Getting to KNOW Sepsis™

Riverside Health System
September 2nd, 2015
Grand Rounds
Objectives: by end of presentation attendees will be able to:

- Differentiate sepsis presentation from other non-infectious conditions of the critically ill
- Discuss the updated evidence-based protocol for sepsis early intervention and treatment

Additional focus:
- List 4 SIRS criteria & 4 Severe Sepsis Criteria
- State 3 sepsis bundle interventions that can be ordered and performed quickly that have been shown to decrease mortality in severe sepsis.
WHY FOCUS ON SEPSIS?

According to the Surviving Sepsis Campaign:

• Hospitalization rates for septicemia or sepsis more than doubled from 2000 through 2008

• Estimated worldwide more than 1,400 people die each day from Sepsis.

• Severe Sepsis is the 10th leading cause of death in the US. Estimated cost is ~ $17 billion annually in the US to treat Sepsis.

• Mortality associated with severe Sepsis ranges from 30% to 50%. When shock is present mortality may be as high as 60%.

Sepsis is not a single disease entity but a progressive disorder

Once a patient becomes septic, the survival rate drops 6% every hour!

Sepsis: Improving the odds (2009) By Steven Tallia and Jolanta E. Kunicka, PhD
SEPSIS Mortality by Day of Stay (2014)

Findings:
• 27% of patients expire on Day 1
Know Sepsis™ – Location Phases

Emergency Department

Intensive Care Unit

Units

Skilled Nursing Facilities

Initial Focus
Surviving Sepsis Campaign
2012 Recommendations

What is best practice for sepsis?

Sepsis Spectrum

SIRS

Sepsis

SIRS + Infection

Sepsis

Sepsis + End Organ Damage

Severe Sepsis

Severe Sepsis + Hypotension

Septic Shock

Temp. >38C or < 36C, HR>90, RR.20 or PaCO2<32
WBCs >12000 or <4,000 or > 10% bands
Sepsis Redefined

Box 2. Key Concepts of Sepsis

- Sepsis is the primary cause of death from infection, especially if not recognized and treated promptly. Its recognition mandates urgent attention.
- Sepsis is a syndrome shaped by pathogen factors and host factors (e.g., sex, race, and other genetic determinants, age, comorbidities, environment) with characteristics that evolve over time. What differentiates sepsis from infection is an aberrant or dysregulated host response and the presence of organ dysfunction.
- Sepsis-induced organ dysfunction may be occult; therefore, its presence should be considered in any patient presenting with infection. Conversely, unrecognized infection may be the cause of new-onset organ dysfunction. Any unexplained organ dysfunction should thus raise the possibility of underlying infection.
- The clinical and biological phenotype of sepsis can be modified by preexisting acute illness, long-standing comorbidities, medication, and interventions.
- Specific infections may result in local organ dysfunction without generating a dysregulated systemic host response.

(Singer et al, 2016)
**CMS Sepsis Core Measure Set**
**Starts: October 1, 2015**

**Population: Severe Sepsis & Septic Shock Patients**
Patients who received **ALL** of the following:

- Received within 3 hours of presentation of severe sepsis:
  - Initial lactate level measurement
  - Blood cultures drawn prior to antibiotics
  - Broad Spectrum or other antibiotics administered

AND

- Repeat lactate within 6 hours if initial lactate elevated

AND ONLY if septic shock present:

- Administer 30 ml/kg crystalloid for hypotension or lactate = 4mmol/L (w/n 3 hours)

AND ONLY IF hypotension persists after fluid administration, received within 6 hours:

- Vasopressors
- Repeat volume status & tissue perfusion assessment consisting of **either**

- **NEXT SLIDE (DRUM ROLE)**
CMS Sepsis Core Measure Set
Starts: October 1, 2015

Population: Severe Sepsis & Septic Shock Patients
Repeat volume status & tissue perfusion assessment consisting of either...

A focused exam including:
• Vital signs, AND
• Cardiopulmonary exam, AND
• Capillary refill evaluation, AND
• Peripheral Pulse evaluation, AND
• Skin Examination

OR

Any two of the following four:
• Bedside Cardiovascular Ultrasound
• Passive Leg Raise or Fluid Challenge
• Central venous pressure measurement
• Central venous oxygenation measurement
Lactate Level

In-hospital mortality stratified by systolic blood pressure and blood lactate level measured at arrival of the ambulance at the scene (T1). *p = 0.046 *p = 0.032 Number of patients per group: low systolic blood pressure (SBP)/low lactate n = 8, low SBP/high lactate n = 25, high SBP/low lactate n = 58, high SBP/high lactate n = 33.

Jansen et al
# Lactate Level

## Table 1

### Baseline characteristics

<table>
<thead>
<tr>
<th></th>
<th>Total: n = 124</th>
<th>Non-survivors: n = 32</th>
<th>Survivors: n = 92</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years, ± SD)</td>
<td>62 ± 19</td>
<td>68 ± 14 *</td>
<td>59 ± 20 *</td>
</tr>
<tr>
<td>Sex (n, % male)</td>
<td>73 (59%)</td>
<td>22 (69%)</td>
<td>51 (55%)</td>
</tr>
<tr>
<td>Intensive care unit admission (n, %)</td>
<td>57 (46%)</td>
<td>15 (47%)</td>
<td>42 (48%)</td>
</tr>
<tr>
<td>Length of stay in hospital (days, ± SD)</td>
<td>13 ± 21</td>
<td>3 ± 6 *</td>
<td>17 ± 23 *</td>
</tr>
<tr>
<td>Time arrival ambulance to ED (minutes, ± SD)</td>
<td>27 ± 9</td>
<td>29 ± 10</td>
<td>26 ± 10</td>
</tr>
<tr>
<td>Ambulance diagnosis (n, %):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- cardiac arrest</td>
<td>12 (10%)</td>
<td>8 (25%) *</td>
<td>4 (4%) *</td>
</tr>
<tr>
<td>- myocardial infarction</td>
<td>17 (14%)</td>
<td>2 (6%)</td>
<td>15 (16%)</td>
</tr>
<tr>
<td>- other cardiological disorders</td>
<td>8 (6%)</td>
<td>1 (3%)</td>
<td>7 (8%)</td>
</tr>
<tr>
<td>- sepsis</td>
<td>8 (6%)</td>
<td>4 (13%)</td>
<td>4 (4%)</td>
</tr>
<tr>
<td>- haemorrhage</td>
<td>10 (8%)</td>
<td>3 (9%)</td>
<td>7 (8%)</td>
</tr>
<tr>
<td>- neurological disorder</td>
<td>19 (15%)</td>
<td>9 (28%) *</td>
<td>10 (11%) *</td>
</tr>
<tr>
<td>- trauma without severe traumatic brain injury</td>
<td>18 (15%)</td>
<td>2 (6%)</td>
<td>16 (17%)</td>
</tr>
<tr>
<td>- trauma with severe traumatic brain injury</td>
<td>2 (2%)</td>
<td>1 (3%)</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>- attempted suicide</td>
<td>4 (3%)</td>
<td>0 (0%)</td>
<td>4 (4%)</td>
</tr>
<tr>
<td>- others</td>
<td>26 (21%)</td>
<td>2 (6%) *</td>
<td>24 (26%) *</td>
</tr>
</tbody>
</table>

Continuous data are presented as mean ± standard deviation (SD). Binary data are presented as n (percentage of total, non-survivors or survivors). * p < 0.05. ED = emergency department.
Surviving Sepsis 2012

• What’s new in the guidelines?
Severe Sepsis Early Identification Screening (1C)

History of Suggestive Infection

AND

- Hyperthermia >101.0
- Hypothermia < 96.8
- Altered Mental Status
- Tachycardia > 90 bpm
- Tachypnea >20 breaths per minute/SpO2 <90%
- Leukocytosis >12,000 WBC
- Leukopenia <4,000 WBC
- Hyperglycemia > 140 plasma glucose

Suspicion of Infection

- SBP <90 mm HG or MAP < 65 mm HG
- SBP decrease > 40 mm HG from baseline
- Creatinine > 2.0 or urine output <0.5 ml/kg for 2 hours
- Bilirubin >2
- Platelet Count < 100,000
- Lactate > 2
- Coagulopathy
- Acute Lung Injury- P/F ratio <250 without pneumonia and <200 with pneumonia

Organ Dysfunction

ED

ICU
Initial Resuscitation

✓ 3 Hour Bundle
  w/n 1hr
  Measure Lactate Level
  w/n 1hr
  Blood Cultures prior to Antibiotic Administration
  w/n 3hr
  Administer Broad Spectrum Antibiotics (1B)
  Lactate Measurement—repeat if elevated

✓ 6 Hour Bundle
  Vasopressors for non-responsive hypotension with goal MAP of >65 mm HG
  Persistent Hypotension—maintain adequate CVP and central venous oxygen saturation
  Administer 30 ml/kg crystalloid for hypotension or lactate >4
<table>
<thead>
<tr>
<th>Fluid Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crystalloids recommended</strong></td>
</tr>
<tr>
<td>• Initial challenge of 30mL/Kg over first 3 hours</td>
</tr>
<tr>
<td>• Do not use Hydroxyethyl starches</td>
</tr>
<tr>
<td>• Albumin may be okay to limit total volume</td>
</tr>
<tr>
<td>• No difference in outcomes with SAFE trial</td>
</tr>
</tbody>
</table>
Vasopressors

- Maintain Mean Arterial Pressure (MAP) of 65
- **Levophed** is first line agent
  - Certain populations may need higher MAP’s
  - Superior to Dopamine
- Recent Meta-analysis: Dopamine had increased risk for mortality (RR 1.01-1.20; P=0.035)
- SSC does **not** support the routine use of Dopamine
### Hemodynamic Support and Adjunctive Therapy

#### Vasopressors Cont’d

- **Epinephrine**
  - Second line agent
- **Phenylephrine**
  - Pure Alpha
  - Decrease in stroke volume
  - Against routine use
- **Vasopressin**
  - May be used at 0.03-0.04 units per minute
  - Low dose Dopamine not recommended
- **Dobutamine** for inotropic effect
- **Steroid** use when other measures have failed
  - No stimulation test recommended
Other Supportive Therapies

- Blood Product Administration
- Mechanical Ventilation
- Sedation, Analgesia and Neuromuscular Blockade
- Glucose Control
- Renal Replacement Therapy
- Bicarbonate Therapy
- DVT Prophylaxis
- Stress Ulcer Prophylaxis
- Nutritional Support
- Establishing Goals of Care
Other supportive therapies: Detail

**Blood & Blood Product Administration**

- Transfuse when Hgb is < 7.0g/dL
  - Except in active hemorrhage, cardiac ischemia, severe hypoxemia
- Fresh Frozen Plasma (FFP) only if bleeding
- Platelets
  - When < 10,000 prophylactically
  - When < 20,000 & bleeding
  - When < 50,000 for surgery
Other supportive therapies: detail

- Ventilator ARDS patients: Use ARDSNet protocol
- Glucose control: 110-180 mg/dL
- Renal Replacement Therapy
  - Continuous & Intermittent equivalent
- Bicarbonate: Not recommended in patients with pH >7.15
- DVT & Stress Ulcer prophylaxis
- Set goals- Discuss goals w/family w/n 72 hrs
• Nutrition
  • Start enteral nutrition w/n 48hrs
  • Avoid mandatory full caloric enteral in first week
  • Use IV glucose & enteral rather than Total Parental Nutrition (TPN)
Not Recommended

- No Epogen (EPO)
- No Intravenous Immunoglobulin (IVIg)
- No Selenium
- No Activated Protein C (APC)
- No place for Pulmonary Artery (PA) Catheter
- No immunomodulation formulations
KNOW SEPSIS™ Conclusion

- Sepsis is a dysregulation of normal immune response
- Early identification and early treatment is key to success
- CMS core measures focus on the Surviving Sepsis Campaign recommendations