Paramedic Initiated Prehospital CMS Sepsis Core Measures

Jason Walchok NRP, FP-C
Training Coordinator, Greenville County EMS

Improving outcomes through education, training, and research
Greenville County EMS

- 80,000+ calls for service annually
- 29 ALS transport units
- 9 QRV’s
- 32 Fire departments provide first response
- Over 200 field providers
- Coverage area of 800 sq. miles
- Dr. Martin Lutz Medical control
  - Dr. Tara Connolly Associate Medical Control
Prehospital Care

• Historically, EMS has proven to have significant impact on time sensitive in hospital interventions, through proper identification and notification:
  – STEMI
  – Stroke
  – Trauma
  – Sepsis Alert
GCEMS Sepsis Protocol

- Identification of Sepsis
- Blood Culture Collection
- Blood collection for serum lactate
- Fluid resuscitation
- Broad spectrum antibiotic administration
- “SEPSIS Alert”
The Burden of Sepsis

• Severe sepsis and septic shock combined are the 10th leading cause of death in the United States
• Over 750,000 cases each year
  – Two-thirds initially seen in the ED
• 215,000 deaths annually
  – 50.37 deaths per 100,000 people
• Number one leading cause of death in non-cardiac ICU’s

Melamed et al. Critical Care; 2009
Band et al. Academic Emer Med; 2011
Kaukonen et al. NEJM; 2015
EMS and Sepsis

• Very little education related to Sepsis during initial Paramedic education

• Prehospital sepsis research is limited
  – Identification
  – Severity of patients
  – Effect of sepsis alert
EMS transports 34% of all patients diagnosed with sepsis, and 60% of all severe sepsis patients arriving to the ED

More likely to present with severe sepsis or septic shock

“EMS systems may offer important opportunities for advancing sepsis diagnosis and care”

Wang et al. Resus.; 2010
Arriving by Emergency Medical Services Improves Time to Treatment Endpoints for Patients With Severe Sepsis or Septic Shock

Roger A. Band, MD, David F. Gaieski, MD, Julie H. Hylton, Frances S. Shofer, PhD, Munish Goyal, MD, and Zachary F. Meisel, MD, MPH

• Arrival by EMS is associated with decreased time to IVF and antibiotics
  – Median time to antibiotics was 116 minutes for EMS vs. 152 minutes for non-EMS
  – Median time to initiation of IVF was 34 minutes for EMS and 68 minutes for non-EMS
• “EMS may represent an effective part of efforts to rapidly diagnose and treat ED patients with critical, time-sensitive illnesses”

If sepsis is identified by EMS personnel, the reduction in time to antibiotics initiation is substantial (69 vs 131 minutes).

EMS transported patients had more organ failure.

“If sepsis is recognized by EMS personnel, the reduction in time to antibiotic and EGDT initiation is more substantial”
Time to antibiotic

- 2012 Surviving Sepsis Guidelines
  - Within one hour of identification

- For every hour sooner that antibiotics were delivered decreased mortality by 8% per hour

- Antibiotic therapy within the first hour of severe sepsis recognition contributed to 80% survival

Gaieski et al. Crit Care Med; 2010
Dillinger et al. Intensive Care Med; 2013

Kumar et al. Crit Care Med; 2006
GCEMS Sepsis pilot

- July 2014 – analysis of the sepsis patient treated by EMS
  - 3-5 Sepsis patients transported per day within Greenville County
  - Average time to antibiotics was 101 minutes once arrived at the ED
    - Not including the time with EMS (average 58 mins including transport)

- If Sepsis could be identified by EMS in the field, this would significantly decrease the time to antibiotic administration, thereby decreasing mortality.
GCEMS Sepsis

- Prehospital Antibiotic administration – Pilot (DHEC – Bureau of EMS)
  - Was not on the state formulary
- November 2014 – Blood culture collection and alert
- February 2015 – Incorporated IV antibiotics into treatment

**Nov-14 to Feb-16**
- 1185 Sepsis alerts
- 957 blood cx collected
- 583 ABX administered
GCEMS and Sepsis

• Training:
  – 170 ALS providers completed 12 hours of education over 3 months
    • Sepsis identification
    • Sepsis protocol
    • Sepsis treatment
    • Aseptic technique
    • Blood culture collection
    • IV Antibiotic administration

• Didactic and simulation training on hi-fidelity simulation mannequins
Systemic Inflammatory Response Syndrome

• SIRS
  – Hyperthermia (> 101ºF) or hypothermia (< 96.8ºF)
  – Heart rate > 90 beats per minute
  – Respiratory rate > 20 breaths per minute or intubated
  – Signs of poor perfusion (such as SBP < 90 mm/hg)

Dillinger et al. Intensive Care Med; 2013
GCEMS Sepsis assessment tool

Greenville County EMS
301 University Ridge Suite 1100 Greenville SC 29611

EMS Evaluation and treatment of Sepsis tool

Date: _______________ EMS Arrival Time: _______ Truck Number: ________________

Lead Medic: ______________________ Culture Drawn by: ______________________

Evaluation for Sepsis

1. **Are any two of the following symptoms present AND new to the patient?**
   - Hyperthermia (> 101°F or 38°C) or hypothermia (< 98.8°F or 36°C)
   - Heart rate > 90 beats per minute
   - Respiratory rate > 20 breaths per minute or mechanical ventilation
   - Signs of poor perfusion (such as SBP < 90 mm/Hg)

2. **Is the patient’s presentation suggestive of any of the following infections?**
   - Pneumonia (cough/thick sputum)
   - Urinary tract infection
   - Acute AMS change
   - Bloodstream/Catheter related
   - Abdominal pain and/or diarrhea
   - Wound infection
   - Skin/soft tissue infection

If positive for sepsis, call a sepsis alert and follow the directions on the back
GCEMS Sepsis treatment tool

GCEMS – both sides of this sheet must be copied and turned in or emailed to Jason Walchok

Treatment for sepsis

Confirm no PCN allergy – if PCN allergy DO NOT ADMINISTER ANTIBIOTICS

- Draw Blood Culture (8cc-10cc of blood in each vial)
- Prepare a 2 inch site area with chloraprep and allow to dry
- Disinfect the top of each culture bottle with alcohol and allow to dry
- Inoculate the aerobic (blue cap) bottle first and then the anaerobic (purple cap) bottle.
- Minimum of 3cc of blood in aerobic bottle is required to proceed with antibiotic therapy
- If unable to draw cultures DO NOT ADMINISTER ANTIBIOTICS

- Draw point of care lactate (only good for 30 min)
- Time Drawn: ____________________

- Begin fluid resuscitation: Normal Saline 1,000cc
- Total given: ____________________
- Time hung: ____________________

- Presumed sepsis from pneumonia: Rocephin 1 Gram IV
- Time hung: ____________________

- Presumed sepsis not from pneumonia: Zosyn (3.375) 4.5 Grams IV
- Time hung: ____________________
Sepsis Kits

- Blood draw contents
  - Specific for each facility
- Prehospital assessment sepsis assessment tool
- Antibiotics
- Mini bag
Blood culture collection

- Area of major concern for hospital laboratory
  - Initial 3 month trial to prove low contamination rate

- No prehospital research
EMS Blood cultures

4.91% contamination rate
EMS Blood Cultures

- Initial set of blood cx
- No growth, 76.4%
Lactate collection

- Blood collected in the field is used in the ED to determine the initial serum lactate level prior to fluid administration.

  Contains potassium oxalate / sodium fluoride that inhibits glycolysis

  Stable 2hrs, 1 hour turn around

  Heparin, can be rapidly processed in ABG machine upon arrival

  Stable 20mins, immediate
Lactate monitors

• Point of care lactate monitoring can assist with sepsis identification though it has limited prehospital availability
  – No CLIA waved devices
  – Require moderate complexity license

• Is a Paramedic’s assessment enough?
Is a Paramedic’s assessment enough?

- The admitting diagnosis of Sepsis was 73.5%
- The lactate level was greater than 4.0 in 13% of patients and greater than 2.2 in 46.2%
- Initial Lactate level upon arrival at the ED
- Non-Sepsis dx patients removed

<table>
<thead>
<tr>
<th>Age: range 18-101 years</th>
<th>mean 70.19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex:</td>
<td>Number</td>
</tr>
<tr>
<td>Male</td>
<td>596</td>
</tr>
<tr>
<td>Female</td>
<td>589</td>
</tr>
<tr>
<td>Receiving Location:</td>
<td></td>
</tr>
<tr>
<td>Residence</td>
<td>763</td>
</tr>
<tr>
<td>Nursing Facility</td>
<td>340</td>
</tr>
<tr>
<td>Medical Office</td>
<td>50</td>
</tr>
<tr>
<td>Public</td>
<td>12</td>
</tr>
<tr>
<td>Shelter</td>
<td>8</td>
</tr>
<tr>
<td>Hotel/Motel</td>
<td>6</td>
</tr>
<tr>
<td>Business</td>
<td>5</td>
</tr>
<tr>
<td>Wilderness</td>
<td>1</td>
</tr>
<tr>
<td>SIRS Criteria:</td>
<td></td>
</tr>
<tr>
<td>Heart Rate</td>
<td>1090</td>
</tr>
<tr>
<td>Respiratory Rate</td>
<td>1030</td>
</tr>
<tr>
<td>Temperature</td>
<td>474</td>
</tr>
<tr>
<td>Hypotension</td>
<td>133</td>
</tr>
<tr>
<td>Prehospital treatment:</td>
<td></td>
</tr>
<tr>
<td>IV access</td>
<td>1032</td>
</tr>
<tr>
<td>Blood cultures</td>
<td>946</td>
</tr>
<tr>
<td>ABX admin.</td>
<td>573</td>
</tr>
<tr>
<td>ED agreement with Sepsis</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1115</td>
</tr>
<tr>
<td>No</td>
<td>54</td>
</tr>
<tr>
<td>Missing data</td>
<td>16</td>
</tr>
</tbody>
</table>
Antibiotic administration

• Broad spectrum capability consistent with in-hospital treatment at local ED’s.

• Rocephin (Ceftriaxone) 1Gram
  – Pneumonia / Pulmonary (excluding nursing homes)

• Zosyn (Piperacillin/Tazobactam) 4.5 Grams (OR 3.375 Grams)
  – All other sources and suspected HCAP

• Both administered IV via the Mini-Bag + system
Mini-Bag Plus system

- Extremely stable for prehospital use
- ABX is reconstituted at the time of treatment
- Administered via 10gtts over 20 minutes
Antibiotic Administration

• 583 total antibiotics administered
  – 867 sepsis patients
  – February 2015 – February 2016

• Zosyn – 361
• Rocephin – 221

[Legend: Rocephin, Zosyn, No Cultures, Allergy, Other no ABX]
Fluid resuscitation

- 30ml/kg initial bolus
  - 1liter followed by a second during extended transports
- Observe for signs of fluid overload
  - Pulmonary Edema
- Consider Dopamine 2-20mcg/kg/min
  - After fluid administration and SBP <90mmHg (Septic Shock)
ED arrival

• Pre hospital interventions are continued
• Patient is tracked by use of “Green sheet”
• Labs and blood cultures are sent to the laboratory
  – EMS Tech code

• CMS Core Measures:
  – EMS blood cultures
  – EMS administered ABX
  – EMS administered fluid
Outcomes

• Average time to ABX in the ED decreased
  – From 101 minutes prior to Sepsis Alert protocol
  – 46 minutes upon arrival after Sepsis Alert protocol implementation

• Lowest mortality rate in the history of Greenville Health System

• Fewer admissions to the ICU

• Significant savings in-hospital

• Preliminary data comparing historical (pre) sepsis patients and EMS administered antibiotics:
  – Decrease in mortality in EMS group
    • Severe sepsis and Septic shock
Sepsis

History:
- Age > 65 years
- Duration of fever
- Severity of fever
- Altered mental status
- Past medical history
- Medications
  - Immunosuppressed
    - Transplant
    - HIV
    - Diabetes
    - Cancer
  - Environmental exposure
  - Last antibiotics or sulfonamide

Significant Findings:
- Hyperthermia (>101°F/38°C)
- Hypothermia (<96.8°F/36°C)
- Tachypnea (>20 bpm, or mechanical)
- Tachycardia (>90 BPM)
- Acute mental status change
- Urinary tract infection
- Pneumonia
- Skin/soft tissue infection
- Abdominal infection
- Wound infection
- Suspected meningitis, endocarditis, or osteomyelitis

Collecting Cultures:
- Maintain aseptic technique at all times
- Put on a new set of clean gloves
- Prepare site with Chloraprep
  - Clean 1 inch site
  - Allow site to dry
  - Do not touch once cleaned
- Remove cap from culture bottles
- Clean bottle diaphragm with alcohol
  - Allow to dry
- Venipuncture and draw blood
  - Add 5-10ml of blood in each bottle
  - Aerobic (BLUE/GREY) first
  - Anaerobic (PURPLE) second

Oxygen
- Full set of vital signs including temperature, pulse oximetry, and respiratory rate
- 12-Lead EKG
- Obtain BG
- Draw 1 set of blood cultures
- Draw Lactate per receiving destination
- Initiate IV administer 1,000ml
- Establish second IV when feasible
- Notify the receiving facility of the Sepsis alert

Glucose <60 signs of hypoglycemia

See AMS/Diabetic Emergency Protocol

Documented or reported Penicillin Allergy

Nursing Home Patient?
- Yes
- Zosyn 4.5 or 3.375 Grams IV, over 10 minutes
- No
- Suspected pneumonia
  - Yes
  - P: Roxithromycin 500mg IV, over 10 minutes
  - P

Notify receiving facility or contact Medical Control

PEARLS:
- If unable to obtain cultures, do not administer antibiotics
- Determine the hospital destination (SFHS or GHS) prior to drawing cultures. Use the appropriate kit.
- Utilize Sepsis Checklist
- Severe shock: Hypotension (SBP <90) refractory to fluid bolus (30ml/kg NS), Consider Dopamine 5-20 mcg/kg/min
- Be alert for signs of anaesthesia during antibiotic administration
- A second liter of Normal Saline can be administered for septic shock
- Extended zosyn times to provide antibiotic therapy are acceptable
- Withdraw antibiotics if suspect meningitis, endocarditis, or osteomyelitis
- Zosyn should be administered to all nursing home patients who meet sepsis alert criteria without a PCN allergy regardless of the source.
Questions

Jason Walchok NRP, FP-C
Training Coordinator
Greenville County EMS
Greenville, South Carolina

jwalchok@greenvillecounty.org
Reference


Reference


• Lena C. W. van der Wekken MD, Nadia Alam MD, Frits Holleman MD, PhD, Pieterenel van Exter MD, Mark H. H. Kramer MD, PhD, FRCP & Prabath W. B. Nanayakkara MD, PhD, FRCP (2016) Epidemiology of Sepsis and Its Recognition by Emergency Medical Services Personnel in the Netherlands, Prehospital Emergency Care, 20:1, 90-96, DOI:10.3109/10903127.2015.1037476