Initiating MEWS in the ER – Early Sepsis Recognition

Jennifer Washington RN, BSN, CEN
Glendale Adventist Medical Center
Emergency Department – Interim Educator
1. Heart Disease
2. Cancer
3. Respiratory diseases
4. Stroke, cerebrovascular diseases
5. Accidents (unintentional injuries)
6. Alzheimer's disease
7. Diabetes
8. Kidney diseases
9. Influenza and pneumonia
10. Suicide
11. Septicemia
Sepsis kills

• The leading cause of death in hospitalized patients

• Approximately 500 deaths per day

• Sepsis is the most expensive disease to treat in the hospital, costing approximately $17 billion dollars annually.

• Early detection and appropriate treatment of sepsis can decrease mortality, improve patient outcomes and decrease the length of stay in hospitals.

Crit Care Med. 2013 May;41(5):1167-74
### Mortality

HealthGrades Emergency Medicine in American Hospitals Study – June 2010

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>ED admissions</th>
<th>Average Unadjusted Mortality Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sepsis</td>
<td>661,856</td>
<td>21.05%</td>
</tr>
<tr>
<td>Respiratory Failure</td>
<td>349,303</td>
<td>20.88%</td>
</tr>
<tr>
<td>Heart Attack</td>
<td>461,736</td>
<td>10.84%</td>
</tr>
<tr>
<td>Stroke</td>
<td>509,205</td>
<td>7.02%</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>1,080,955</td>
<td>5.06%</td>
</tr>
<tr>
<td>PE</td>
<td>112,933</td>
<td>4.56%</td>
</tr>
<tr>
<td>Bowel obstruction</td>
<td>337,871</td>
<td>3.25%</td>
</tr>
<tr>
<td>Pancreatitis</td>
<td>113,806</td>
<td>2.59%</td>
</tr>
</tbody>
</table>
Hospitalizations for septicemia or sepsis (as a first-listed or principal diagnosis) increased from 326,000 in 2000 to 816,000 in 2010, and the rate of these hospitalizations more than doubled from 11.6 per 10,000 population in 2000 to 26.5 per 10,000 population in 2010. Overall hospitalizations did not increase during this period.
Joint International collaboration
Started 2002
Most Recent Guidelines 2012
Reduce mortality from Sepsis
Evidence Based Guidelines
2012 RECOMMENDATIONS

Fluid Resuscitation
30ml/kg

Diagnosis
Blood Cultures within 1 hour
Imaging to determine source

Antibiotics
Within the 1st hour of recognition of sepsis
AUTOMATED SURVEILLANCE

• Identify patients at an early stage
• Simple protocols based on physiological parameters
• Reduce pre-ICU Resuscitations
• Reduce mortality and LOS
HEALTHCARE SYSTEMS USING CERNER’S LIGHTHOUSE SEPSIS ALERTS

Trinity Health
Penn State Hershey
University of Missouri Health System
Detroit Medical Center
Munson HealthCare
Adventist Health System
MERCY HOSPITAL ANDERSON
SEPSIS RECOGNITION AND TREATMENT

• Reduced Code Blues Called outside ICU by 50%
• Increased RRT calls by 100%
• SIRS/MEWS alert identified the “sicker” patients
• Quantifies way to describe patient
  • “Went from a 4 to a 7”
SEPSIS Mortality Index & Observed - by Facility
May 2012 - April 2013

MORTALITY INDEX - O/E

- Premier Top Decile
- AH Avg
- Premier Database Avg

O/E: Observed to Expected Ratio

Average Mortality Rate (%)

0.0% 5.0% 10.0% 15.0% 20.0% 25.0%
SEPSIS Length of Stay Index & Observed - by Facility
May 2012 - April 2013

Arithmetic Observed
Arithmetic O/E

Average LOS (days)
Adventist Health Goals for Sepsis Care

To save lives and cut costs from sepsis through early recognition and timely, aggressive, effective care.

• Identify Cases – specific populations
• Reduce progression from SIRS to Septic Shock
• Reduce LOS
• Reduce Mortality

INITIATE CARE SOONER
## Modified Early Warning Score (MEWS)

<table>
<thead>
<tr>
<th></th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>1</th>
<th>&gt;22</th>
<th>&gt;30</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Respiratory Rate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per Minute</td>
<td>&lt;8</td>
<td>9 - 14</td>
<td>15 - 20</td>
<td></td>
<td></td>
<td>&gt;22</td>
<td>&gt;30</td>
</tr>
<tr>
<td><strong>Heart Rate Per Minute</strong></td>
<td>&lt;40</td>
<td>40 - 50</td>
<td></td>
<td>&gt;95</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Systolic Blood Pressure</strong></td>
<td>Less than 70</td>
<td>70 - 80</td>
<td>81 - 100</td>
<td>101 - 200</td>
<td></td>
<td>&gt;200</td>
<td></td>
</tr>
</tbody>
</table>

| **Level of Consciousness** |                          |            |              |              |              |             |             |
|                            | **Obtundation** | Responds to Pain | Responds to Voice | **Alert** | **Delirium** | Confusion | Confused |
|                            | **Unresponsive** | | **Lethargy** | **Alert** (Sedated = 0) | New agitation | | |
|                            | **Stuporous** | | | | | | |
| **Temperature**            | <35.0 C | 35.0 – 36.0 C | 36.1 – 38.0 C | 38.1 – 38.6 C | >38.6 C | >101.5 F | >101.9 F |
|                            | <95.0 F | 95.0 – 96.8 F | 96.9 – 100.4 F | 100.5 – 101.5 F | | | |

NOTE: Sepsis Alert SIRS & Organ Dysfunction Criteria overlayed in red and **AH LOC levels are in blue.**

Modified and Tested by NHS Trust, 2008/Posted on IHI Website, Modified by Cerner, 2013

Systemic Inflammatory Response Syndrome (SIRS) is present if any 2 of the values listed below are evident.

- Temp (F) < 96.8 or > 100.9
- HR > 95
- Resp > 22
- WBC < 4 or > 12
- Bands > 10

Possible New Infection:
- Pneumonia, empyema
- Urinary tract infection
- Acute abdominal infection
- Meningitis
- Skin/soft tissue infection
- Bone/joint infection
- Wound infection
- Blood Stream Infection
- Endocarditis
- Implantable device
- Other

SIRS + suspicion of new infection:
- Detailed assessment of patient

Sepsis + evidence of new organ dysfunction:
- MAP < 65
- SBP < 90
- Creatinine Increase of .5 mg/dL
- Bili >= 2 <= 10 mg/dL
- Lactate >= 2 mmol/dL
- 40 mmHg drop in SBP from baseline
- Creatinine > 2 mg/dL
- Urine Output < 0.5 mL/kg/hr over 2 hours
- Bilateral pulmonary infiltrates & increased 02 requirements to keep SpO2 > 90%
- Platelet count < 100,000
- Coagulopathy (INR > 1.5 or aPTT > 60 secs)
- Acutely Altered Mental Status

ORGAN DYSFUNCTION CRITERIA USED FOR POSSIBLE SEVERE SEPSIS ALERTS

FLUIDS & ANTIBIOTICS

SIRS
SEPSIS
SEVERE SEPSIS
SEPTIC SHOCK

SEPSIS ALERTS FIRE

Pay attention

Do Something Now

MEWS ALERT FIRES

MODIFIED EARLY WARNING SCORE (MEWS)

1 2 3 4 5 6 7 8 9+

- Is something going on with my patient?
- Did I accurately record vitals?
- Review vitals and labs, get new orders and treat as appropriate
- In ED, confer with physician. On unit, confer with physician and/or MET/RRT team
Modified Early Warning Score (MEWS) Alert Criteria
- Fires when MEWS score >= 4

Sepsis Alert Criteria
- Possible SEPSIS = 3 SIRS
- Possible SEVERE SEPSIS = 2 SIRS + 1 Organ dysfunction
All ED Patients being tracked for MEWS/Sepsis
### Rapid Response Team Dashboard

**Patient List:** 15 Emergency

<table>
<thead>
<tr>
<th>Score</th>
<th>Patient Name</th>
<th>Date of Birth</th>
<th>BSN</th>
<th>Room / Bed</th>
<th>Rapid Response Team Activation</th>
<th>Alert Status</th>
<th>Resuscitation Status</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
<td>06/30/1953</td>
<td>837787</td>
<td>ED03 - 00</td>
<td>5 hrs ago</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

**Trends**

- **Temperature:** 98°F, 5 hrs ago
- **Heart Rate:** 114 bpm, 24 hrs ago, 110 bpm, 44 hrs ago
- **Respiratory Rate:** 31, 24 hrs ago, 12, 24 hrs ago, 18, 24 hrs ago
- **MEWS:** 5.00, 24 hrs ago, 4.00, 30 mins ago

**Previous Comments:**

No comments found.

**Add Comments**

- 06/15/1963: 1110086, --, --, Active, --
- 08/06/1946: 883175, --, --, Active, --
- 12/24/1963: 1292495, --, --, Active, --
- 02/22/1964: 1001099, --, --, Active, --
- 09/17/1959: 657487, ED01 - DO, --, Active, --
- 08/08/1952: 659578, ED25 - DO, --, Active, --
- 03/26/1965: 1258494, ED04 - DO, 101 mins ago, Active, Full Resuscitation
- 07/25/1948: 749276, --, --, Active, --
- 10/06/1905: 705227, --, --, Active, --
- 03/03/1928: 911412, --, --, Active, --
# Sepsis Alert Criteria

## Patient Information

**Chief Complaint:** c/o sepsis all day today. BS 67

**Reason For Visit:** RESPIRATORY FAILURE/PULMONARY FEVER

**Room/Bed:** ED03-00

**Targeted Discharge Date:** No results found

**Advance Directive:** Yes

**Last Visit:** 10/29/13 (Inpatient)

**Code Status:** No results found

## Home Medications

- **Albuterol** (sulfate 1 mg, nasal spray, 0.9 mg, 1 Drop, INH, ONCE)
- **Dexmedetomidine** (IV, 1 mg, 1 Drop, INH, ONCE)
- **Dexamethasone** (IV, 5 mg, 1 Drop, INH, ONCE)
- **Diphenhydramine** (IV, 25 mg, 0.9%, 50 mL, IV, INH, ONCE)
- **Gammagard (Zostavax)** (500 mg, 2.5 mL, IV, INH, ONCE)
- **Sodium Chloride** (100 mL, 0.9%, 1,000 mL, IV, INH, ONCE)

## Significant Events

### Results From: Last Sepsis Event 11/03/2013 10:58

- **Last Blood Work:**
  - White Blood Cell: 19.1
  - Hemoglobin: 110
  - Platelet: 32
  - Lactate: 0.5

### Critically Ill Patients

- **Temperature:** 99°F
- **Pulse:** 114 bpm
- **Respiratory Rate:** 33 bpm
- **Oxygen Saturation:** 98%

### Oxygen Saturation

- **SPO2:** 100%
- **Heart Rate:** 72 bpm
- **Respiratory Rate:** 18 bpm
- **Oxygen Delivery:** 15 L/min

### Diagnoses and Problems

- **Sepsis**
- **Respiratory Failure**
- **Pneumonia**

### Interventions

- **Administered Medications:**
  - **Sodium Chloride** (0.9%, 1,000 mL)
  - **Sodium Chloride** (0.9%, 1,000 mL)
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### Outstanding Orders

- **Blood Pressure Monitor**
- **Heart Rate Monitor**
- **Respiratory Rate Monitor**
- **Temperature Monitor**

### Diagnoses and Problems

- **Sepsis**
- **Respiratory Failure**
- **Pneumonia**
• Purpose of the alert NOT to make the definitive diagnosis of sepsis
• But to caution the provider that criteria have been met
• So sepsis should be considered in the workup.
**Adventist Health**

**Early Warning Alerts (Sepsis and MEWS Scores) by Hospital**

5 Days: Oct 14 - 18, 2013

**Hospital-Wide (5 days)**

**ED Alerts included**
Adventist Health
Early Warning Alerts (Sepsis and MEWS Scores) by Hospital
14 days, October 16 – 29, 2013

Emergency Department ONLY (14 days)
Adventist Health
Early Warning Alerts (Sepsis and MEWS Scores) by Hospital
14 days, October 16 – 29, 2013

Hospital-wide (14 days)
ED alerts excluded
MEWS/SEPSIS ALERTS

• November 19  PTU
  • Pulmonary Telemetry 29 Beds
• House-wide December 3\textsuperscript{rd}
• Education thru Healthstream