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Sepsis Wave II

Sepsis 2017: “What’s the problem? What’s the solution?”
Engaging Nurses in Sepsis Identification and Early Measures

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Presenters



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Sepsis 2017: “What’s the problem? What’s the solution?”

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April 26th, 2017

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
- Need for Early Recognition:
 - SIRS, Lactate, qSOFA
- Protocolized Care
- Conclusions

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

qSOFA Criteria:

- 0 qSOFA points

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 “sepsis”—infection + organ dysfunction
- What does this mean?
- Why is this important?

Epidemiology of Sepsis



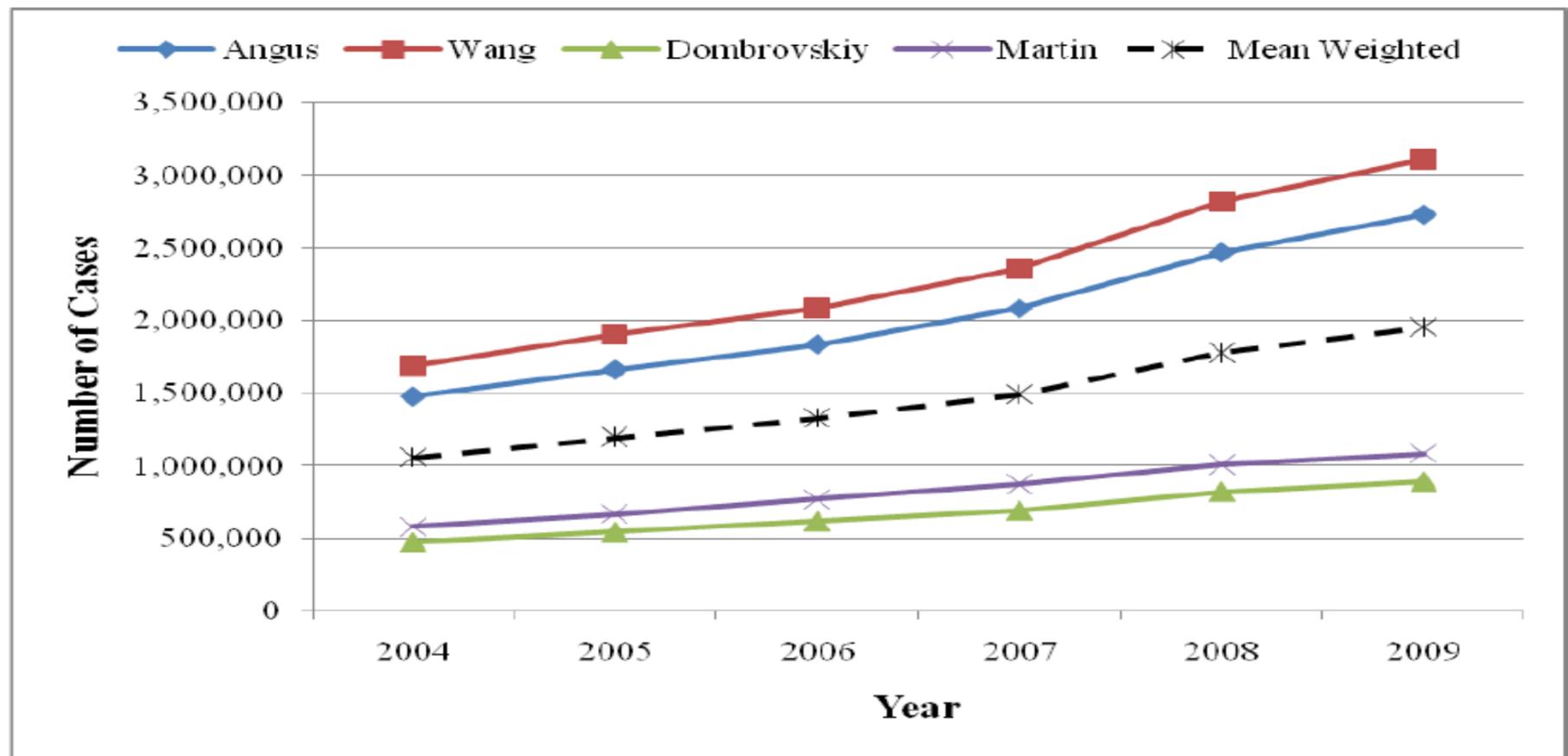
Why is this so Important?

- A patient a minute presents to a US ED
- 750,000 cases/yr of severe sepsis in USA
- 215,000 deaths/yr directly related to sepsis
- Tenth leading cause of death in USA
- Rate of sepsis cases is increasing faster than the population
- 37% of severe sepsis patients come through the ED

Underestimate?

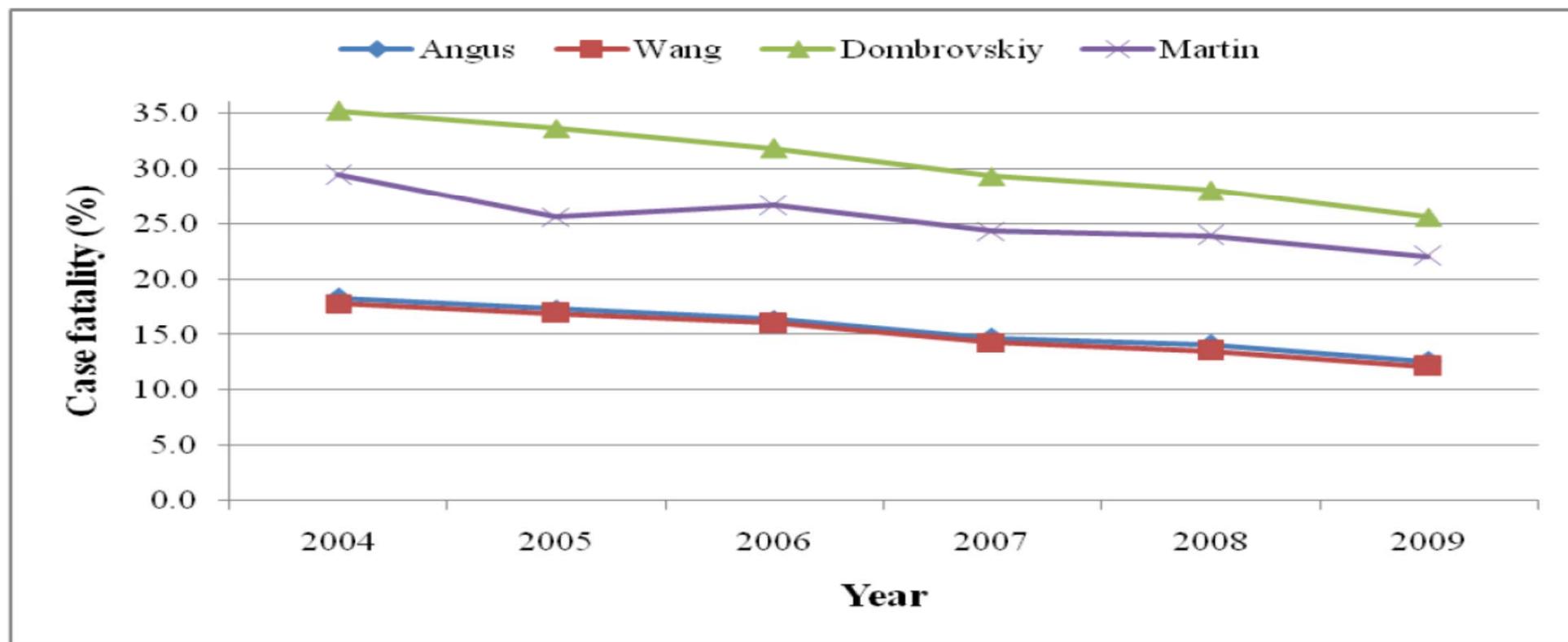
- “Benchmarking the incidence and mortality of severe sepsis in the United States”
- NIS: Nationally representative sample
- 4 previously validated capture techniques (Angus, Wang, Dobrovskii, Martin)
- All utilize ICD 9 codes (+/- sepsis codes)
- Annual incidence and mortality from severe sepsis

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%.

New Definitions

Sepsis-3

- Sepsis is now defined as **life-threatening organ dysfunction caused by a dysregulated host response to infection**
- No more SIRS!
- No more Severe Sepsis!
- Septic shock now requires administration of vasopressors AND lactate > 2 mmol/L
- Usefulness still to be determined

Getting Started

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	Ini, Shout	2	56 Years	157/100	97.9	99		14	14
13:59 01/28	64		Male	CP	2	51 Years	153/90	96.4	100	96	14	14
14:22 01/28	10		Female	HTN	2	77 Years	197/89	96.4	87		14	15
14:28 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	73		Female	NV	3	18 Years	113/68	96.7	70		14	14
13:05 01/28	73		Male	HTN	3	45 Years	151/83	97.8	64		14	14
15:20 01/28	23		Male	HA	3	39 Years	138/93	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 criteria and systolic
blood pressure ≤ 90 mm Hg
or lactate ≥ 4 mmol/liter

Systemic Inflammatory Response Syndrome (SIRS) Criteria

SIRS Criteria

- Criteria:
 - T < 96.8° F or > 100.4° F
 - HR > 90 beats/min
 - RR > 20 breaths/min
 - WBC < 4,000/mm³ > 12,000/mm³, or > 10% bands

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

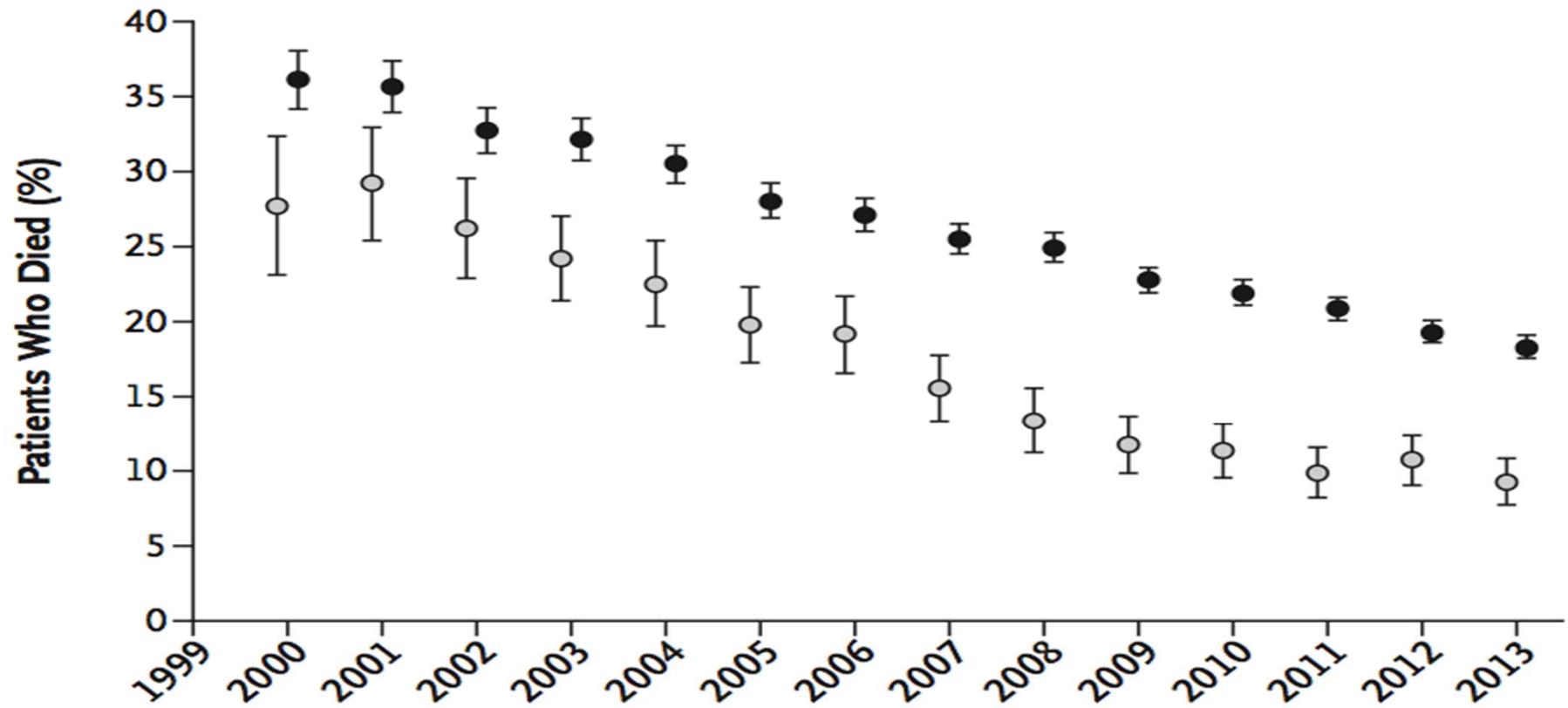
Systemic Inflammatory Response Syndrome Criteria in Defining Severe Sepsis

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.

- 172 ICUs in Australia, New Zealand
- 109,663 severe sepsis patients
 - 87.9% SIRS-positive
 - 12.1% SIRS-negative
- “The need for two or more SIRS criteria...excluded one in eight otherwise similar patients with infection, organ failure, and substantial mortality...”

● SIRS-positive sepsis ○ SIRS-negative sepsis

A Unadjusted Annual Mortality



quick Sequential Organ Failure Assessment (qSOFA)

qSOFA

- SBP < 100 mmHg
- RR > 22 breaths per minute
- Change in mental status: GCS < 14
- In a large administrative dataset, AUC better than SIRS
- Mortality associated with criteria (0= \leq 1%; 1=2-3%; 2=8%; 3= \geq 20%)
- “Sepsis” meets \geq 2 criteria, overall mortality of 10%, likelihood of \geq 3 days in ICU

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)

Our patient: No Protocol—1st Outcome

- 11:30: Patient waits to be seen
- 13:12: Treatment Room: Reassessment
- Repeat VS:
 - T°, 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—qSOFA Criteria:
• qSOFA 3

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 (2 or more SIRS) 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

Lactate

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

Utilizing Lactate

PDH
Thiamine

Liver: Cori Cycle

The diagram illustrates the metabolic pathway of lactate. A box labeled 'Liver: Cori Cycle' has an upward-pointing arrow leading to a box containing 'PDH' and 'Thiamine'. A horizontal arrow points from the right towards the 'Liver: Cori Cycle' box, indicating the entry of lactate into the liver.

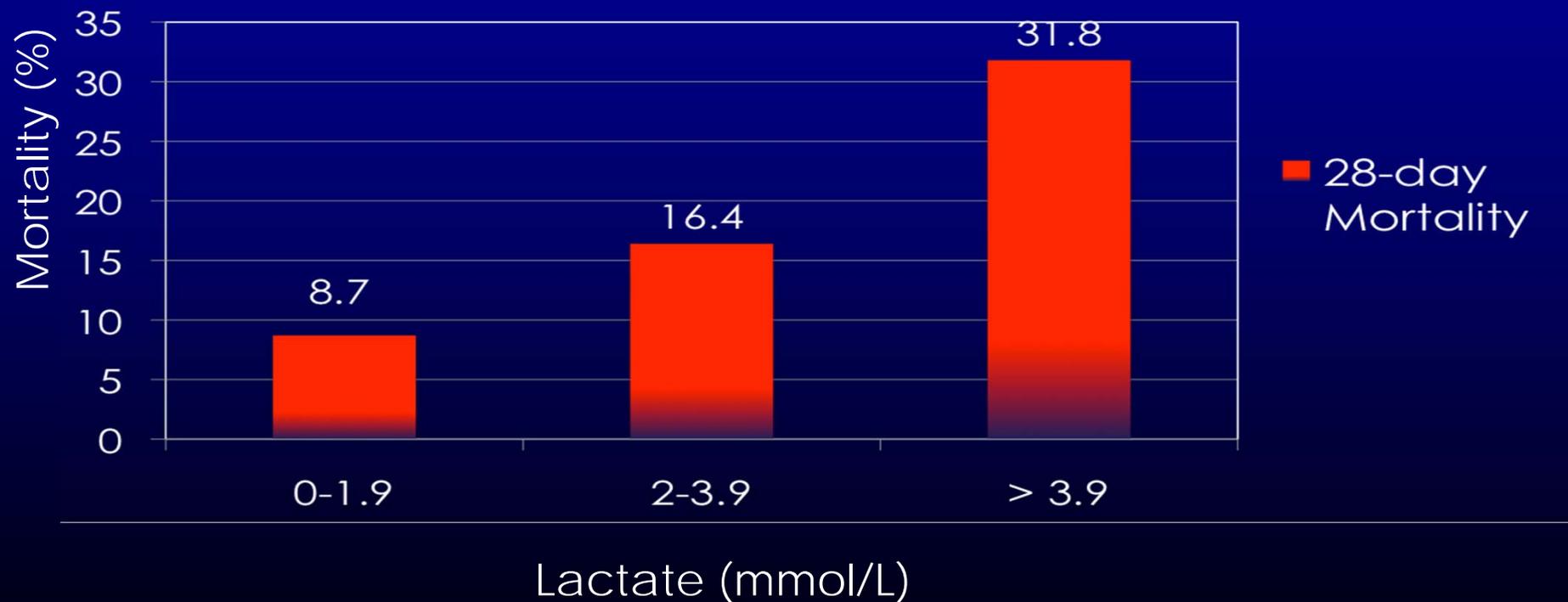
Serum lactate is associated with mortality in severe sepsis independent of organ failure and shock*

Mark E. Mikkelsen, MD, MS; Andrea N. Miltiades, BA; David F. Galeski, MD; Munish Goyal, MD; Barry D. Fuchs, MD; Chirag V. Shah, MD, MS; Scarlett L. Bellamy, ScD; Jason D. Christie, MD, MS

- Hypothesis
 - Lactate measured on ED presentation is associated with mortality and risk stratifies severe sepsis patients INDEPENDENT of blood pressure
- 831/856 (97%) of admitted severe sepsis pts had lactate sent
 - Median lactate=2.9 mmol/L
 - 28 day mortality: 22.7%
- Divided into:
 - Low: ≤ 2 mmol/L
 - Medium: > 2 to ≤ 3.9 mmol/L
 - High: ≥ 4 mmol/L
- Stratified to presence or absence of refractory hypotension

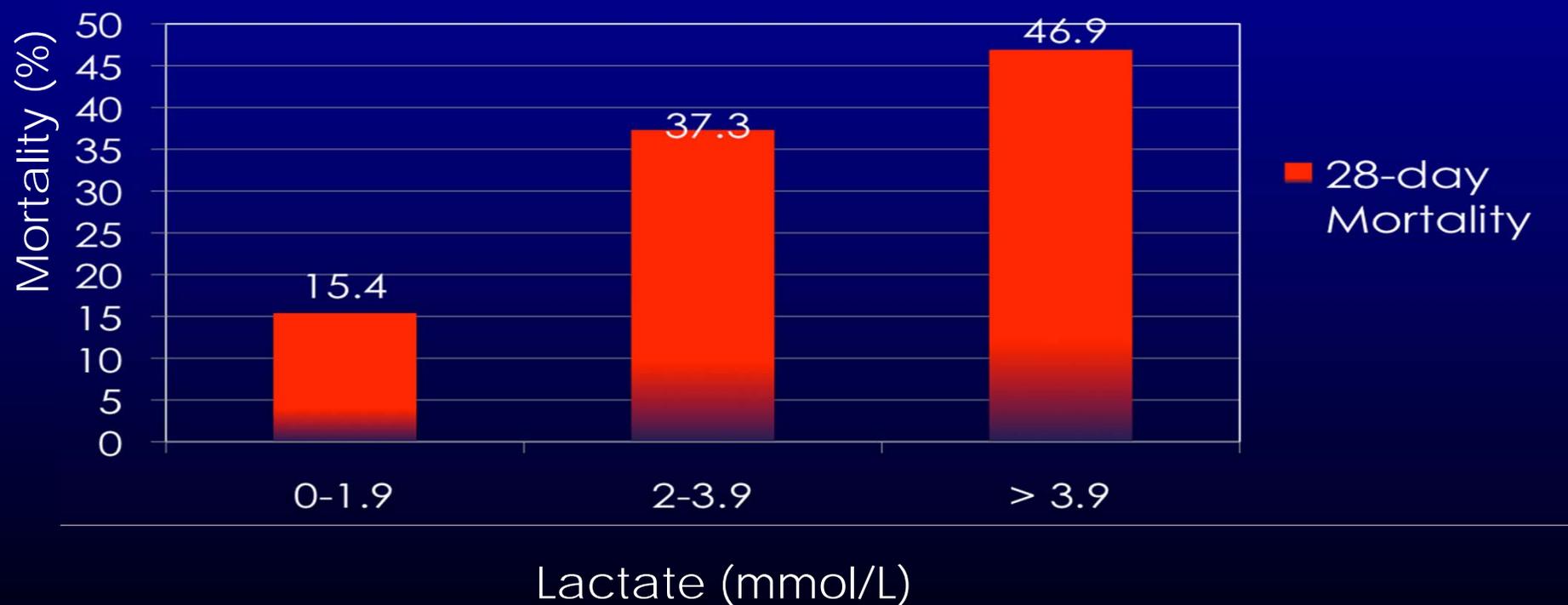
ED Lactate in Severe Sepsis

Normotensive



ED Lactate in Severe Sepsis

Hypotensive



Our Case: Changing Severity

Our Patient: Lactate Protocol



- 11:55: Lactate (15 min p sent)= 5.4 mmol/L
- Immediate 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
- Vanco, Pip-Tazo, 1st, 70 min post-triage

Patient Vignette: Lactate Protocol



- Continue volume resuscitation (I/O: 4550/20)
- Repeat Lactate: 3.2 mmol/L
- Repeat ECHO:
 - Decreased EF 45%; --IVC collapse negligible
- MAP decreased to 55 mmHg
 - A-line, L FA; CVC R IJV under US guidance
 - Started on NE and Dobut
- Surgery consulted

Our patient: Inclusive Protocol



- 11:30: “Potential sepsis protocol patient”
 - “Sepsis Alert” activated
- 11:40: 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 – qSOFA Criteria:
• 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 confused
- 14:08: 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

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: Anytime, Anywhere, 2017



- Huge epidemiologic burden of sepsis
- Recognition: major hurdle
 - SIRS: Helpful but not infallible
 - Lactate: Screening tool and risk stratifier
 - qSOFA → Will it be helpful? ID sicker patients
- Screen in ED, on wards for early recognition
- Recognize syndrome => start care without delay
- In 2017, “standard care” => a protocol that fits your institution’s resources

Engaging Nurses in Sepsis Identification and Early Measures

authored by: Gina Carbino, BSN, RN, CEN, CPEN, CCRN, PCCN, SANE-A



COIs

Objective:

Identify effective strategies to engage nurses in sepsis identification and early measures

**SEPSIS
KILLS**

More than AIDs, breast, and
bowel cancer COMBINED!

Greek For



SEPSIS CAN BE.....

Bacterial:

e. coli
strep
staph



Viral:

viral meningitis
influenza



Fungal:

candida
PCP



Parasitic:

malaria
giardia



SEPTIC tank =

build up of waste



Sepsis Teams

Who should be on the team?

- ED physician
- Triage nurse
- ED Nurse nurse
- Laboratory technician
- Pharmacist
- Admission/registration
- Additional team members may include:
 - Critical care medicine physician
 - ICU charge nurse
 - Infectious disease physician



Sepsis Coordinator



- The go to person in your shop on sepsis
 - Serves as an in house expert on sepsis
 - This person is a “sepsis” visual reminder to staff
 - ROUNDING, ROUNDING, ROUNDING!

Building Templates and Protocols



- Access and download pre-made templates & make them your own or create your
- There is a ton of information
 - Templates and algorithms can help make it manageable and less overwhelming

<http://www.survivingsepsis.org/Resources/Pages/Protocols-and-Checklists.aspx>

<https://www.cdc.gov/sepsis/clinicaltools/>

Screening for Sepsis



- Triage/ED
- Admission/Shift Assessment
- Interdisciplinary team rounding
- Rapid response team

Triage



- Protocol hanging in triage
 - Clearly list out high risk patients
 - Immunocompromised, elderly, infants
- ESI 2 for patients with sepsis
 - Triage “up” policy for sepsis

Sepsis Bundles



Badge Buddies

TO BE COMPLETED WITHIN 3 HOURS:

- 1) Measure lactate level.
- 2) Obtain blood cultures prior to administration of antibiotics.
- 3) Administer broad spectrum antibiotics.
- 4) Administer 30 ml/kg crystalloid for hypotension or lactate ≥ 4 mmol/L.

“Time of presentation” is defined as the time of triage in the emergency department or, if presenting from another care venue, from the earliest chart annotation consistent with all elements of severe sepsis or septic shock ascertained through chart review.

TO BE COMPLETED WITHIN 6 HOURS:

- 5) Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation) to maintain a mean arterial pressure (MAP) ≥ 65 mm Hg.
- 6) In the event of persistent hypotension after initial fluid administration (MAP < 65 mm Hg) or if initial lactate was ≥ 4 mmol/L, re-assess volume status and tissue perfusion and document findings according to Table 1.
7. Re-measure lactate if initial lactate elevated.

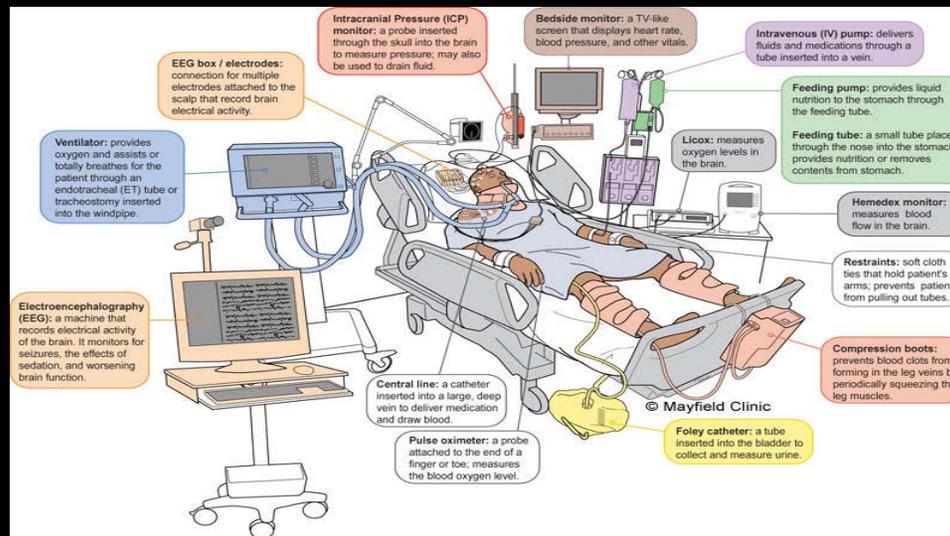
http://www.sccm.org/SiteCollectionDocuments/SSCBundleCard_Web.pdf

Rounding

- Develops a personal connection with staff
- Visual reminder to screen, complete interventions, and document
- Provides an opportunity for staff to ask questions
- Provides an opportunity to ensure updated infographics and guidelines are displayed
- **ROUND AS OFTEN AS POSSIBLE**

Speaking of Infographics.....

Everyone loves infographics



https://www.cdc.gov/sepsis/pdfs/sepsis_infographic_final.pdf

Sepsis Binder

- Make sure it has a designated spot on every unit
- Make sure staff knows where it is located
- Place one on every unit
- Put all your organizations templates and sepsis guidelines in it



Chart



- Collect data
- Find out where your gaps are
- Find out what you are doing right
- Gather information for case reviews

Case Reviews



- Don't just pick really bad patient outcome cases
 - Nurses want to know what they did right, too!
- Quarterly or monthly lunch and learns
 - Invite all department and disciplines
 - Helps understand patient flow and develop relationships

House Wide Education

- Inservices on sepsis, treatment protocols, & medications
 - Get pharmacy and nutrition involved
- Skills check off/competency for equipment
 - Invasive lines
 - Monitors
 - Titrating drips
 - Etc



Consistently Update

- Sepsis Binder
- Rounding
- Bright, consistent signage
- Templates
- Case reviews



Engaging Nurses in Sepsis Identification and Early Measures

Take Aways

- Sepsis Kills.... A LOT!
- Nurses are pivotal to early recognition of sepsis
- Clear, consistent signage displayed in triage, nurses desk, & physician dictation room
- Sepsis binder
- ROUND AS OFTEN AS POSSIBLE



“Never underestimate the power of a small group of committed people to change the world. In fact, it is the only thing that ever has”

–Margaret Mead

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What's Next?

- Complete Sepsis Portal Activities
- Register for the May Webinar
www.acep.org/equal
- Questions? Contact the E-QUAL team at
equal@acep.org