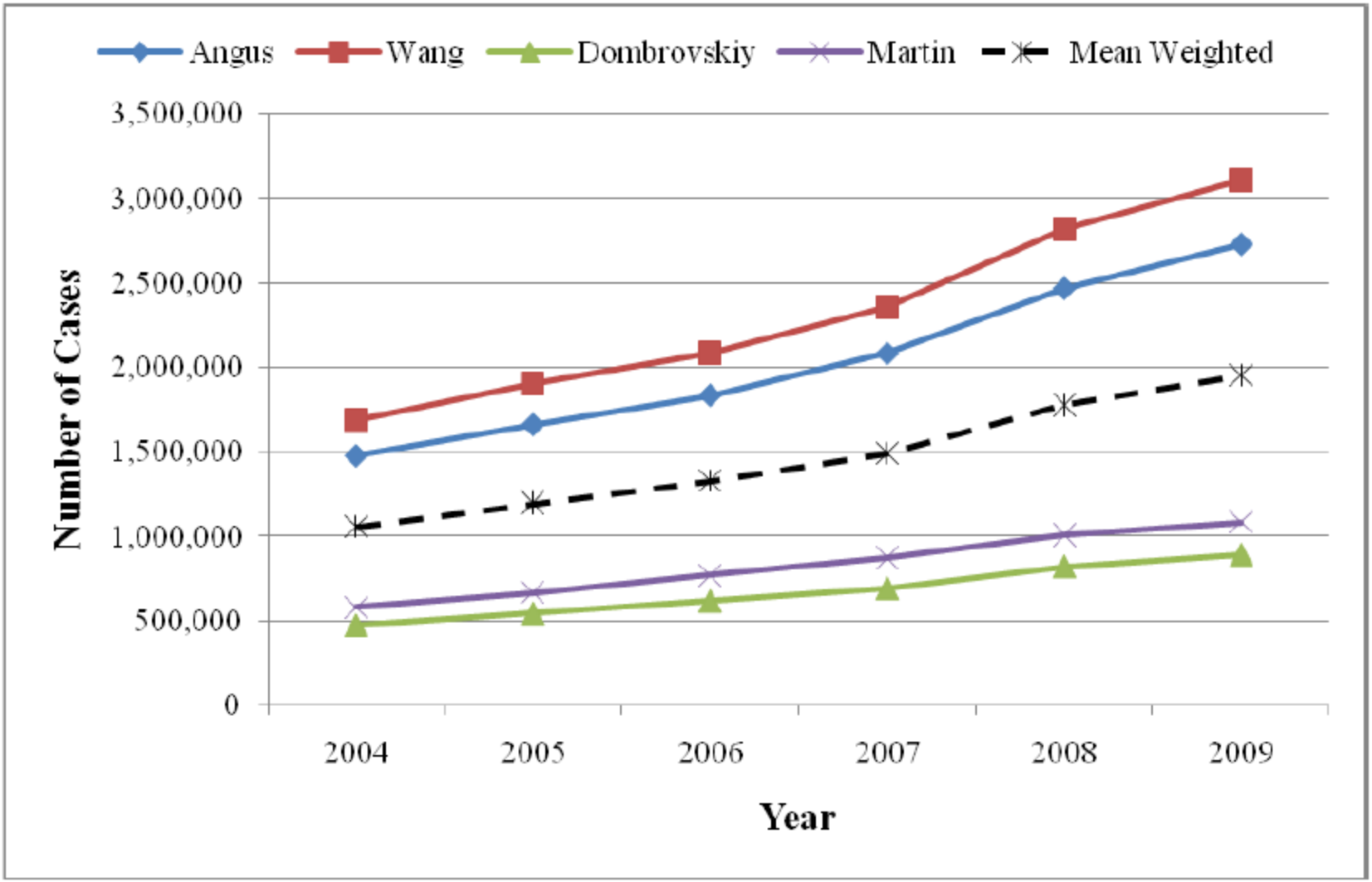
- 54 year-old male
- Abdominal pain
- Triage VS:
  - Tº, 100.5˚ F -- BP, 128/78 mmHg
  - HR, 88 BPM -- RR, 21 breaths per minute
  - O_2 sat, 96%, RA -- Pain, 6/10
- Triaged as ESI 3 patient
- To waiting room along with 15 other patients

Typical sepsis patient

- 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 “severe sepsis”
- What does this mean?

Epidemiology of Sepsis

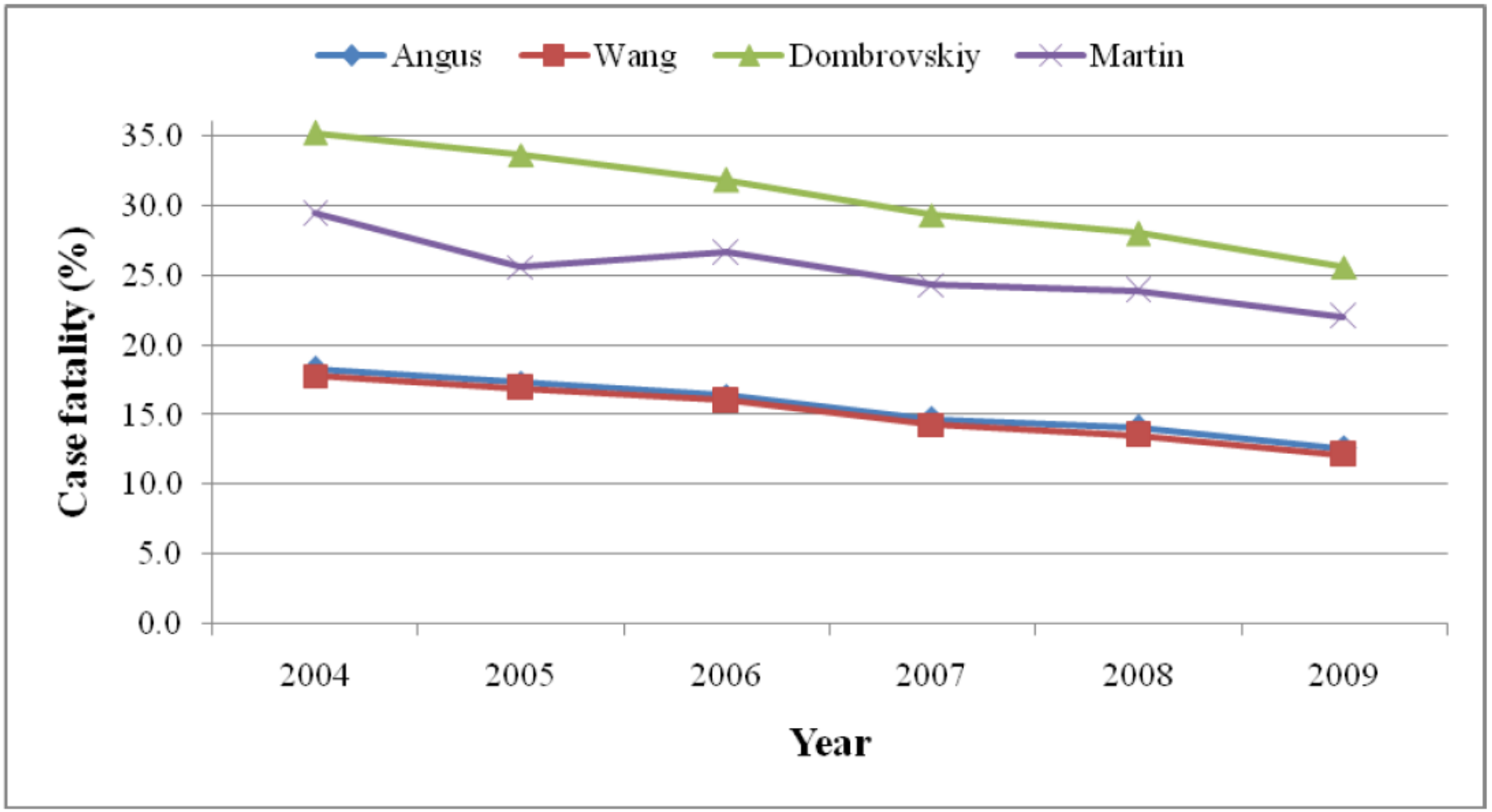
Figure 2a: Incidence of Severe Sepsis by Method Over 6-year Period[1]



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

Gaieski et al, CCM, 2013

Figure 2b: In-hospital Case Fatality of Severe Sepsis by Method[1]



[1] 95% CI < 1%.

Know Your Hospital's Baseline

Severe Sepsis Cohorts Derived From Claims-Based Strategies Appear to be Biased Toward a More Severely Ill Patient Population*

Stacey-Ann Whittaker, MD[1]; Mark E. Mikkelsen, MD, MS[1,2]; David F. Gaieski, MD[1,3]; Sherine Koshy, MHA, RHIA, CCS[4]; Craig Kean, MS[5]; Barry D. Fuchs, MD[1]

TABLE 2. Sensitivities of Two Different Code Abstraction Methods for Identifying Cases of Severe Sepsis and Septic Shock Determined by Patient-Level Data

Code Abstraction Method	Sensitivity to Identify Severe Sepsis Cases ($n = 1735$)[a]	95% Confidence Interval
1. Severe sepsis (ICD–9-specific coding method, 995.92)	20.5%	18.6% to 22.4%
2. Combining end-organ dysfunction and infection codes (the Angus coding method)	47.2%	44.8% to 49.5%
Code Abstraction Method	**Sensitivity to Identify Septic Shock Cases ($n = 321$)[a]**	**95% Confidence Interval**
1. Severe sepsis (ICD–9-specific coding method, 995.92)	49.5%s	44.0% to 55.0%
2. Septic shock (ICD–9-specific coding method, 785.52)	42.4%	37.0% to 47.8%
3. Combining end-organ dysfunction and infection codes (the Angus coding method)	75.1%	70.4% to 79.8%

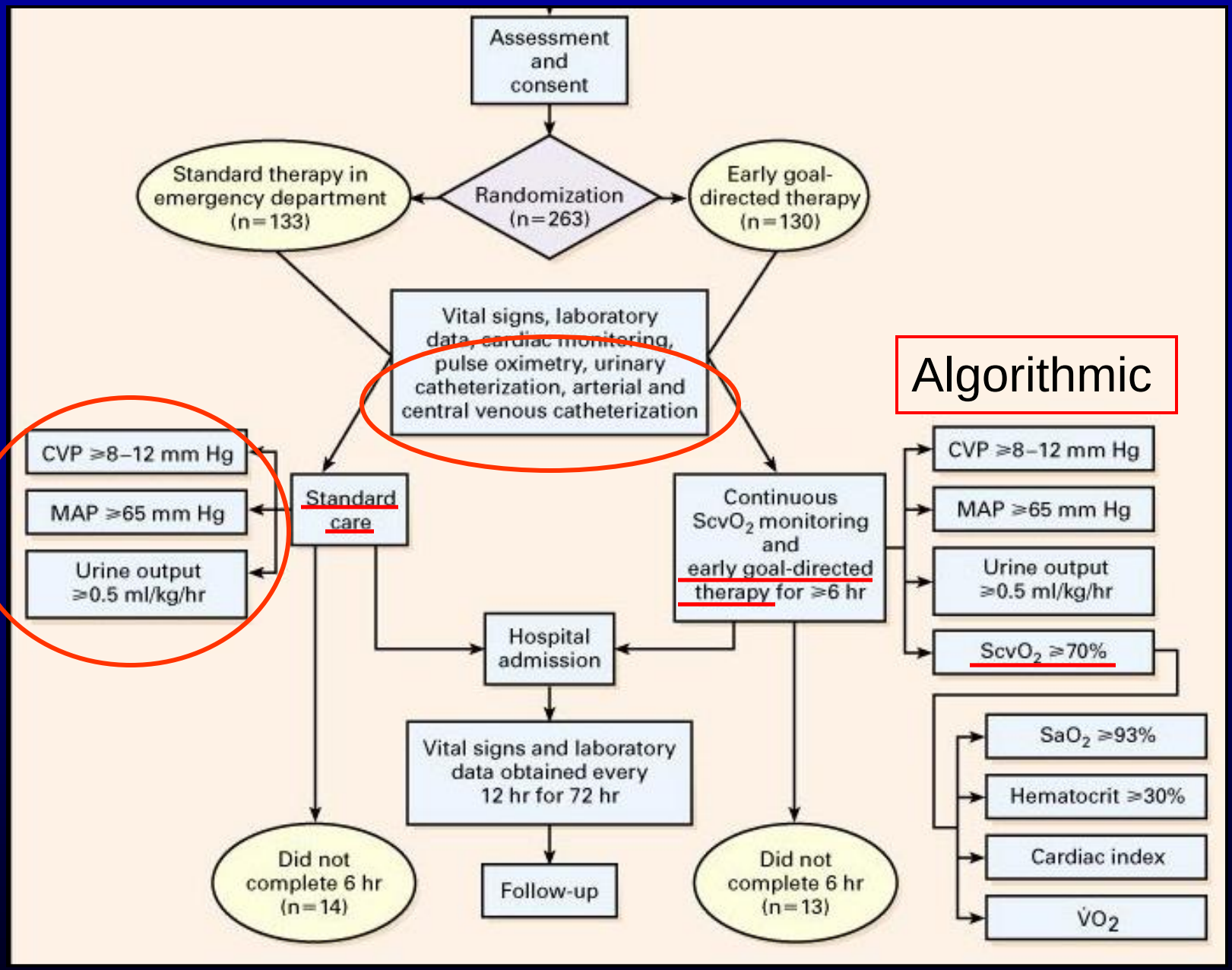
ICD-9 = *International Classification of Diseases*, 9th Revision.

[a]Cases of septic shock ($n = 321$) were encompassed within the severe sepsis ($n = 1735$) population.

Categorical data are presented as proportions.

Whittaker, CCM, 2013

Getting Started



Rivers et al. NEJM, 2001

The NEW ENGLAND JOURNAL of MEDICINE

Our patient. Next steps?

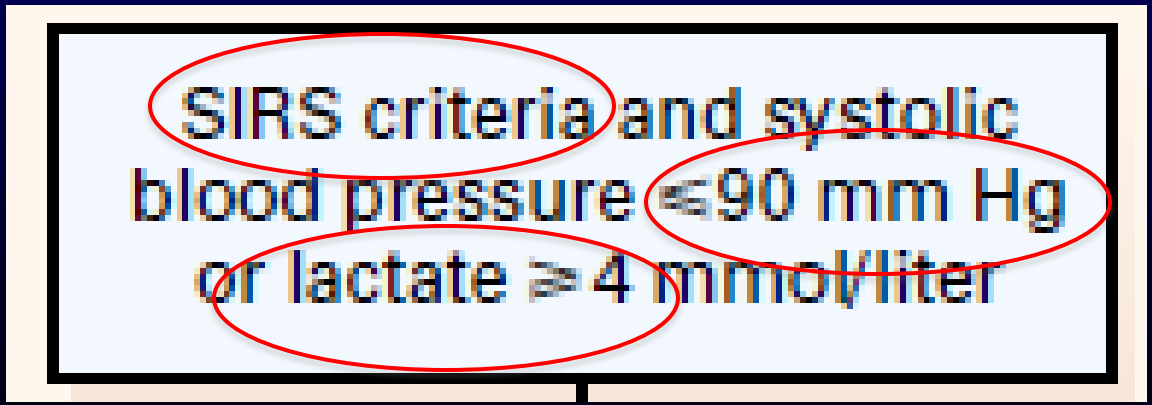
- Other easily obtainable data?
- What if lactate = 1.4 mmol/L?
- What if lactate = 4.1 mmol/L?
- EMR algorithm utilizes CC + VS to generate an automatic order for a serum lactate
- Drawn by EMT 10 minutes after triage
- Sent to the critical care laboratory for analysis

Recognition

Emergency Department = 36 | Rapid Care = 4 | Waiting Room

Time	UnAtt	PT	Gender	Complaint	C	Age	BP	Temp	Pulse	O2Sat	Resp	Re
13:43 01/28	51		Male	Inj, Shoul	2	56 Years	157/100	97.9	99		14	14
13:59 01/28	84		Male	CP	2	51 Years	153/90	96.4	105	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	75		Female	N/V	3	18 Years	113/68	96.7	70		14	14
13:05 01/28	79		Male	HTN	3	45 Years	151/88	97.8	64		14	14
15:20 01/28	23		Male	HA	3	39 Years	136/93	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	

Need for Early Recognition

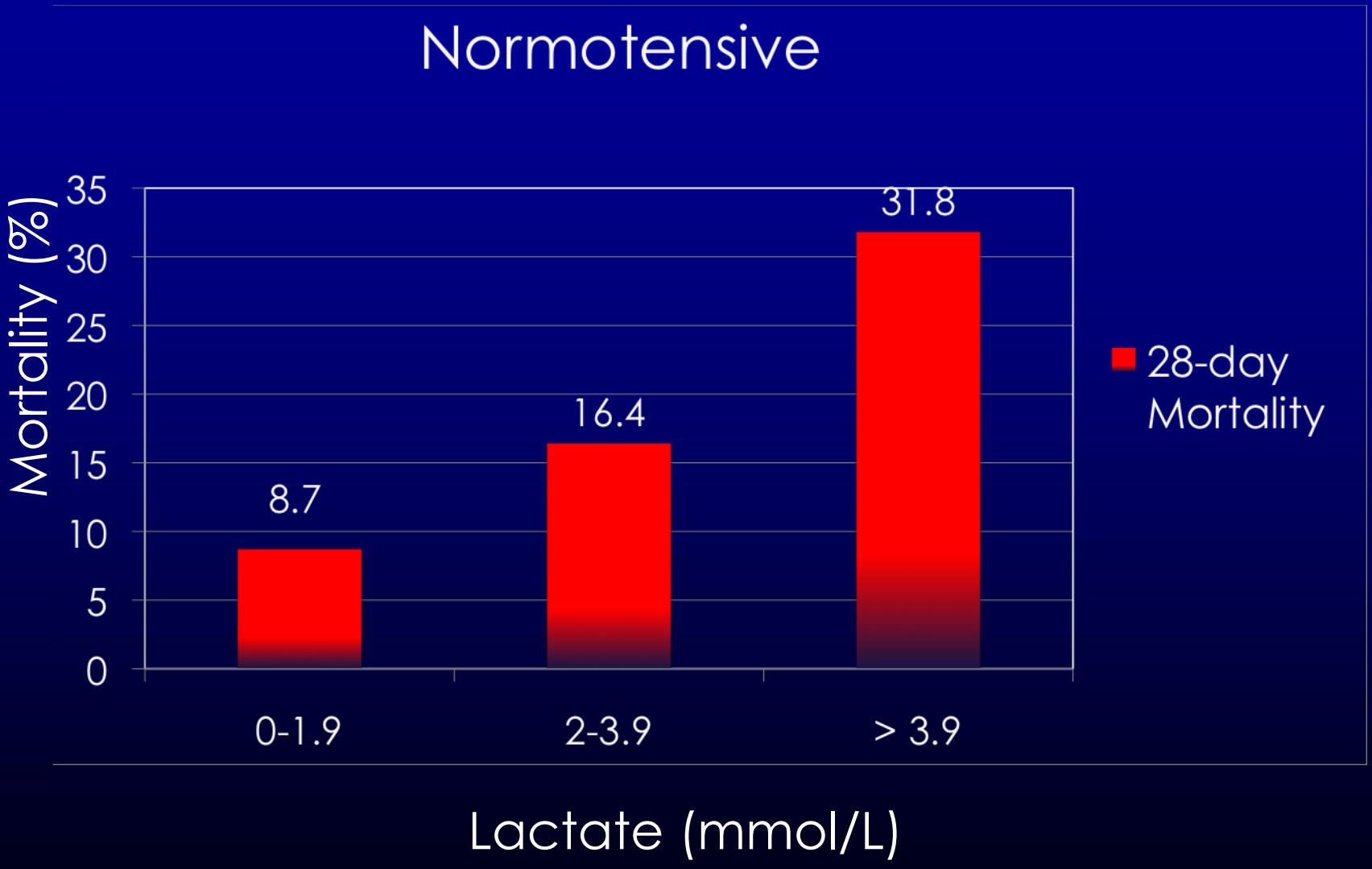


SIRS, Severe Sepsis

- Historically => very sensitive; but not specific
- Shapiro => neither sensitive nor specific
- 3102 pts, suspect infection (blood Cx drawn)
  - 34% of severe sepsis pts didn't meet SIRS criteria
  - 24% of septic shock pts didn't meet SIRS criteria
- Need other methods

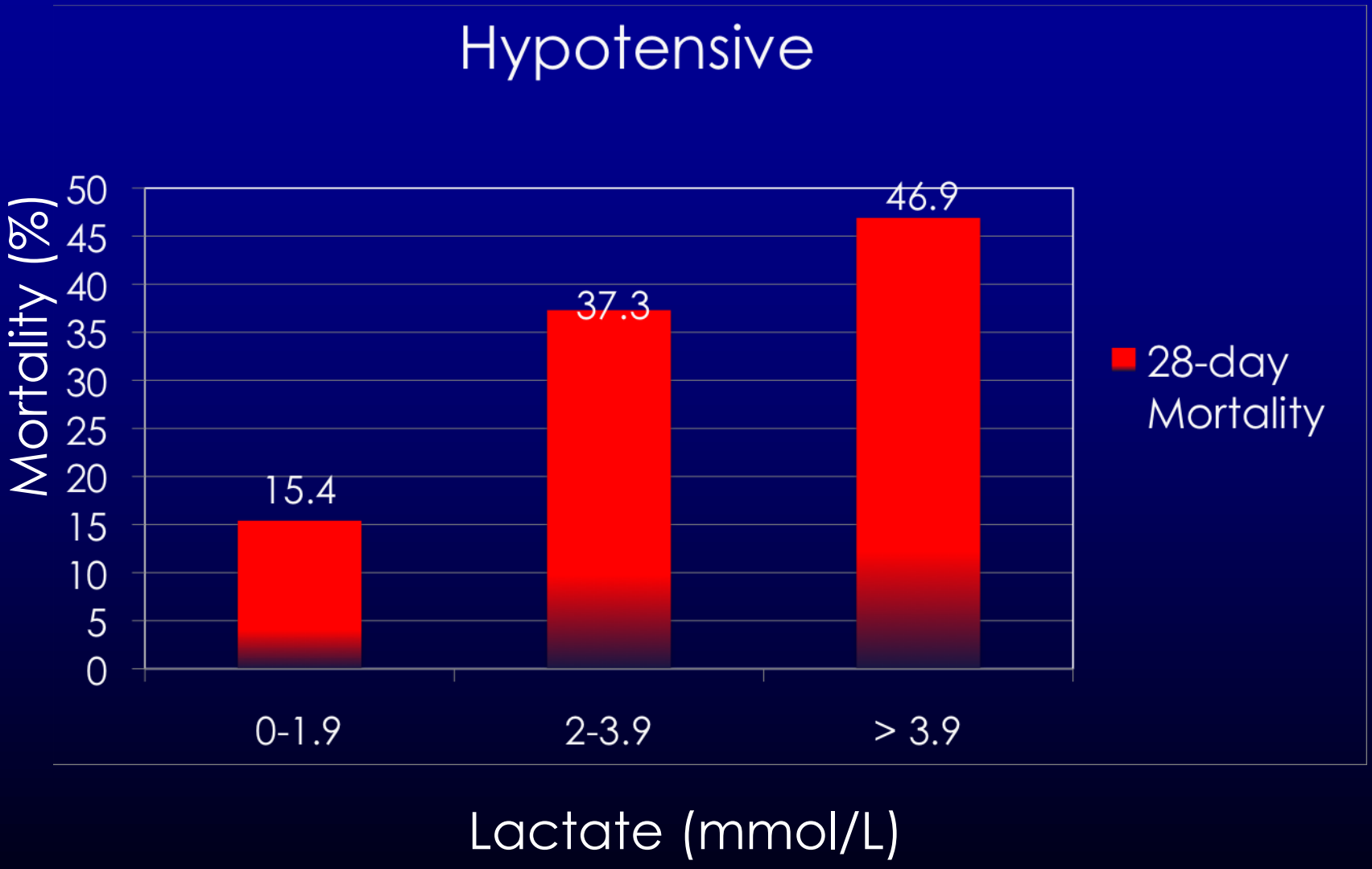
Shapiro et al. Ann Emerg Med, 2006

ED Lactate in Severe Sepsis



Mikkelsen et al. CCM. 2009

ED Lactate in Severe Sepsis



Mikkelsen et al. CCM. 2009

Our Case: Changing Severity

Protocolized Care

- Lactate = 5.4 mmol/L→Treatment room
- 2 18 gauge IVs placed
- Bedside ECHO:
  - Under-filled RV; > 50% IVC collapse
- 3 L NSS in 1 hr
- WBC=16.5; Tbili=2.7; AST/ALT 335/284
- Repeat VS: BP 128/82; HR 84; RR 24
- Bedside ultrasound:
  - + Gallstones; + GBWT

Protocolized Care

- Continue volume resuscitation (I/O: 4550/20)
- Repeat Lactate: 3.2 mmol/L
- Repeat ECHO:
  - Decreased EF 45%; --IVC collapse negligble
- MAP decreased to 55 mmHg
  - A-line, L FA; CVC R IJV under US guidance
  - Started on NE and Dobut
- Vanco, Pip-Tazo, 1st, 50 min post-triage

Time to Antibiotics

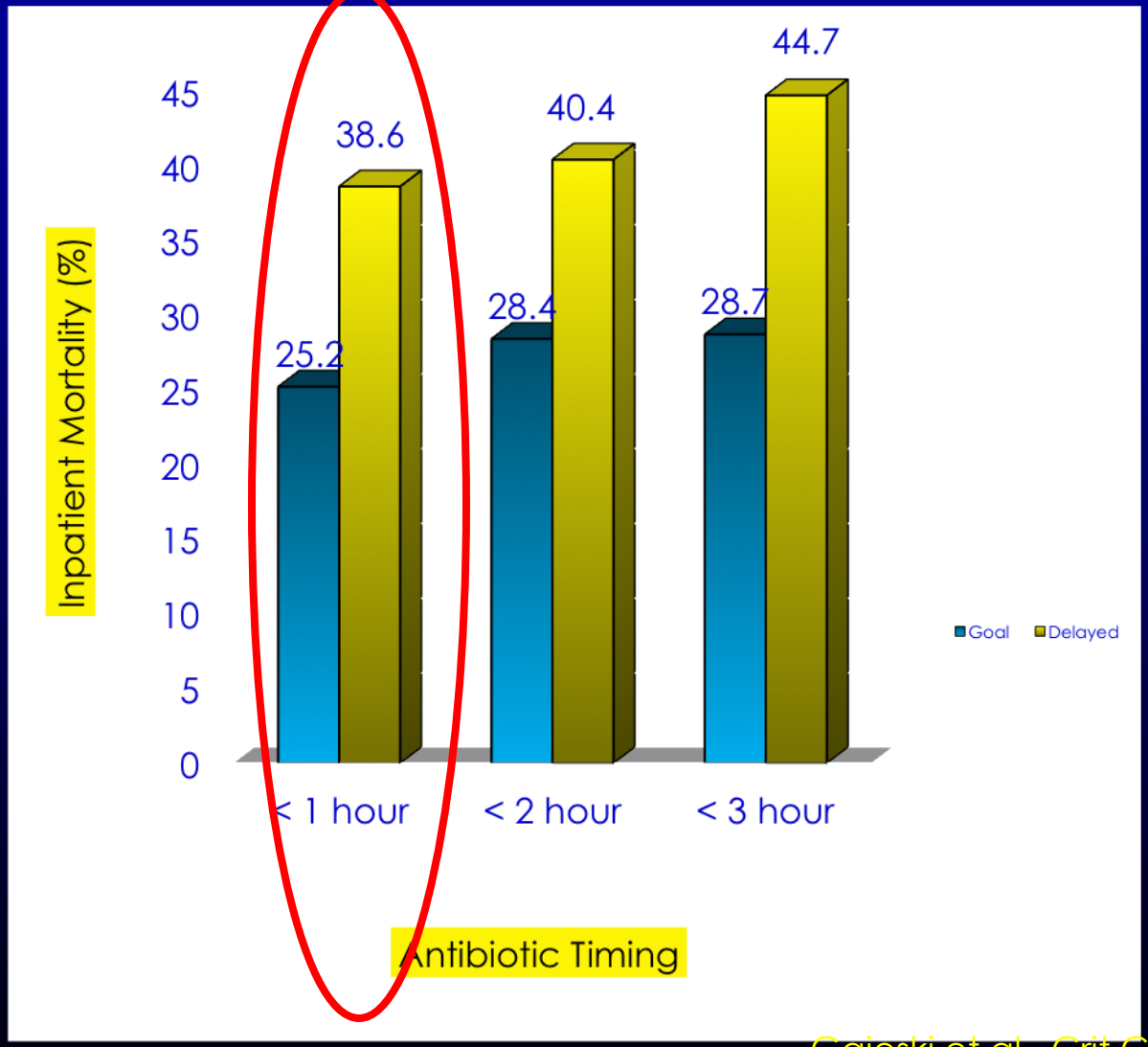
Impact of time to antibiotics on survival in patients with severe sepsis or septic shock in whom early goal-directed therapy was initiated in the emergency department

David F. Gaieski, MD; Jesse M. Pines, MD, MBA, MSCE; Roger A. Band, MD; Mark E. Mikkelsen, MD, MSCE; Richard Massone, MD; Frances F. Furia, MD; Frances S. Shofer, PhD; Munish Goyal, MD

- Study the relationship between time to antibiotics and mortality in patients treated with EGDT in the ED
- 261 patients
- Average time to antibiotics:
  - Triage to antibiotics: 119 minutes
  - Qual for EGDT to antibiotics: 42 minutes

Gaieski et al. Crit Care Med, 2010

Time Qual for EGDT to Appropriate Antibiotics



Gaieski et al. Crit Care Med, 2010

Department of Emergency Medicine

Septic Shock Antibiogram

Pre-Antibiotic Guidelines

Begin immediately after 2 sets of blood + other cultures drawn, lactate etc

Broad-Spectrum Antimicrobials:
+ Cefepime 1 gm IV (1)
+ Vancomycin 1 gm (≤ 70 kg) or 1.5 gm (> 70 kg) IV
± Amikacin 15 mg/kg or 7.5 mg/kg (CrCl < 20) IV (4)

No ← **PCN Allergy** → Yes

Broad-Spectrum Antimicrobials:
+ Levofloxacin 750 mg IV
+ Vancomycin 1 gm (≤ 70 kg) or 1.5 gm (> 70 kg) IV
± Amikacin 15 mg/kg or 7.5 mg/kg (CrCl < 20) IV (4)

Community Acquired Pneumonia:
+ Azithromycin 500mg IV (2)

Anaerobic Source:
+ Metronidazole 500 mg IV (3)

On TPN:
+ Fluconazole 400 mg IV

Prolonged Neutropenia ± Steroids:
+ Caspofungin 70 mg IV
± Hydrocortisone 50-100 mg IV

Gaieski et al, CCM, 2011

Preventing Readmissions

Post-Discharge Problems

"Unfortunately, discharge from a severe sepsis hospitalization is all too often the beginning of the end"

Buchmann, "You Tell Me." CCM, 2015

Readmissions @ Penn

- Admitted with septic shock and discharged alive to a non-hospice, 2007-2010
- 269 at-risk survivors:
  - 63 (23.4%) readmitted within 30 days of discharge
  - 16% resulted in death or d/c to hospice
  - 46% of readmits were infection-related
- Is “sepsis follow-up clinic” the answer?
  - Piloted @ Vanderbilt

Ortego et al. CCM, 2015

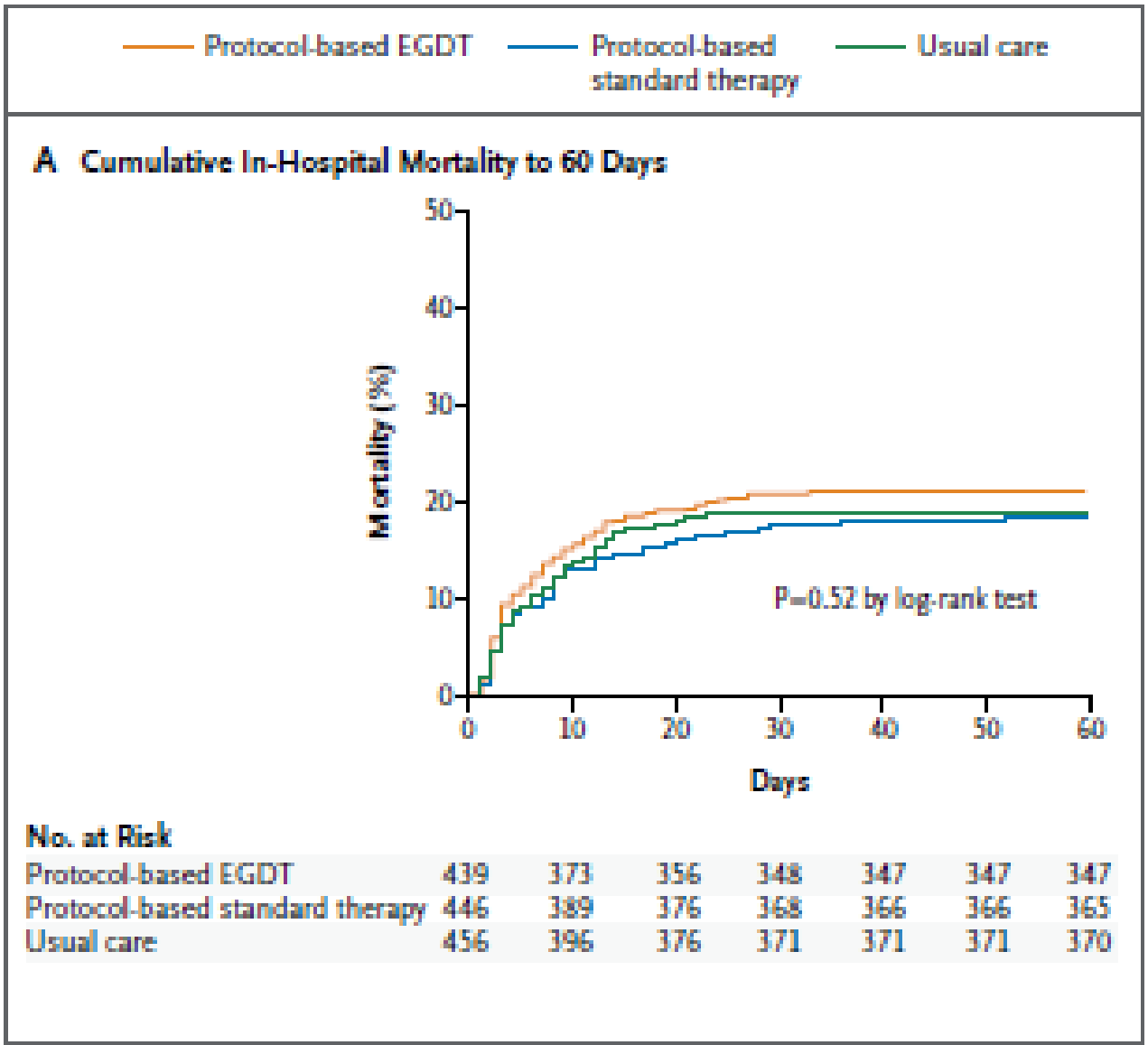
Case Conclusion

- 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

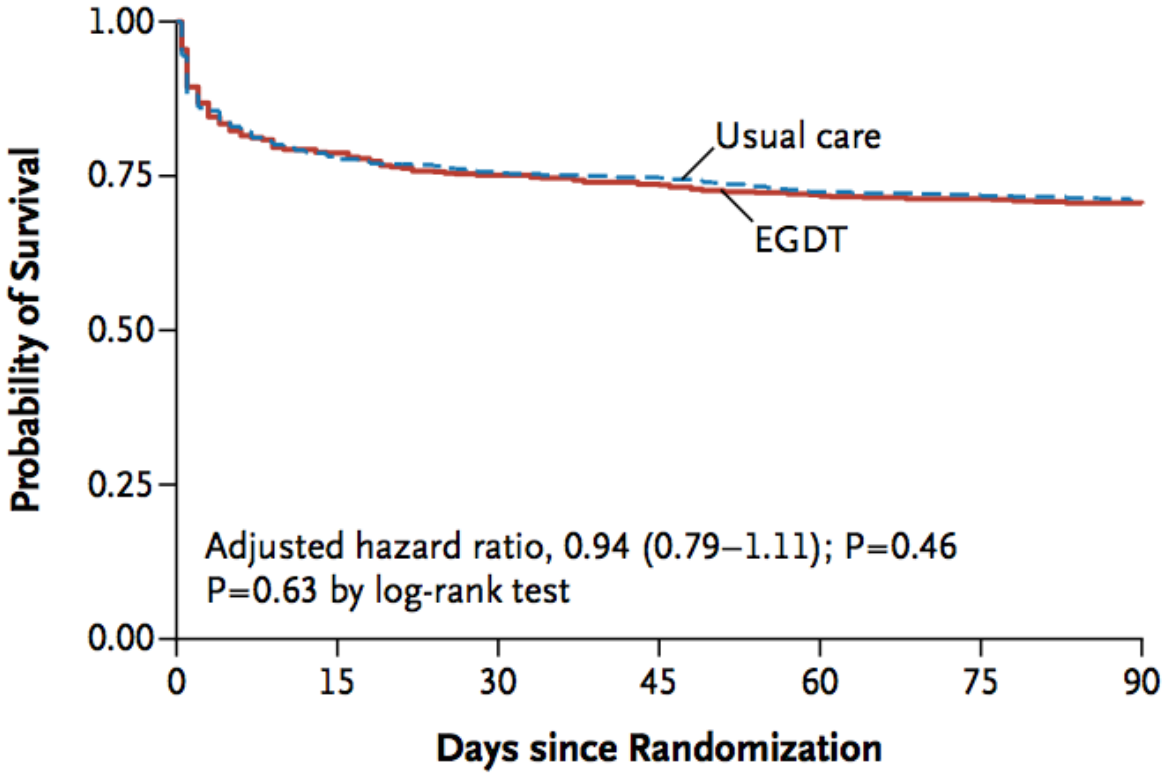
Sepsis Improvements @ HUP

- Baseline IHM, 2002-2004: 25.4%
- Baseline EGDT era, 2005-2007: 18.9%
- 2009:
  - 532 patients w/ SS
  - IHM: 9.8%
  - 398 pts (75%): 1st Lactate > 2.1mmol/L
  - 41% Qual EGDT; 58% Received EGDT
  - Rest modified protocol w/ US, LacClear
- Always tweaking protocol

ProCESS


Protocol-based EGDT
Protocol-based standard therapy
Usual care
A Cumulative In-Hospital Mortality to 60 Days
Mortality (%)
50
40
30
20
10
0
0
10
20
30
40
50
60
Days
P=0.52 by log-rank test
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

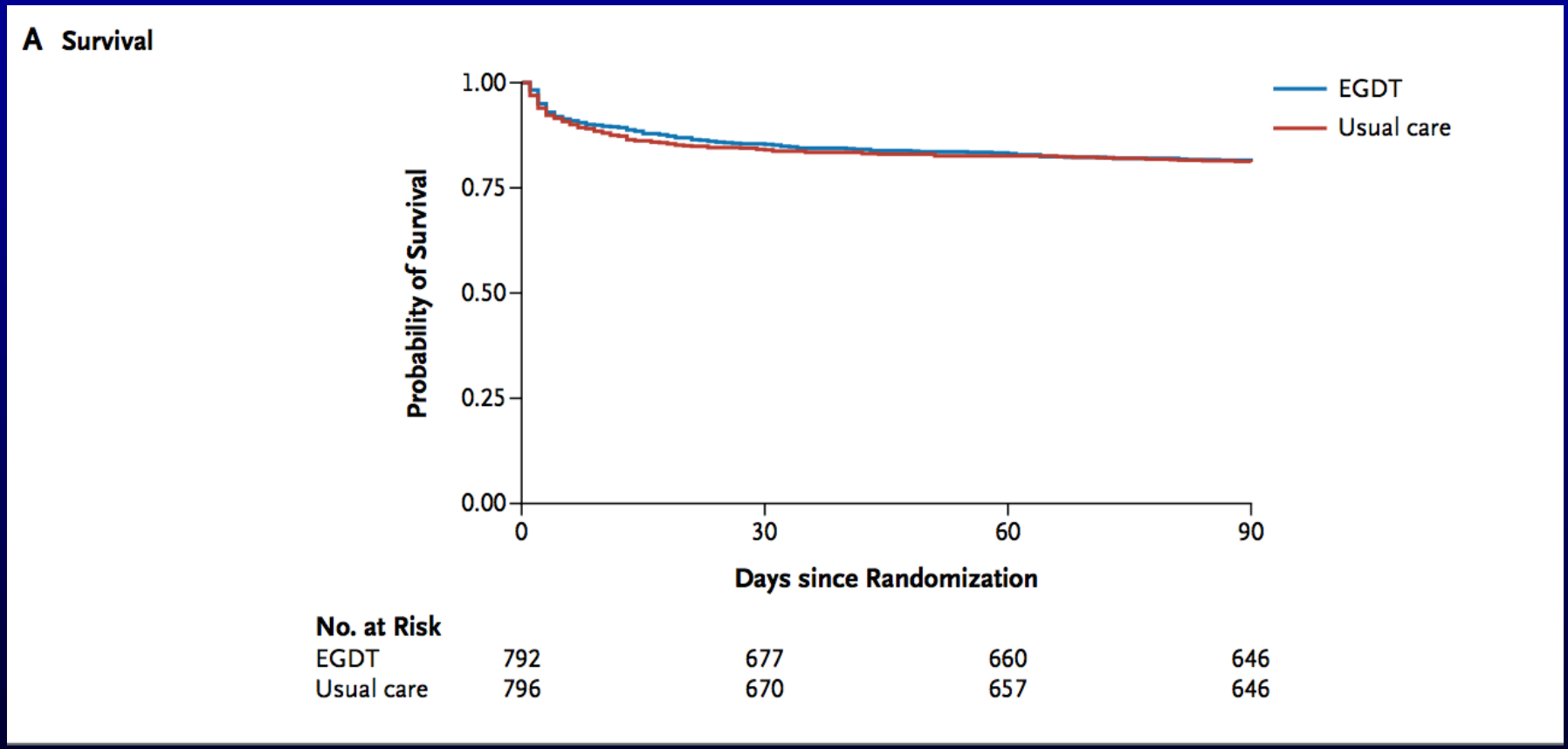
ProMISe



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
1.00
0.75
0.50
0.25
0.00
Probability of Survival
EGDT
Usual care
0
30
60
90
Days since Randomization
No. at Risk
EGDT 792 677 660 646
Usual care 796 670 657 646

Conclusions

- Huge epidemiologic burden of sepsis
- Know your baseline; know your weak links
- In 2016, “standard care” = “protocolized care”
- Recognition: major hurdle
  - SIRS: Helpful but not infallible
  - Lactate: marker and screening tool; automate
- Track outcomes; modify protocol for institution
- Complications of sepsis continue post-d/c
- Details always changing/further research needed


STOP