Sepsis & Septic Shock

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Lifebridge Critical Care

1

Define Sepsis & Septic Shock

2

Demonstrate how aggressive resuscitation, early antibiotics and source control help improve morbidity and mortality

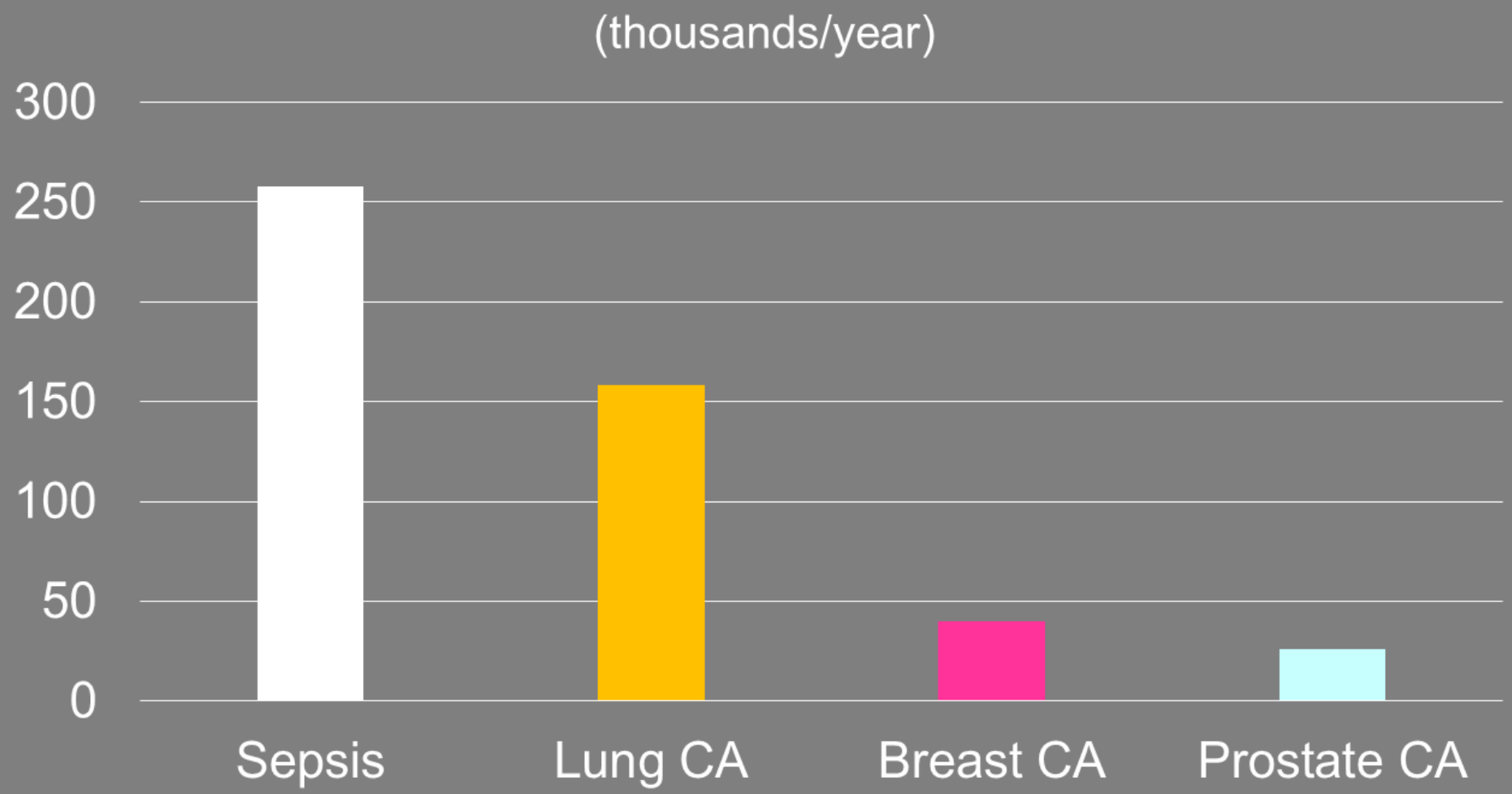
3

Discuss the importance of lactic acid and procalcitonin levels in the septic patient

Sepsis

- Single most expensive condition in U.S.
- 1.7 million cases/ year
- 270,000 deaths/ year
- 30 day readmission-most common
- 30-50% hospital deaths
- < 1/3 Medicare discharged home

US Death rates



The Name Game

- Septicemia
- Sepsis
- Severe Sepsis
- Urosepsis
- Sepsis Syndrome
- Septic Shock
- Systemic Inflammatory Response Syndrome (SIRS)

Definitions 1992

- SIRS
  - Heart rate
  - Respiratory rate
  - Temperature
  - WBC
- Sepsis
- Severe Sepsis
- Septic Shock

Consensus 2001

- Definitions left intact
- Expanded diagnostic criteria

Sepsis-3 2016

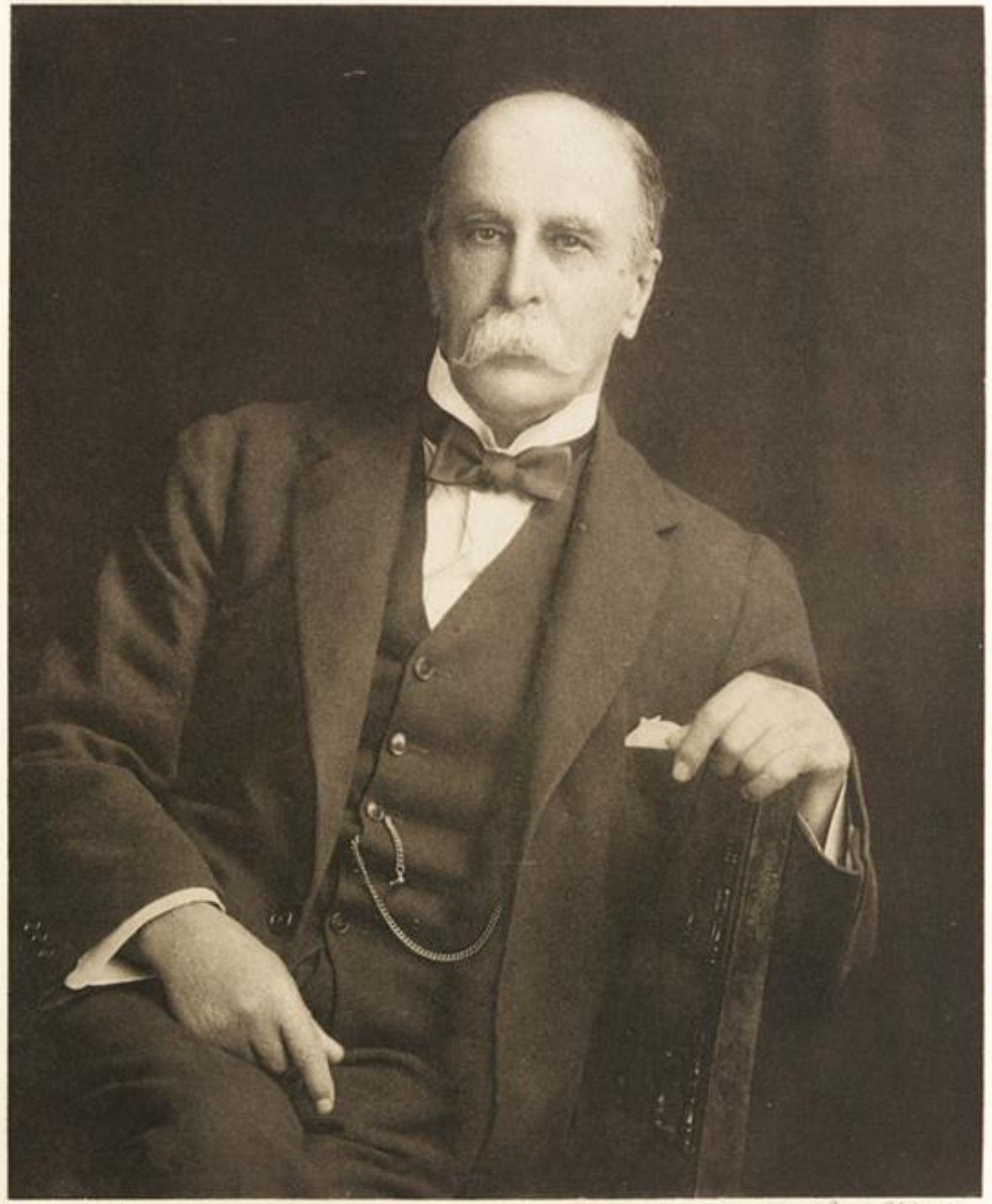
Organ Dysfunction
vs
Inflammation

…is defined as life-threatening organ dysfunction caused by a dysregulated host response to infection.

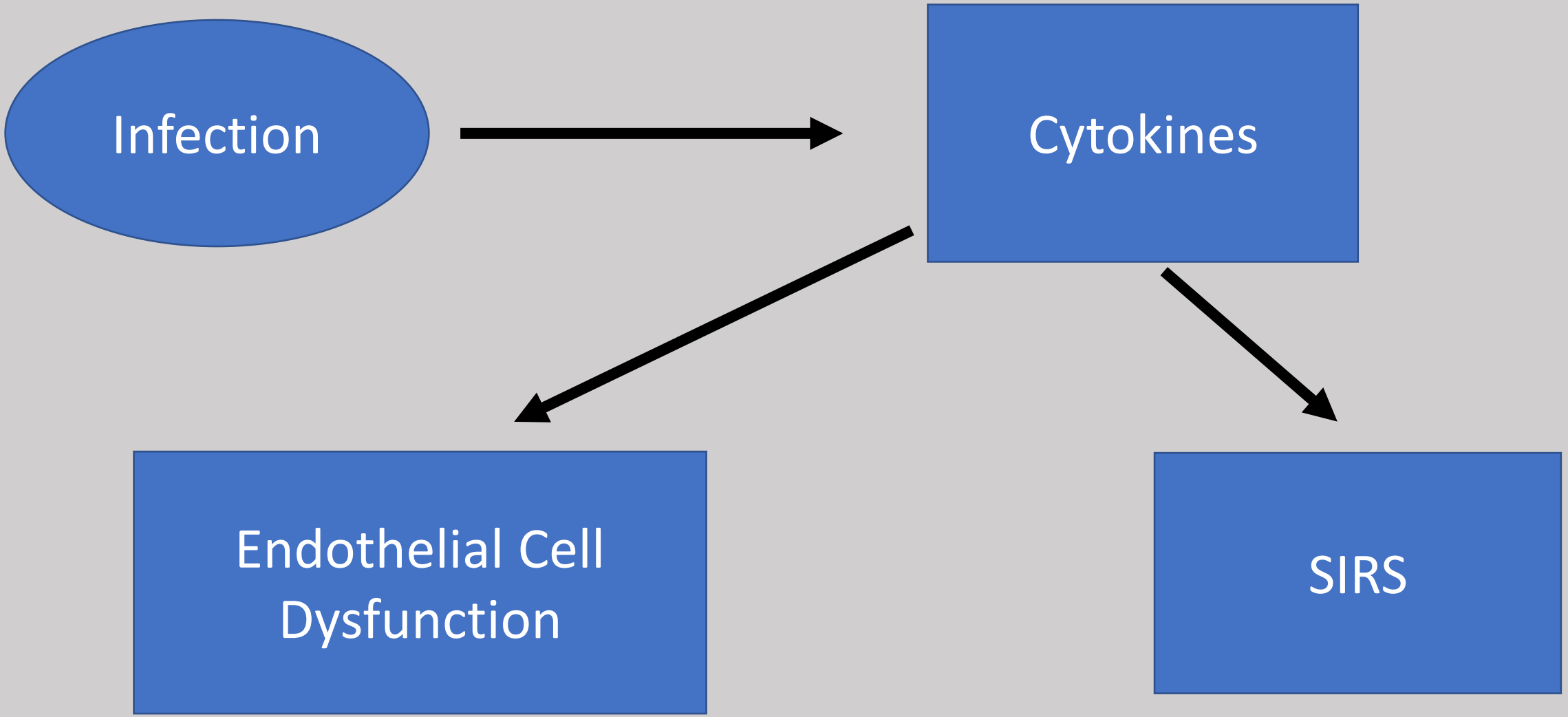
…when the body's response to infection injures its own tissues and organs

Sir William Osler 1904

"…except on a few occasions the patient appears to die from the body's response to the infection rather than from it."



Proinflammatory Mediators



Endothelial Cell Dysfunction

Microvascular Thrombi
Platelet Clumping

Vasodilation
Microvascular Permeability
Fluid Transudation

Ischemia

Organ Dysfunction/
Shock

Inflammation vs Organ Dysfunction

SIRS
- Heart rate
- Resp rate
- Temp
- WBC

Sequential Organ Failure Assessment (SOFA)

Sequential Organ Failure Assessment (SOFA)

PaO_2/FiO_2 ratio	Platelet count	Bilirubin
MAP	Glasgow Coma Score	Creatinine & urine output

Q-SOFA (quick)

Resp rate ≥ 22

Altered mentation

Systolic BP ≤ 100 mmHg

“Sepsis is an unrecognized killer (and) a medical emergency.”

Tom Frieden, M.D. MPH (former) Director, Centers for Disease Control and Prevention (CDC)

Recognizing Sepsis

Edgar

- 80 yo man fever, productive cough
- T 39° BP 110/70 HR 112 RR 20
- CXR RLL infiltrate
- QSOFA = 0

Earl

- 77 yo man change in mental status
- T 38.5° BP 90/60 HR 96 RR 26
- CXR RLL infiltrate
- QSOFA = 3

Fill the Tank!

Initial Bolus…
30mL/kg (1.5 – 3 Liters)

Wide Open!

Lactated Ringers

Antibiotic Timing

Goal < 1 hour

Delays
- ↑ Morbidity/ Mortality
- ↑ Acute Kidney Injury
- ↑ Acute Lung Injury

Antibiotic Timing

…every hour of delay was associated with an approximately 12% decreased probability of survival…”

Kumar A, Roberts D, Duration of hypotension before initiation of effective antimicrobial therapy is the critical determinant of survival in human septic shock. *Crit Care Med* 2006; 34(6): 1589-96

Empiric Antibiotics

Blood Stream Infections (BSI)

Mortality
- Appropriate 20%
- Inappropriate 34%

Lebovici L, et al, The benefit of appropriate empirical antibiotic treatment in patients with bloodstream infection. *J Inter Med* 1998; 244: 379-386.

Antibiotic Choices

Cephalosporins

Aminoglycosides

Macrolides

Fluoroquinolones

Penicillins

Carbapenems

Vancomycin

Folic acid antagonists

Antibiotic Choices

Source

Host

Bug

Antibiotic Stewardship

Empiric Broad Spectrum therapy

Narrow

- Pathogen ID/ Sensitivities
- Procalcitonin
- Clinical Improvement

Lactate

- Global Tissue Hypoxia
- Anaerobic respiration
- Trending lactate levels

Procalcitonin

Bacterial infection w/ severe inflammatory reaction

Early, sensitive and specific

Not elevated: viral, chronic inflammatory, most autoimmune disorders

Elevated: trauma, post op, rare

SEP-1
(1 hour bundle)

- Measure lactate
- Blood cultures
- Administer broad spectrum antibiotics
- Begin 30mL/kg crystalloids for hypotension or lactate >4
- Vasopressors for persistent ↓BP

Jennifer

30 yo woman 3 days abdominal pain following laparoscopy

Confused, BP 80/40, HR 140, RR 32, T 39.5°

Diffuse abdominal tenderness, rigidity

WBC 24k, bands 46%, platelets 104k, Lactate 8.7

Control the Source

Glucose Control

- Maintain serum glucose ≤ 180mg/dL
- IV vs SQ
- Enteral nutrition

Septic Shock

… a subset of sepsis in which the underlying circulatory and cellular/metabolic abnormalities are profound enough to substantially increase mortality.

Septic Shock

- Persistent hypotension requiring vasopressors and…
- Lactate >2

(despite adequate fluid resuscitation)

Vasopressors

- Norepinephrine
- Vasopressin
- Epinephrine
- Phenylephrine

- Angiotensin II (ATHOS-3)

Steroids

Unresponsive to vasopressors
- relative adrenal insufficiency

"Stress" dosing
- chronic steroid use

Hydrocortisone 50mg IV q6h

Keys to Success

- Recognize organ dysfunction (qSOFA)
- Aggressive IV fluid resuscitation (30 mL/kg)
- Early empiric broad spectrum antibiotics
- Vasopressors
- Steroids
- Source control
- Glucose control

Citations

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