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Sepsis in the ED

Vijay Kairam MD
University of Utah Emergency Medicine
Case 1

- 75 yo male arrives to the Orange Zone, complains of chest pain and shortness of breath.
- VS P 110, BP 95/65, R 20 SaO2 91%
- PE: Pale, diaphoretic, talking in full sentences
Case 2

- 65 year old female, had the sudden onset of dysarthria, R sided hemiparesis about 1.5 hrs ago
- VS P 75 BP 155/75 R 16 SaO2 96%
- PE: Airway intact but drooling, R sided hemiparesis
Case 3

• 76 yo female, has been feeling generally weak for the last few days. Thought she had a fever today and came to ED.

• VS: 88/54, hr 105, t 38.5, 95% RA

• PE: Seems drowsy but will talk when stimulated, nl chest and abd exam
Who is most likely to die in the next 30 days?

- Case 1: Acute MI - 9%
- Case 2: Cerebrovascular Accident - 15%
- Case 3: Septic Shock - 40%
Sepsis, Some Definitions

• SIRS: Systemic Inflammatory Response Syndrome
• Sepsis: SIRS + presence of known or suspected infection
• Severe Sepsis: Sepsis + end organ dysfunction
• Septic Shock: Sepsis + Shock
SIRS = 2 or more

- T >38 or < 36
- HR > 90
- RR > 20
- WBC > 12 K or < 4 K
What does the pt in case 3 have?

88/50, hr 105, t 38.5, rr 20, 95% RA

SEPTIC SHOCK!
What if her vitals were...

100/65, hr 105, rr 20, t 38.5, 95% on RA

Lactate?
Sepsis Demographics

- 750,000 cases of severe sepsis in North America each year
- 200,000 cases of septic shock each year
- 30-35% mortality for severe sepsis
- 50% mortality for septic shock
Pathophysiology of Sepsis

- Triggered by bacterial toxins and inflammatory cascade
- Progressive end-organ dysfunction
  - Tissue hypoxia from inadequate O2 delivery
  - Mitochondrial dysfunction
  - Microthrombi deposition at capillary level
- Distributive shock
Severe Sepsis

• End-organ dysfunction
  - Altered mental status
  - Decreased urine output
  - Acute lung injury
  - Coagulopathy
  - Cardiac dysfunction

• Lactic Acidosis
Early Goal Directed Therapy

- Patients with severe sepsis or septic shock (sbp < 90 after 20-30 cc/kg bolus over 30 min OR lactate > 4)
- Randomized to normal ED care vs EGDT

SIRS criteria and systolic BP <90 mm Hg or lactate >4 mmol/liter

Assessment and Consent

Standard therapy in emergency department

Randomization

Early goal directed therapy

Vital signs, laboratory data, cardiac monitoring, pulse oximetry, urinary catheterization, arterial and central venous catheterization

CVP >8-12 mm Hg
MAP > 65 mm Hg
Urine output >0.5 ml/kg/hr

Continuous ScvO₂ monitoring and early goal directed therapy for >6 hrs

CVP >8-12 mm Hg
MAP >65 mm Hg
Urine output >0.5 ml/kg/hr
ScvO₂ >70%

Hospital Admission

Vital signs and laboratory data obtained every 12hr for 72hr

Follow Up

Lena Carleton, University of Michigan
Early Goal Directed Therapy in the Treatment of Severe Sepsis and Septic Shock

Lena Carleton, University of Michigan
EGDT Decreases Mortality

- In Hospital Mortality
  - Standard Therapy: 46.5%
  - EGDT: 30.5%
  - ARR: 16.5%
  - NNT: 7
- 28 Day Mortality
  - Standard Therapy: 49.2%
  - EGDT: 33.3%
  - ARR: 15.9%
  - NNT: 7
- 60 Day Mortality
  - Standard Therapy: 56.9%
  - EGDT: 44.3%
  - ARR: 12.6%
  - NNT: 8

Implementing EGDT Reduces Mortality

• Carolinas Medical Center - Puskarich et al Crit Care Med 2009;13:R167
  - 1 year mortality pre-implementation vs post-implementation of EGDT protocol: 49% vs 37% P = 0.04 (ARR 12%, NNT 8)

• Robert Wood Johnson Medical Center - Trzeciak et al Chest 2006;129(2):225-232
  - In-hospital mortality pre vs post implementation of EGDT protocol: 43.8% vs 18.2% P = .09 (ARR 25.6%, NNT 4)

• Loma Linda - Nguyen et al Crit Care Med 2007;35(4):1105-12
  - EGDT Sepsis Bundle if completed decreases in-hospital mortality: 20.8% vs 39.5% P < .01 (ARR 18.7, NNT 6)
Do you need the whole package?

• Isn’t it enough to place a line and do appropriate blood pressure and fluid management?

• Do I really need to do the whole package if their vital signs stabilize?
ScvO2
Just placing a line is not enough

• Septic patients who were normoxic (ScvO2 70-89%) had lower mortality rate than those with hypoxia (ScvO2 < 70%)
  – 22% (95% CI 18-27%) vs 40% (95% CI 29-53%)

• Septic patients who were initially hypoxic but were resuscitated through EGDT and became normoxic within 6 hrs, had similar mortality rates to those who were initially normoxic.
  – 22% (95% CI 18-27%) vs 19% (95% CI 13-25%)

Cryptic Shock
Normalized VS Are Not Enough

• 86% of standard therapy group had normalization of vitals signs by 6 hrs (MAP > 65, CVP > 8, UOP > 0.5 ml/kg/hr) vs 95% of EGDT group
• 39.8% had persistent global tissue hypoxia (elevated lactate or ScvO2 < 70) compared to 5% of EGDT group
• In house mortality for this group with cryptic shock was 56.5% vs 30.5% for EGDT group

Otero et al Chest 2006;130:1579-1595
Sepsis Bundle Goals

1. Initiate CVP/ScvO2 monitoring within 2 hrs
2. Antibiotic administered within 4 hrs
3. EGDT complete within 6 hrs
4. Corticosteroid given if persistently hypotensive despite vasopressors
5. Lactate monitored for clearance

Sepsis Protocol

• Identifying Appropriate Patients
• Nurse Initiated Sepsis Order Set
  – Labs
  – Telemetry
  – Initiation of IVF
• Activation of Sepsis Protocol if pt persistently hypotensive or lactate > 4.
Appropriate Patients

• Inclusion Criteria: SIRS criteria with known or suspected infection

• Exclusion Criteria:
  – Acute cerebral vascular event
  – Acute coronary syndrome
  – Acute pulmonary edema
  – History of congestive heart failure
Nurse Initiated Order Set

- Labs
  - Lactate drawn first (to avoid prolonged tourniquet time)
  - cbc, cmp, troponin, blood cxs x 2
  - UA - cath UA if unable to void in 30 min
- Other Studies
  - Cxr - if respiratory symptoms, RR > 20, or hypoxemia
  - EKG - if hypotensive, tachycardic, or having chest pain or SOB
- Telemetry
- If sbp < 90 or lactate > 4
  - Notify MD immediately
  - Initiate IVF with 20 cc/kg NS IV over 30 min
  - Re-assess after IVF
Sepsis Protocol

• Initiate if SBP < 90 after 20 cc/kg bolus or Lactate > 4
• Notify ED Physician
• Move pt to Room 1 or 2 if available
• Page out “sepsis protocol in ED now” to:
  – ED pharmacist
  – MICU attending
  – MICU resident
Central Line Placement < 2hrs

- Nursing/EMT will do sterile prep for central line
  - Discuss planned site and type of catheter with MD
  - Position the patient
  - Prep and drape the patient
  - Open and prep the central line kit
  - Notify MD that central line is ready for placement
- MD will place line with Nursing/EMT sterile assistance
- CVP monitoring to be recorded with vital signs
- Labs
  - VBG with lactate off central line
  - PT/INR, PTT
  - Type & Screen
- STAT pcxr for line placement
Early Antibiotics < 4hrs

- Broad Spectrum
- Ensure blood cxs drawn x 2
- ED pharmacist facilitates
EGDT

CVP?
- < 8-12: 500 cc Bolus
- > 8-12:
  - MAP?
    - < 65: Vasopressor (NE preferred)
    - > 65:
      - SvO2?
        - < 70%: HCT?
          - < 30%: Transfuse
          - > 30%: Inotrope (Dobutamine preferred)

Consider
- Mechanical Ventilation
- Steroids if persistently hypotensive
Summary

• Sepsis and septic shock are common presentations in the ED
• Vital signs are vital in defining sepsis
• Early recognition and prompt treatment of sepsis can significantly reduce mortality
Questions?