Surviving Sepsis in 2016

Critical Care Conference

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Surviving Sepsis Campaign

FAITH REGIONAL HEALTH SERVICES
Objectives

- Recognize sepsis and the sepsis syndromes including the pathogenesis of multiple organ dysfunction in sepsis.
- Identify the treatment recommendations in sepsis.
- Describe CMS core measures for sepsis survival
- Review patient cases, demonstrating how to meet core measures while providing real-time patient care
- Review Faith Regional sepsis mortality data over the course of mortality reduction initiative
Why Focus on Sepsis?

• Sepsis is diagnosis in over one million patients each year in the United States

• Sepsis is the leading cause of death in non-coronary care intensive care units

• Mortality rate between 30% and 50%
Why Sepsis?

- The cost to the US healthcare system for sepsis, and pneumonia grew twice as fast as the overall growth in hospital charges
  - $54 billion per year
  - Approximately 180 percent increase from 1997 to 2005

- In 2011 the treatment resulted in $20.3 billion
Why Sepsis?

- It’s common and increasing in frequency as the population age
- It’s associated with high risk of death and long length of stay
- It’s expensive
- AND.... The good new is:
We Can Make a Difference

- There are interventions proven to reduce mortality and cost

- However, these interventions are not routinely done in all settings

- Adherence to *Surviving Sepsis Campaign* bundles is an effective approach to significantly decrease mortality of patients with severe sepsis or septic shock
In 2003
- Critical care and infectious disease experts
- Representing 11 international organizations

Developed guidelines (published in 2004) for bedside care of severe sepsis and septic shock

With the objectives
- to increase awareness
- improve outcome in severe sepsis
- do so by early recognition and early therapy

Revisions in 2008

New Guideline Revisions were published in February of 2013
- 30 international organizations, 68 experts
Surviving Sepsis Campaign Responds to Sepsis-3

March 1, 2016

“...the continued successes of sepsis screening, early identification and treatment that have been the hallmark of SSC’s quality improvement efforts associated with improved survival during the preceding decade.” Surviving Sepsis Campaign

3 Step Process:

Step 1: Screening & Management of Infection
Step 2: Screening for Organ Dysfunction & Management of Sepsis*
Step 3: Identification & Management of Initial Hypotension

*Formally called Severe Sepsis
Systemic Inflammatory Response Syndrome (SIRS):

- The systemic inflammatory response to a variety of severe clinical insults:
  - Infection, pancreatitis, ischemia, multiple trauma, tissue injury, hemorrhagic shock, or immune-mediated organ injury
SIRS is manifested by **two or more** of the following conditions:

- Temperature $> 100.9$ or $< 96.8$ (>$38^\circ C$ or <$36^\circ C$)

- Heart rate $> 90$/min

- Respiratory rate $> 20$/min or $\text{PaCO}_2 < 32$ mm Hg (4.3 kPa)

- White blood cell count $> 12,000$/mm$^3$ or $< 4000$/mm$^3$ or $> 10\%$ immature bands
What other conditions can produce a systemic inflammatory response & organ dysfunction?

Non-infectious illnesses that should be considered:

**Tissue injury cause by:**
- Trauma
- Hematoma
- Venous Thrombosis
- Myocardial or pulmonary infarcts
- Transplant rejection

- Pancreatitis
- Hyperthyroidism
- Drug or Blood Product reaction
- Malignancies
- Central Nervous system hemorrhages
SEPSIS

• Greek verb root *sepo* (meaning I rot)

• Primary cause of death from infection

• Life-threatening organ dysfunction caused by a deregulated host response to infection

• A syndrome shaped by pathogen factors & host factors with characteristics that evolve over time

• Should be considered with anyone presenting with infection (presumed or documented)
Clinical Criteria to Identify Patients with Sepsis

- Hyperthermia
- Hypothermia
- Tachypnea
- Tachycardia
- Organ Dysfunction
- Confusion
- Abdominal pain
- Decrease in platelet count
- Fatigue/malaise

Other signs of Sepsis

- Leukocytosis
  - \( \text{WBC} > 12,000 \)
- Leukopenia
  - \( \text{WBC} < 4000 \)
- Hyperglycemia
  - > 140
Relationship Between Sepsis and SIRS

- INFECTION
  - Bacteria
  - Fungi
  - Viruses
  - Paracites
  - Other

- SEPSIS

- SIRS
  - Trauma
  - Burns
  - Pancreatitis
  - Other
SEPTIC SHOCK

- Serious condition that occurs when an overwhelming infection leads to life-threatening low blood pressure (MAP <65)

- Sepsis induced hypotension with acute circulatory failure resulting in persistent hypoperfusion or hypotension despite adequate fluid resuscitation.
  - But what is “adequate fluid resuscitation”? 

- Sepsis-induced hypoperfusion is defined as infection-induced hypotension, elevated lactate, or oliguria

- Underlying circulatory & cellular/metabolic abnormalities are profound enough to substantially increase mortality
Clinical Signs of Septic Shock

- Myocardial Depression
- Altered Vasculature
- Altered Organ Perfusion
- Imbalance of O₂ delivery and Consumption
- Metabolic (Lactic) Acidosis

Can affect any part of the body: brain, kidneys, liver & intestines

Symptoms:
- Cool, pale arms & legs
- High or low temperature
- Lightheadedness
- Little or no urine
- Low BP
- Palpitations, tachycardia
- Tachypnea
- Restlessness, agitation, lethargy, confusion
- Skin rash or discoloration
How do you figure the MAP?

Look at the automatic machine

\[ \text{MAP} = (\text{DBP} \times 2) + \text{SBP} \div 3 \]

Example:

- Map of 120/56 is 77
  \[ 77 = (56 \times 2) + 120 \div 3 \]
- What is the MAP of 92/36

- What is the MAP of 106/40

What is the MAP goal?
Multiple Organ Dysfunction Syndrome (MODS)

- The presence of altered organ function in an acutely ill patient such that homeostasis cannot be maintained without intervention.
- It is a process rather than an event.
- Alteration in organ function can vary from a mild degree of organ dysfunction to completely irreversible organ failure.

- Has major clinical impact......WHY???

  - Patients Die
Stages of Sepsis

- **SIRS**
  - Two or more of the following:
    - Temperature > 100.9 or < 96.8
    - Heart rate > 90 beats per minute
    - Respiratory rate > 20 breaths per minute or PaCO2 < 32mmHg
    - White blood cell count > 12,000/cu mm, < 4,000/ cu mm, or > 10% band forms

- **Sepsis**
  - SIRS plus a presumed or culture-documented infection
  - Organ dysfunction, hypotension, or hypoperfusion (including but not limited to lactic acidosis, oliguria, or acute mental status changes)

- **Septic Shock**
  - Hypotension (despite fluid resuscitation) plus hypoperfusion that required vasopressor support

- **MODS**
From Infection to Septic Shock

- Begins with a major insult to the body
  - a perforated bowel, that causes infection
- Bacteria enter the bloodstream
  - Endotoxins on the bacterial cell wall stimulate an immune response
  - Neutrophils mediate cellular changes
- The invading pathogenic microorganism stimulates the release of cytokines, such as interleukin-1
  - Cytokines trigger an exaggerated inflammatory response
    - Cause vasodilatation & erosion of blood vessel endothelium & capillary leakage begins
      - Fluid leaks from the circulation into the interstitial tissue
      - A decrease in intravascular volume results in hypotension
      - Causes fluid to build in organs
From Infection to Septic Shock (continued)

- Inadequate tissue perfusion leads to cellular hypoxia and lactic acidosis
- Blood vessel damage triggers the coagulation cascade, micro thrombi form, impeding blood flow
  - Decrease tissue perfusion leading to hypoxia of the heart, kidneys & brain
  - Heart doesn’t pump well---hypotension
  - Brain swells---increased ICP
  - Death can occur rapidly
1. The development of sepsis begins with a major assault on the body, such as the perforated bowel pictured here, that causes infection.

2. Bacteria enter the bloodstream, where endotoxins on the bacterial cell wall stimulate an immune response, which involves the release of pro-inflammatory cytokines such as interleukin-1. Such chemical mediators cause vasodilation and erosion of blood vessel endothelium, and capillary leakage begins (2a). Damage in the blood vessels triggers the coagulation cascade; microthrombi form, impeding blood flow (2b).

2a. Capillary leakage causes fluid accumulation in a variety of organs. In the lung, for example, oxygen-carrying red blood cells and fluid accumulate in the alveoli, slowing gas exchange.

2b. The resulting decrease in tissue perfusion leads to tissue ischemia and hypoxia of the lungs, the heart, the kidneys, and the brain. The heart doesn’t pump efficiently, causing hypotension; brain swelling causes increased intracranial pressure, influencing all parts of the brain, including those governing breathing and heart rate; renal and respiratory failure may also occur. Death can result rapidly.
Who is at risk?

- But more likely the following populations:
  - Hospitalized patients
  - The very young or very old
  - Compromised immune system
  - Are already very sick and often in hospital
  - Wounds or injuries (burns, car crash, bullet)
  - Have certain addictive habits (alcohol or drugs)
  - More prone to develop sepsis due to their genes

751,000 New Cases Each Year
More People at Risk

- Patients admitted with serious disease are at highest risk at developing sepsis because of...
  - Underlying disease, comorbid factors
  - Previous use of antibiotics
  - Presence of drug-resistant bacteria in the hospital, nosocomial
  - Presence of tube for treatment (IVs, urinary catheter, wound drainage)
  - Community-acquired infections
  - >65 y/o and Male
Why is Sepsis Important?
Sepsis & Septic Shock

- Major cause of morbidity and mortality worldwide.
  - Leading cause of death in non coronary ICU.
  - 11th leading cause of death overall.
- More than 751,000 cases of severe sepsis in US annually.
- In the US, more than 750 patients die of severe sepsis daily.

Fact: More Americans die each year from SEPSIS than either Heart Attack or Stroke.
Fact: More Americans die each year from **SEPSIS** than either Heart Attack or Stroke

Sepsis Kills

CDC Data
Screening Tool

- **Sepsis is a medical emergency and needs identified and treated rapidly!**
- ED patients
- Every patient
  - Every Unit
    - Every Shift
  & PRN
### Early Identification: Sepsis Screening Tool: 3 Questions

#### Evaluation for Sepsis Screening Tool - Adult

**Severe Sepsis = Infection + SIRS + Organ Dysfunction**

1. **Does the patient have a current presumed (based on signs/symptoms) or documented infection?**

- [ ] Pneumonia
- [ ] Empyema
- [ ] Acute abdominal infection (N/V/D)
- [ ] Urinary tract infection
- [ ] Skin/soft tissue infection
- [ ] Bone/Joint infection
- [ ] Bloodstream catheter infection
- [ ] Wound infection
- [ ] Endocarditis
- [ ] Implantable device infection
- [ ] Meningitis
- [ ] Other - see comment below

**Comment:**

If any ONE of the above under #1 is present, select YES:

- [ ] Yes
- [x] No
Early Identification:  
Sepsis Screening Tool: 3 Questions

2. Are any two of the following signs & symptoms of infection both present and not considered to be chronic?

Note: Laboratory values may not be available. Solicit order from MD if needed.

**SIRS Criteria**

- [ ] Tachycardia (greater than 90 bpm)
- [ ] Tachypnea (greater than 20 bpm)
- [ ] Leukopenia (WBC less than 4 tho/cmm)
- [ ] Leukocytosis (WBC greater than 12 tho/cmm)
- [ ] Hypothermia (less than 96.8 F, 36C)
- [ ] Bands (% Band) greater than 10 %
- [ ] Hyperthermia (greater than 100.9 F, 38C)

**Other Signs/Symptoms**

- [ ] Acutely altered mental status
- [ ] Hyperglycemia (serum glucose greater than 140 mg/dL in absence of diabetes)

If TWO OR MORE of the above under #2 are present, select YES:

- [ ] Yes
- [ ] No
3. Are any of the following organ dysfunction criteria present and not considered to be chronic or a result of therapy?

- SBP less than 90 mmHg or MAP less than 65 mmHg
- SBP decrease greater than 40 mmHg from baseline
- Bilateral pulmonary infiltrates with a new (or increased) oxygen requirement to maintain SpO2 greater than 90%
- Bilateral pulmonary infiltrates with PaO2/FiO2 ratio less than 0.5 ml/kg/hr for greater than 2 hours
- Creatinine greater than 2.0 mg/dL or Urine output less than 0.5 ml/kg/hr for greater than 2 hours
- Bilirubin greater than 2 mg/dL
- Platelet count less than 100,000
- Coagulopathy (INR greater than 1.5 or PTT greater than 60 seconds)
- Lactate greater than 2 mmol/L
- Invasive mechanical ventilation
- Non-invasive mechanical ventilation

If any ONE of the above under #3 is present, select YES:

- Yes
- No
TRIAGE GUIDELINES:

* If YES to all 3 items above, patient meets the criteria for possible SEVERE SEPSIS. Arrange transfer to IMCU/ICU
  - Arrange transfer to IMCU/ICU
  - Call an RRT and/or notify the physician immediately
* If 2/4 SIRS criteria in #2 and Yes to #1, Flag & watch closely for Sepsis
* If 3 SIRS criteria in #2 and Yes to #3, arrange transfer to IMCU/ICU.

Lots more samples at www.survivingsepsis.org
Robson Pre-hospital screening tool

- Patient is considered septic if any 2 of the following are met:
  - Temperature > 38.3 degrees C (100.9 degrees F) or < 36.0 degrees C (96.8 degrees F)
  - Heart rate > 90 Beats per minute
  - Respiratory rate > 20 Breaths per minute
  - Acutely altered mental status
  - Serum glucose < 120 mg/dL or 6.6 mmol/L.

- Some pre-hospital services are performing POC and calling Code Sepsis

- EtCO2 levels is inversely proportional to serum lactate levels in the ED with suspected sepsis
  - EtCO2 measurement of ≤ 25 mmHg is strongly correlated with lactate levels > 4 mmol/L in the setting of suspected sepsis, and therefore may be useful as an objective measure for tissue hypoperfusion.
So now what?

Therapy For Sepsis
Time Sensitive Interventions

- Code STEMI – “Time is Muscle”
- Code Trauma – “The Golden Hour”
- Code Stroke – “Time is Brain”

- Code Sepsis - “Time is Tissue”
Treating Severe Sepsis & Septic Shock using the 6 Resuscitation Bundle Components

1. **Serum Lactate** measured. Repeat within 6 hours of initial sepsis symptom presentation
2. **Blood cultures** prior to antibiotic administration
3. **Antibiotics**-broad-spectrum, within 1 hour of recognition/ED admit (delay increase mortality)
4. **Initial fluid bolus** of minimum of 30 ml/kg IV fluid, may need to repeat if no response in BP (a portion of this may be albumin equivalent)
   - Albumin is suggested in the fluid resuscitation of sepsis & septic shock when patients require substantial amount of crystalloids
5. **Administer Vasopressors**--if MAP is < 65 after adequate fluid resuscitation then add:

- Norepinephrine (Levophed) is **1st choice** to maintain MAP > 65.
- Then add epinephrine when an additional agent is needed to maintain adequate BP.
- Vasopressin 0.03units/min can be added to norepinephrine to either raise MAP to target or to decrease norepinephrine dose, but should not be used as initial vasopressor.
  - **Avoid Dopamine** Only recommended in highly selected patients whose risk for arrhythmias was felt to be very low & who had a low heart rate and/or cardiac output.
6. **CVP, ScvO2, & SvO2:**
   - If have **persistent hypotension** despite fluid resuscitation (septic shock) and/or **lactate >4 mmol/L** maintain adequate central venous pressure & central venous oxygen saturation.

   - Achieve a central venous pressure (CVP) of >8 mm Hg

   - Achieve a central venous oxygen saturation (ScvO2) > 70% or mixed venous oxygen saturation (SvO2) > 65%
Bundles

The Surviving Sepsis Campaign Care Bundles are the core of the sepsis improvement efforts.

SURVIVING SEPSIS CAMPAIGN BUNDLES

TO BE COMPLETED WITHIN 3 HOURS:
1) Measure lactate level
2) Obtain blood cultures prior to administration of antibiotics
3) Administer broad spectrum antibiotics
4) Administer 30 ml/kg crystalloid for hypotension or lactate ≥4 mmol/L

TO BE COMPLETED WITHIN 6 HOURS:
5) Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation) to maintain a mean arterial pressure (MAP) ≥65 mm Hg
6) In the event of persistent arterial hypotension despite volume resuscitation (septic shock) or initial lactate ≥4 mmol/L (36 mg/dL):
   -- Measure central venous pressure (CVP)*
   -- Measure central venous oxygen saturation (ScvO2)*
7) Remeasure lactate if initial lactate was elevated*

*Targets for quantitative resuscitation included in the guidelines are CVP of ≥8 mm Hg; ScvO2 of ≥70%, and normalization of lactate.
Sepsis is now a CMS Core Measure!
Sepsis Core Measures

- Began July 2015, with adjustments in 2016

- CMS’s goal for core measures are:
  - To decrease organ failure
  - Overall reduce hospital mortality
  - Decrease length of stay
  - Decrease costs of care
Sepsis Core Measures

Inclusion criteria:

- > 18 years of age
- ICD-10 principle or other Dx code of Sepsis, Severe Sepsis, or Septic Shock

Exclusion criteria:

- Patients with comfort or palliative care order within 3 hours of presentation of severe sepsis, and 6 hours of septic shock
- Transfer-in from another facility
- Patients with severe sepsis who die within 3 hours of presentation, or with septic shock who die within 6 hours of presentation
- Patients receiving IV antibiotics for more than 24 hours prior to presentation of severe sepsis
**#1. Could your patient have an infection?**

2 SIRS + 1 organ dysfunction = Sepsis

<table>
<thead>
<tr>
<th><strong>#2. SIRS Criteria (2 or more)</strong></th>
<th><strong>#3. Organ Dysfunction (any one)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp &gt; 100.9 F (38.3C)</td>
<td>SBP &lt; 90</td>
</tr>
<tr>
<td>Temp &lt; 96.8 F (36C)</td>
<td>MAP &lt; 65</td>
</tr>
<tr>
<td>Heart Rate &gt;90/min</td>
<td>SBP decrease &gt; 40 from known baseline</td>
</tr>
<tr>
<td>Respiratory Rate &gt;20/min</td>
<td>Creatinine &gt; 2.0</td>
</tr>
<tr>
<td>WBC &gt; 12,000</td>
<td>UOP &lt; 0.5mg/kg/hr for 2 hours</td>
</tr>
<tr>
<td>WBC &lt; 4,000</td>
<td>Bilirubin &gt; 2mg/dL</td>
</tr>
<tr>
<td>&gt;10% bands</td>
<td>Platelet count &lt;100,000</td>
</tr>
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<td></td>
<td>INR &gt;1.5 or a PTT &gt;60 sec</td>
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<td>Lactate &gt; 2 mmol/L</td>
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<tr>
<td></td>
<td>Invasive or non-invasive mechanical ventilation</td>
</tr>
</tbody>
</table>
If severe sepsis present and initial Lactate < 4.0, assess patient for shock and need for vasopressor after initial fluid bolus.

<table>
<thead>
<tr>
<th>Within 3 hours of Presentation of Symptoms of Severe Sepsis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure Lactate (if lactate &gt; 4, follow shock algorithm)</td>
</tr>
<tr>
<td>Blood Cultures drawn prior to antibiotics</td>
</tr>
<tr>
<td>Antibiotics administered</td>
</tr>
<tr>
<td><strong>Crystalloid fluid 30ml/kg (LR or NS) for any one organ dysfunction including hypotension (document chronic organ dysfunction)</strong></td>
</tr>
</tbody>
</table>
Within 6 hours of Presentation of Symptoms of Severe Sepsis

1. Repeat Lactate if initial Lactate is > 2.0

2. Assess patient for persistent hypotension 1 hour following fluid completion.
   - If hypotension persists in the hour following fluid bolus as evidenced by two consecutive readings of either SBP < 90, MAP < 65, or decreased SBP > 40mmHg, and if shock state is due to sepsis, administer vasopressor AND document one of the options below for tissue perfusion.
   - If shock not due to sepsis, document etiology of shock in chart and correct the underlying cause. (Pt may still benefit from continued fluid bolus and/or vasopressor).
   - When initial lactate > 4.0 must document Option 1 or 2 Tissue Perfusion exams after fluid bolus (even if vasopressor not initiated).
Within 6 hours of Presentation of Symptoms of Severe Sepsis

Option 1: Focus exam documented by MD/APRN/PA
- Vital Signs (T, P, R, BP)
- Cardiopulmonary Exam (heart & lungs)
- Capillary Refill Evaluation
- Peripheral pulse Evaluation
- Skin Examination (reference to color)

OR

Option 2: Any 2 of the following documented by MD/APRN/PA
- Central Venous Pressure measurement
- Central Venous Oxygen measurement
- Bedside Cardiovascular Ultrasound
- Passive Leg Raise or Fluid Challenge

Documentation for Tissue Perfusion can be found in EMR Septic Shock Order Set & must be documented within 6 hours of presentation of symptoms.
Accepted Antibiotic Choices for Sepsis/Septic Shock per CMS

- **Monotherapy:**
  - Ertapenem/Imipenem/Meropenem
  - Cefotaxime/Ceftazidime/Ceftriaxone/Cefepime
  - Levaquin
  - Unasyn
  - Zosyn

- **Combination:**
  - Aminoglycosides or Aztreonam or Cipro +
  - Ancef or Clindamycin or Daptomycin or Vancomycin or Linezolid or Macrolide or PCN
Determining Sepsis vs Septic Shock

- Documentation of **TIME** is crucial!
  - Must know **time patient presented with symptoms**
  - Must know when **first lactate was drawn and result**
  - Must know when **30ml/kg fluid bolus started and ended**

- **Within one hour after 30ml/kg fluid bolus**, provider must determine if patient requires vasopressor or not, and this must occur **within 6 hours of the patient arrival time**
Other causes of low SBP/MAP readings not due to septic shock:

- Hypovolemia
- Hemorrhage shock
- Cardiogenic shock
- Sedation required for intubation
- Drug overdose
- Erroneous reading due to malfunctioning cuff/arterial line
Other causes for lactic acidosis:

- **Type A Lactic acidosis:** Marked tissue hypoperfusion caused by hypovolemia, cardiopulmonary failure, or cardiac arrest. Concurrent respiratory acidosis also contributes.

- **Type B Lactic acidosis:** occurs in patients without overt systemic hypoperfusion. Causes include toxin-induced impairment of cellular metabolism, regional areas of tissue ischemia, high levels of metformin, tumor lactic acidosis, alcoholism, and drug-induced mitochondrial dysfunction in HIV-infected patients.

- **Type D Lactic acidosis:** an unusual form of metabolic acidosis that occurs in patients with short bowel syndrome or other forms of malabsorption. It may also develop in patients with diabetic ketoacidosis.
How EMRs can help us:

- **Sepsis Orderset use**
  - First lactate ordered in orderset triggers a second lactate order
  - If orderset not used, must enter time 2nd lactate must be drawn STAT so assessed before 6 hours

- **Focused exam**
  - Found within Sepsis orderset
  - Provides easy way to document focused exam so important points are not missed in dictation
Sepsis Order Sets

- Build order sets to reflect the SCC guidelines for mortality reduction.

www.survivingsepsis.org
Case study

- 75 y/o male admitted to the ED with sx of malaise, SOB, nausea and vomiting. Weight is 135kg
- Arrival time is 1200
- Triage notes initial VS: temp 100.8, 80/40 (60) – 110-26.
- O2 sat on RA 88% so 3L O2 applied with increased sats
- Pt lethargic/sleepy but arouses and answers questions
- Initial CXR = RUL consolidation with diffuse infiltrates
- Labs drawn: WBC 11.8, hgb 15.0, Cr 3.5, BUN 50, Lactate 4.2 
  (lab result time was 1300)
Case Study, continued

- SIRS criteria positive:
  - Elevated HR and RR, multiple organ dysfunctions present
- Possible source of infection = pneumonia, possible gastritis
- **Severe sepsis with septic shock present:**
  - **Source of infection and initial lactate > 4.0**
  - Blood cultures x 2 drawn
  - Fluid bolus of 30ml/kg started at **1330**
  - Antibiotics of Vancomycin and Zosyn were initiated
- Patient becomes more lethargic and tachypnic, not arousing as readily.
- ABG drawn: 7.18-52-60-80%-15-14
Case Study, continued

- Decision is made to intubate patient in ED; sedation given for intubation
- Patient is transferred to ICU at 1500

- Receiving provider must know where we are with amount of fluid bolus given!
- ED to ICU nursing report states 3 of 4 liters given so far
- Start 2\textsuperscript{nd} line to give 4\textsuperscript{th} Liter NS—completed at 1600
Case Study, continued

- Timing review:
  - Pt arrived and triaged at **1200**
  - Severe sepsis determined and fluid bolus started **1330**
  - Initial lactate resulted at **1300**
  - Fluid bolus completed at **1600**
  - *Must draw 2nd Lactate for review prior to **1800**
  - *Must do focused exam/document prior to **1800**
  - *Vasopressors if needed must be prior to **1800**
Focused exam documented at 1630: (2 scenarios)

- 2 consecutive MAP readings were 58 and 56, but due to propofol; Propofol stopped and changed to Versed with MAP recovery to > 65 consistently with continued IV fluids so vasopressor not initiated. *above low bps due to propofol must be documented as reason vasopressor not started*

- Following 30ml/kg fluid bolus MAP remained < 65 consistently, so central line placed and levophed drip initiated

Second Lactate drawn at 1700:

- If result is < 4.0 and bps are stable with IVF, no need for vasopressor, as patient responded to fluid resuscitation
- If result remains > 4.0 but bps stable after fluids, is there another cause for lactic acidosis?
CASE STUDY #2

• 55 y/o to ED at 0658 via EMS w/ altered mental status, backboard, c-collar, no recall of last NOC’s events, did have N/V/D day before came to ED. Woke outside.
• Triage VS: 97.8-55-14- 81/51(51)-91% RA
• No PMH, hx schiz, not taking meds
• VS 07:50
  • T. 101.1  P 121 BP 71/42 R 30-92% O2 @ 4L
• Weight is 70 Kg
**Labs @ 0755**
- BUN 40
- Cr 2.1
- Bili 0.6
- Liver enzymes elevated
- Lactate 4.6
- ETOH <3
- WBC 6.0
- Platelets 97
- Trop 2.240
- INR 1.65  PT 17.1
- Blood Culture
- UA

**Other tests:**
- CXR: elevated rt hemidiaphragm, otherwise negative
- Head CT: negative
- EKG: Sinus tachy, ST Depression

Does this patient screen in positive for possible Severe Sepsis?

1. Infection?
2. Any 2 present of the S/S of infection?
3. Organ dysfunction criteria present?
**VS:**
- 0815 P 124, 80/58(62)
- 0830 P 122 BP 74/51(55)
- 0845 P 121 BP 70/45(50)
- 0900 P 125 BP 86/45(54)
- 0930 P 121 BP 76/45(51)
- 1000 P 119 BP 69/43(49)
- 1030 P 145 BP 69/31(40)

**Treatment:**
- NS 1L bolus at 0715, 0838, 0913 @ 500ml/hr (2100ml total)
- 0915 Zozyn IV
- 1000 Levaquin IV
- 1013 Levophed started, BP 63/34(44)
- ASA
- Tylenol
- Abluterol Neb
- O2 continues
Disposition

- Admitted to ICU at 1019
- ED MD dx of septic shock, renal failure, + cardiac enzymes, elevated liver enzymes
- ICU placed central line, art line; Levophed continued; gave 4 more L. NS
- Vanc was added
- Blood culture + for E. Coli, enterococcus & Klebsiella
- US Gallbladder: acute cholecystitis

**Pt discharged home on 11/8/2012**
## Signs of infection and sepsis at home

Common infections can sometimes lead to sepsis. Sepsis is a deadly response to an infection.

<table>
<thead>
<tr>
<th></th>
<th><strong>Green zone</strong></th>
<th><strong>Yellow zone</strong></th>
<th><strong>Red zone</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Are there changes in my heartbeat or breathing?</strong></td>
<td>No signs of infection.</td>
<td>My heartbeat is faster than usual. Breathing is a bit more difficult and faster than usual.</td>
<td>Heartbeat is very fast. Breathing is very fast.</td>
</tr>
<tr>
<td><strong>Do I have a fever?</strong></td>
<td>I have not had a fever in the past 24 hours and I am not taking medicine for a fever.</td>
<td>Fever between 100°F to 101.4°F.</td>
<td>Fever is 101.5°F or greater.</td>
</tr>
<tr>
<td><strong>Do I feel cold?</strong></td>
<td>I do not feel cold.</td>
<td>I feel cold and cannot get warm. I am shivering or my teeth are chattering.</td>
<td>Temperature is below 96.8°F. Skin or fingernails are pale or blue.</td>
</tr>
<tr>
<td><strong>How is my energy?</strong></td>
<td>My energy level is as usual.</td>
<td>I am too tired to do most of my usual activities.</td>
<td>I am very tired. I cannot do any of my usual activities.</td>
</tr>
<tr>
<td><strong>How is my thinking?</strong></td>
<td>Thinking is clear.</td>
<td>Thinking feels slow or not right.</td>
<td>My caregivers tell me I am not making sense.</td>
</tr>
<tr>
<td><strong>Are there changes in how I feel after a hospitalization, procedure, infection, or change in wound or I.V. site?</strong></td>
<td>I feel well. I had pneumonia, a urinary tract infection (UTI) or another infection. I had a wound or I.V. site. It is healing.</td>
<td>I do not feel well. I have a bad cough. My wound or I.V. site looks different. I have not urinated (peed) for 5 or more hours. When I do urinate (pee) it burns, is cloudy or smells bad.</td>
<td>I feel sick. My wound or I.V. site is painful, red, smells or has pus.</td>
</tr>
</tbody>
</table>

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My plan for preventing infection at home

Things I can do to prevent infection:

☐ Wash my hands often, using soap and water, especially after touching door knobs

☐ Stay away from people who have coughs or colds. Stay away from crowds unless your doctor says it’s OK

☐ Get recommended vaccines (shots) like flu, whooping cough and pneumonia

☐ Eat healthy foods and drink water

☐ Keep my wounds or I.V. site clean

☐ Have a plan for getting help when I am in the yellow zone

Look for signs of infection:

• Do a daily check up using this stoplight form

• Report any signs of an infection in the yellow right away!

• Watch for sepsis. Sepsis is a very dangerous response to an infection by your body. Sepsis can lead to tissue damage, organ failure and death. Any one of the signs in the red zone can be a sign of sepsis. Tell your doctor “I am concerned about sepsis.”

How I will do these things:

Your care team will work with you to set goals so you can stick to your plan.
NURSING RESPONSIBILITY IN REDUCING SEPSIS RELATED MORTALITY

- Nursing is in a key position to help prevent and recognize sepsis and septic shock
  - Maintain compliance with hand washing and sterile technique
  - Be alert for sepsis and septic shock
  - Use the screening tool to help identify patients with possible sepsis or septic shock
  - Notify the physician if sepsis or septic shock is suspected
  - Begin the Resuscitation Bundle elements: fluids and antibiotic
Why are nurses in the best position to make a difference?

- Main caregivers in the hospital setting
- Able to recognize changes in patient’s clinical condition
- Partners with providers
- Coordinates of care
Delay in recognition or treatment of *sepsis* and *septic shock* increases risk of death.
Timeline of Sepsis Initiative

- February 2011—Sepsis Committee formed at the recommendation of Critical Care Committee
- July-September 2011—Education to physicians & other providers, nursing staff, RT, pharmacy, etc.
- October 2011—Order sets created, sepsis screening tool began
- In 2012-2013—FRHS had half the mortality
- April 2014—Dr. Chaudry presents sepsis at the Critical Care Conference
- 2014 Revisions to Screening tool and order sets, education to CAH
- October 2015—CMS core measure on Sepsis
FRHS Sepsis Data:

- **Septic Shock Mortality**
  - 2011-46% (20 patients)
  - 2012-24% (8 patients)
  - 2013-22% (19 patients)
  - 2014-16% (10 patients)
  - 2015-14% (19 patients)
  - 2016-18% (12 patients)
Overall Mortality: Sepsis, Severe Sepsis & Septic Shock
PRIORITY FIRST INTERVENTIONS

- Fluids
- Lactate
- Blood cultures
- Antibiotics
Questions
Thank You

Autumn is a second spring when every leaf is a flower.