Understanding the Latest Sepsis Guidelines – Case Presentation

Presented by:
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I have no disclosures
Objectives:

• Discuss the epidemiology of severe sepsis & its implications.
• Explain the 2016 Third International consensus definitions for sepsis and septic shock.
• Discuss the sepsis bundles.
• Explore the new phase IV of the surviving sepsis campaign.
• Using a case presentation explain the 2016 surviving sepsis campaign guidelines for the management of sepsis and septic shock.
Leading cause of death in noncoronary ICU in the US

- Estimated more than 1 million cases of severe sepsis in the US annually
- In the US, more than 500 patients die of severe sepsis daily
- High mortality rate of 28 to 50%
- Costs an average of $22,000 per patient with a total cost of $20.3 billion to US hospital
The Response: Surviving Sepsis Campaign

The Society of Critical Care Medicine (SCCM), European Society of Intensive Care Medicine (ESICM), & International Sepsis Forum (ISF) joined forces to develop a three phase Surviving Sepsis Campaign.
Surviving Sepsis Campaign Guidelines

A campaign developed by 11 organizations made up of international critical care and infectious disease experts.


Severe Sepsis

- It is a disease of the microcirculation
- Patients in septic shock have persistent microcirculatory alterations which lead to associated organ failure and death
- Therefore, microvascular recruitment and not just global hemodynamic resuscitation should be targeted.

The sublingual microcirculation during septic shock and resuscitation
History of present illness:

- 50 y.o. Caucasian male seen in the ED
- C.C.: several day history of hematemesis & melena.
- Other associated manifestations included weakness, dizziness, & anorexia.
- Three days ago, he saw his PCP with a C.C. of bilateral leg pain. He was given narcotics for presumptive peripheral neuropathy
## Medical History

<table>
<thead>
<tr>
<th>Past Surgical History:</th>
<th>Medications:</th>
<th>Social History</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemorroidectomy</td>
<td>Nasarel</td>
<td>Married with 2 children, Ages 14 &amp; 21</td>
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<tr>
<td></td>
<td>Claritin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roxicet</td>
<td>Occupation: Unemployed (recently laid off)</td>
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<tr>
<td></td>
<td>ASA</td>
<td>ETOH: a bottle of wine &amp; Several beers</td>
</tr>
<tr>
<td>Past Medical History</td>
<td>Advil</td>
<td>Tobacco: Neg</td>
</tr>
<tr>
<td>Right Rib Fracture</td>
<td>Codeine</td>
<td>Drugs: Neg</td>
</tr>
<tr>
<td>Seasonal Allergies</td>
<td>Tylenol</td>
<td></td>
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<tr>
<td>Hepatitis C</td>
<td></td>
<td></td>
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<tr>
<td>Liver Cirrhosis</td>
<td></td>
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<tr>
<td>ETOH Abuse</td>
<td></td>
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</tbody>
</table>
On admission:

**Vital Signs** – T 36.5 C, P 104, RR 22, B/P 91/57

**General** – 71 kg, Moderate distress, A&O x3

**HEENT** – Scleral icterus

**Musculoskeletal** – 2+ edema bil. Lower extremities. Sl. Erythema, warm & tender to palpation esp. both feet

**Skin** – spider angioma, mild jaundice

**Abdomen** – Mildly distended, nontender, normoactive bowel sounds
Does this patient have an anion gap metabolic acidosis?

Anion gap is the difference between cations and anions. Normal is 8-16. 132-(97+17) = 18

For every 1 gm decrease of Albumin from normal (4gm), add 2.5 to the anion gap.

4-2.5=1.5 x 2.5 = 3.75 + 18 = 21.75 (actual anion gap)

What are the 2 most common causes of anion gap metabolic acidosis in the acute care?

Na⁺ 132  BUN 54
K⁺ 3.9  Cr 1.8
Cl⁻ 97  Glucose 118
HCO₃⁻ 17  Albumin 2.5
10/12 - 1211

AST 103  AØ 66  TP 6.1  Mg 1  Ca 8.1
ALT 96  BT 1.8  Alb 2.5  Amylase 37
Lipase 150  Ammonia 5  Acetaminophen neg
ETOH neg
What is contributing to this neutropenia?

Does he have sepsis?
ACCP/SCCM Consensus Definitions

**Infection**
- Inflammatory response to microorganism, or
- Invasion of normally sterile tissues

**Systemic Inflammatory Response Syndrome (SIRS)**
- Systemic response to a variety of processes

**Sepsis**
- Infection plus
- 2 SIRS criteria

**Severe Sepsis**
- Sepsis
- Organ dysfunction

**Septic shock**
- Sepsis
- Hypotension despite fluid resuscitation

**Multiple Organ Dysfunction Syndrome (MODS)**
- Altered organ function in an acutely ill patient
- Homeostasis cannot be maintained without intervention

The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)
## Sepsis 2.0 vs Sepsis 3.0

<table>
<thead>
<tr>
<th>Sepsis 2.0</th>
<th>Sepsis 3.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIRS</td>
<td>Eliminated</td>
</tr>
<tr>
<td>Sepsis</td>
<td>New definition</td>
</tr>
<tr>
<td>Severe sepsis</td>
<td>Eliminated</td>
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</tbody>
</table>
Sepsis – life threatening organ dysfunction caused by a dysregulated host response to infection.

Lay definition: life threatening condition that arises when the body’s response to an infection injures its own tissues and organs.

Organ dysfunction – an acute change in total SOFA (Sequential sepsis related Organ Failure Assessment) score ≥ 2 points consequent to the infection.

Estimated SOFA 2 or more had an overall mortality risk of approximately 10% in a patient with presumed infection.

<table>
<thead>
<tr>
<th>System</th>
<th>Score</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Respiration</td>
<td></td>
<td>≥400 (53.3)</td>
<td>&lt;400 (53.3)</td>
<td>&lt;300 (40)</td>
<td>&lt;200 (26.7) with respiratory support</td>
<td>&lt;100 (13.3) with respiratory support</td>
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<tr>
<td></td>
<td>Pao$_2$/FiO$_2$, mm Hg (kPa)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Coagulation</td>
<td></td>
<td>≥150</td>
<td>&lt;150</td>
<td>&lt;100</td>
<td>&lt;50</td>
<td>&lt;20</td>
</tr>
<tr>
<td></td>
<td>Platelets, ×10$^3$/μL</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Liver</td>
<td></td>
<td>&lt;1.2 (20)</td>
<td>1.2-1.9 (20-32)</td>
<td>2.0-5.9 (33-101)</td>
<td>6.0-11.9 (102-204)</td>
<td>&gt;12.0 (204)</td>
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<tr>
<td></td>
<td>Bilirubin, mg/dL (μmol/L)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiovascular</td>
<td></td>
<td>MAP ≥70 mm Hg</td>
<td>MAP &lt;70 mm Hg</td>
<td>Dopamine &lt;5 or dobutamine (any dose)$^b$</td>
<td>Dopamine 5.1-15 or epinephrine ≤0.1 or norepinephrine ≤0.1$^b$</td>
<td>Dopamine &gt;15 or epinephrine &gt;0.1 or norepinephrine &gt;0.1$^b$</td>
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<td></td>
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<td></td>
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<tr>
<td>Central nervous system</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Glasgow Coma Scale score$^c$</td>
<td>15</td>
<td>13-14</td>
<td>10-12</td>
<td>6-9</td>
<td>&lt;6</td>
</tr>
<tr>
<td>Renal</td>
<td></td>
<td>&lt;1.2 (110)</td>
<td>1.2-1.9 (110-170)</td>
<td>2.0-3.4 (171-299)</td>
<td>3.5-4.9 (300-440)</td>
<td>&gt;5.0 (440)</td>
</tr>
<tr>
<td></td>
<td>Creatinine, mg/dL (μmol/L)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Urine output, mL/d</td>
<td></td>
<td></td>
<td></td>
<td>&lt;500</td>
<td>&lt;200</td>
</tr>
</tbody>
</table>

Abbreviations: FiO$_2$, fraction of inspired oxygen; MAP, mean arterial pressure; Pao$_2$, partial pressure of oxygen.

$^a$ Adapted from Vincent et al.$^{27}$

$^b$ Catecholamine doses are given as μg/kg/min for at least 1 hour.

$^c$ Glasgow Coma Scale scores range from 3-15; higher score indicates better neurological function.
Septic Shock

Subset of sepsis in which underlying circulatory and cellular/metabolic abnormalities are profound enough to substantially increase mortality.

Patients with persistent hypotension requiring vasopressors to maintain MAP ≥65 mmHg and having a serum lactate > 2 despite adequate volume resuscitation.

Mortality is in excess of 40%
Eliminated the term severe sepsis – felt to be superfluous

Current use of the 4 SIRS criteria to identify sepsis was unanimously considered by the task force to be unhelpful

- SIRS do not necessarily indicate a dysregulated, life threatening response
- Studies in Australia and New Zealand showed 1 in 8 infected ICU patients with new organ dysfunction did not have 2 SIRS yet had protracted course with significant morbidity, mortality*

Controversies and Limitations

Neither SOFA or qSOFA are meant to be stand alone definitions of sepsis. Failure to meet 2 or more criteria should not lead to a deferral of investigation or treatment of infection.

Because lactate measurement offered no meaningful change in the predictive validity beyond 2 or more qSOFA criteria in the identification of patients likely to be septic, the task force could not justify the added complexity and cost alongside the simple bedside criteria.

Should not constrain the monitoring of lactate as a guide to therapeutic response or as an indicator of illness severity.

CMS and coders have not caught up to the new definitions
The baseline Sequential (Sepsis-related) Organ Failure Assessment (SOFA) score should be assumed to be zero unless the patient is known to have preexisting (acute or chronic) organ dysfunction before the onset of infection. qSOFA indicates quick SOFA; MAP, mean arterial pressure.
Diagnosis: Sepsis
What are the interventions?
What unit are you going to admit the patient to?
Unit Admission Orders

Admitted to the Medical Unit at 1700 with UGIB
Orders:
Normal saline 125ml/hr
Protonix 40 mg IV daily
MVI, Thiamine, Folate
Magnesium sulfate 2 gm
Ativan
ETOH withdrawal observation
US abdomen to R/O ascites
H&H q4h
GI Consult
10/12 - 2300

Vitals: T37.4 HR 120 RR 60 B/P 76/32

Patient ‘s condition begins to deteriorate. Neuro: more confused & disoriented.

Lungs: good breath sounds w/rapid kussmaul breathing

Abdomen: Hypoactive

Extremities: edematous, mottled, only dopplerable post. Tibialis pulses
Interpret the basic metabolic panel.

Does the patient have an anion gap metabolic acidosis?

What is contributing to the metabolic acidosis?

Interpret the blood gases.
Surviving Sepsis Campaign Recommendations

Early Recognition & Initial Resuscitation

- Sepsis & septic shock are medical emergencies. Treatment & resuscitation begin immediately.

- Further hemodynamic assessment are needed to determine type of shock if not clinically evident

- Resuscitation should continue until lactate are normalized

Surviving Sepsis Campaign Recommendations

Early Recognition & Initial Resuscitation

- In the resuscitation from sepsis-induced hypoperfusion, at least 30 mL/kg of IV crystalloid fluid be given within the first 3 hours
- Dynamic rather than static variables be used to predict fluid responsiveness
Surviving Sepsis Campaign Recommendations

 screenings for sepsis & Performance Improvement

 Hospitals and hospital systems should have a performance program for sepsis, including sepsis screening for acutely ill, high risk patients
Surviving Sepsis Campaign Recommendations

Diagnosis

- Appropriate routine microbiologic cultures (including blood) should be obtained before starting antimicrobial therapy with no substantial delay
  - Include at least 2 sets of blood cultures
Failure to Identify Severe Sepsis Early

- Delay to initiation of therapy
- Development of organ dysfunction
- ↑ resource utilization, LOS, mortality, cost

Shorr et al. CCM 2007 35:5 1257-1262
# Sepsis Mortality

<table>
<thead>
<tr>
<th>Patient Location</th>
<th>Subjects (%)</th>
<th>Hospital Mortality (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Source</td>
<td>100</td>
<td>34.8</td>
</tr>
<tr>
<td>Emergency</td>
<td>52.4</td>
<td>27.6</td>
</tr>
<tr>
<td>ICU</td>
<td>12.8</td>
<td>41.3</td>
</tr>
<tr>
<td>Med-Surg Units</td>
<td>34.8</td>
<td>46.8</td>
</tr>
</tbody>
</table>

Levy MM Intensive care medicine 2010 Feb, 36(2), 222-231
Early Identification of Severe Sepsis on the Med-Surg units
Surviving Sepsis Campaign Phase IV
Surviving Sepsis Campaign Phase IV

- 4 US based collaborative groups
  - 15-20 sites per collaborative
  - N=1746 patients

- Thesis: Timely recognition & management of sepsis on the wards using protocols will reduce mortality and need for ICU transfer

- Goal: Improve sepsis screening & best practice bundle treatment on the wards

- Study: Impact on bundle compliance & mortality
VALUE OF NURSES AT THE BEDSIDE

- Empower nurses to recognize and report sepsis, severe sepsis and septic shock
Antimicrobial Therapy

- Should be started within the first hour of recognition of sepsis & septic shock, after appropriate cultures have been obtained
- Start with empiric broad spectrum therapy with one or more antimicrobials
- Narrow coverage once pathogen identification and sensitivities are established
Time to Antibiotics Following Onset Septic Shock

Surviving Sepsis Campaign Recommendations

**Antimicrobial Therapy**

- Caution against sustained systemic antimicrobial prophylaxis in patients with severe inflammatory states of noninfectious origin
- Dosing strategies should be optimized based on accepted pharmacokinetic/pharmacodynamic
- Empiric combination therapy (using at least from 2 different classes) should be used for the initial management of septic shock
Antimicrobial Therapy

- Combination therapy should not be routinely used for most serious infections, including bacteremia and sepsis without shock.
- De-escalate with discontinuation of combination therapy within the first few days in response to clinical improvement.
Surviving Sepsis Campaign Recommendations

Antimicrobial Therapy

- Limit treatment to 7 to 10 days, longer if patients have a slow clinical process, undrainable foci of infection, bacteremia with S. aureus, some fungal & viral infections, or immunologic deficiencies, including neutropenia
- Daily assessment for de-escalation
- Use of procalcitonin levels to support shortening or discontinuation of empiric antibiotics
Surviving Sepsis Campaign Recommendations

- Source Control

  - Anatomic diagnosis of infection requires emergent source control
  - Prompt removal of intravascular access devices that are a possible source of sepsis or septic shock
Fluid Management

- Crystalloid as fluid of choice
- May use albumin in addition to crystalloids when substantial amounts of fluids are required
  - Restore euvolemia initially, then give cautiously after stabilization.
  - Evidence that a higher cumulative fluid balance at day 3 was independently associated with an increase in death*
- Recommend against use of hydroxyethyl starches

ICU Orders

- Femoral CVC and intra-arterial lines were inserted
- D5W with 3 amps NaHCO\textsubscript{3} @ 999ml/hr \times 6^* 
- Normal saline @ 999ml/hr
- Urine & blood cultures were sent
- Pipercillin/Tazobactam and Gentamycin were started
- Magnesium 4 gm IV over 4 hours
- Vasopressor was started

Which vasopressor should be used for septic shock?
Surviving Sepsis Campaign Recommendations

**Vasopressors in Septic Shock**

First Line: Norepinephrine

Second Line: Epinephrine, Vasopressin (0.01-0.03 u/min)

Niche Drugs: Dopamine (bradycardia), Dobutamine (persistent hypoperfusion)
Surviving Sepsis Campaign Recommendations

- Arterial line placed for patients requiring vasopressors
- Target MAP ≥ 65 mm Hg
ICU Orders

- Intubated and placed on pressure controlled ventilation: Rate 18, ΔP 25, PEEP 5
- Ventilation with lower tidal volumes 6ml/kg predicted body weight
Surviving Sepsis Campaign Recommendations

+ Mechanical Ventilation of Sepsis-Induced Acute Lung Injury (ALI/ARDS). - ARDSnet
  - Use of low tidal volume 6 ml/kg of predicted body weight with the goal of maintaining a plateau pressure of <30 cm H₂O
  - Higher PEEP over lower PEEP with sepsis induced moderate to severe ARDS
Surviving Sepsis Campaign Recommendations

Mechanical Ventilation of Sepsis-Induced Acute Lung Injury (ALI/ARDS).

- Prone positioning in patients with sepsis induced ARDS with PaO$_2$/FiO$_2$ ratio <150
- Against the use of high frequency oscillatory ventilation (HFOV)
- No recommendation regarding the use of noninvasive ventilation
Surviving Sepsis Campaign Recommendations

- Mechanical Ventilation of Sepsis-Induced Acute Lung Injury (ALI/ARDS).
  - Use of neuromuscular blockade for \( \leq 48 \) hours with P/F ratio <150
  - Use conservative fluid strategy in patients who do not have evidence of tissue hypoperfusion
  - Against the use of \( \beta \)-2 agonists without bronchospasms
  - Against routine use of pulmonary arterial catheter
Surviving Sepsis Campaign Recommendations

- Mechanical Ventilation of Sepsis-Induced Acute Lung Injury (ALI/ARDS).
  - HOB up 30 degrees
  - Weaning protocols with daily spontaneous breathing trials (SBT)
He was sedated with Diprivan and Fentanyl
Surviving Sepsis Campaign Recommendations

Sedation and Analgesia in Sepsis

- Continuous or intermittent sedation be minimized in the mechanically ventilated patients, targeting specific titration endpoints
- Use of Propofol or Precedex over benzodiazepines
ICU Orders

Also placed on Heparin subcutaneous and Pantoprazole IV
Surviving Sepsis Campaign Recommendations

- Deep Venous Thrombosis Prophylaxis.
  - Recommend LMWH vs low dose unfractionated heparin
  - Combination of pharmacologic & intermittent pneumatic compression devices
  - Mechanical VTE prophylaxis when pharmacologic is contraindicated
Surviving Sepsis Campaign
Recommendations

Stress Ulcer Prophylaxis.

- Use proton pump inhibitors or histamine-2 receptor antagonists who have risk factors for GI bleed
- Do not use for patients without risk factors for GI bleed
10/13 - 0600
Sedated. VSS T38.6 HR 120 MAP 65-75 Minimal UOP

Norepinephrine 18 mcg/min

D5W with 3 amps NaHCO3 @ 999cc/hr

Fentanyl @ 50 mcg/h

Diprivan @ 18 mcg/kg/min
Interpret the basic metabolic panel.

Interpret the CBC and differential.

Interpret the Coagulation Panel.

What does the lactate of 12.4 indicate?

Interpret the ABG.
ICU Orders

- Transfuse 4 units of PRBCs & 4 units of leukopoor Fresh Frozen Plasma
- Stop the NaHCO$_3$
- Started Insulin Protocol
Surviving Sepsis Campaign Recommendations

Blood Product Administration.

- Only give PRBC if hemoglobin decreases to <7 g/dL in adults in the absence of MI, severe hypoxemia, or acute hemorrhage.
- Against use of erythropoietin for anemia.
- Use of fresh frozen plasma to correct clotting abnormalities in the absence of bleeding or planned invasive procedures is not recommended.
Blood Product Administration.

- Give prophylactic platelet transfusion when <10,000 in the absence of apparent bleeding & when counts are <20,000 if high risk for bleeding. Higher platelet count ≥50,000 for active bleeding, surgery, or invasive procedures.
Surviving Sepsis Campaign Recommendations

- Immunoglobulins and Antithrombin.
  - Against the use of either
Bicarbonate Therapy.

Bicarbonate use for the purpose of improving hemodynamics or reducing vasopressor requirements is not recommended for treatment of hypoperfusion induced lactic acidemia with pH ≥ 7.15
**Surviving Sepsis Campaign Recommendations**

**Glucose Control.**

- Use protocols to maintain glucose ≤ 180mg/dl
  - Start insulin when 2 consecutive glucose > 180mg/dl
- When using IV insulin patients should receive a glucose calorie source & blood glucose be monitored q1-2 hrs until stable & then q 4 hrs
- Low glucose levels obtained with point of care (POC) testing be interpreted with caution
- Use of arterial blood if A-line is present rather than capillary for POC
Physical Exam

- CXR: bilateral interstitial infiltrates
- Extremities: pitting edema, mottled, cold below knees, hot around thighs, only dopplerable pulses, small bullous skin lesions bilaterally.
Photos taken by Sophia Rodgers
Blood cultures came back positive for gram negative rods in all 4 bottles

Urinalysis had a few bacteria & WBC but nonspecific

What is the significance when the blood cultures come back positive so quickly?
Dr. DeFlice, the Gastroenterologist, came in. He was told of the patient physical findings and deteriorating condition.

Did the patient eat any raw oysters recently?

Vibrio Vulnificus
Vibrio Vulnificus

**Epidemiology**

+ First identified in late 1970s, is a gm. Neg bacterium
+ It exists as a free living bacterium inhabiting marine environment.
+ Filter feeding shellfish, such as oysters, concentrate the bacteria.
Epidemiology

Certain populations are at highest risk for serious infection.

- Alcoholic cirrhosis – 31 to 43%
- Underlying liver disease including cirrhosis & chronic hepatitis – 24 to 31%
- Alcohol abuse without documented liver disease – 12 to 27%
- Hereditary hemochromatosis – 12%
- Chronic diseases such as diabetes mellitus, rheumatoid arthritis, thalassemia major, chronic renal failure, preleukemia, lymphoma – 7 to 8%
Clinical Manifestations

Most serious are wound infections and bacteremia

Wound infections

V. vulnificus may contaminate wounds exposed to estuarine waters or shellfish
Clinical Manifestations

- Primary bacteremia – Associated with ingestion of raw or undercooked shellfish, particularly raw oysters. Generally occurs with patient who are high risk.
  - One-third will present in shock or become hypotensive within 12 hours of hospital admissions.
  - Three-fourths will have distinctive bullous skin lesions
  - Thrombocytopenia is common with evidence of DIC
  - Leukopenia rather than leukocytosis will occur
  - GI bleed
Vibrio Vulnificus

Mortality

- More than 50% overall with primary bacteremia and more than 90% in those who become hypotensive.
- Persons who survive the acute shock often require prolonged hospitalization in the ICU with complications resulting from multiorgan system failure.
Vibrio Vulnificus

**Diagnosis**
- Blood or stool cultures

**Treatment**
- No definitive trials of therapy
- Tetracycline and Ciprofloxacin (based on clinical observations & limited animal studies)
Vibrio Vulnificus

Prevention

- Persons in high risk groups should avoid eating raw or undercooked shellfish, esp. raw oysters and should avoid situations in which estuarine associated wounds are likely to occur.
ID consult was obtained. Pipercillin/Tazbactam & Gentamycin were d/c’d. Changed to Levofloxacin, Ceftazidime, Doxycycline, Metronidazole

Wife arrived with son. She confirmed patient had eaten raw oysters at a local restaurant one week ago.

After discussing patient’s extremely grave condition and poor prognosis, wife decided to make him a DNR.
Goals of care & communication of prognosis

- Advanced directives, end of life care planning
- Goals should be addressed as early as feasible but no later than 72 hours
10/13 - 1200

Chem. BG ↓ 54. Insulin off. 1 amp glucose given. UOP ↓

10/13 - 1600

Bullous skin lesions worsen (see photos)
Photos taken by Sophia Rodgers
10/13 - 1800

- Becomes oliguric
- 7.06/58/56
- Hypotensive despite increasing norepinephrine to 25 mcg/min
- Vasopressin added
- Steroids considered
Surviving Sepsis Campaign Recommendations

Relative Adrenal Insufficiency

Steroids

- Consider for adult septic shock when hypotension responds poorly to adequate fluid resuscitation & vasopressors
- ACTH stimulation test not be used to identify the subset of adults with septic shock
- Intravenous corticosteroids (hydrocortisone) 200mg per day
- Wean steroids when vasopressors no longer required
Surviving Sepsis Campaign Recommendations

- **Renal Replacement Therapy (RRT)**
  - Either continuous or intermittent can be used in septic patients with acute kidney injury (AKI)
  - Using continuous to facilitate fluid balance in hemodynamically unstable septic patients
  - Against use of RRT in AKI for increase in creatinine or oliguria without other indications for dialysis
Surviving Sepsis Campaign Recommendations

**Nutrition**
- Against use of early TPN alone or in conjunction with enteral feedings who can be fed enterally.
- Might consider IV glucose & advance enteral feeds as tolerated over first 7 days in critically ill patients for whom early feeding is not feasible.
- Early trophic or full enteral feeding.
- Against the use of omega 3 fatty acids as an immune supplement.
Surviving Sepsis Campaign Recommendations

**Nutrition**

- Against routinely monitoring residual unless patient demonstrates feeding intolerance or considered high risk for aspiration
- Use of a prokinetic agent with feeding intolerance
- Place feeding tube post-pyloric with feeding intolerance or high risk for aspiration
- Against use of selenium, arginine or glutamine
10/13 - 2107
SpO2 ↓ 64%

10/13 - 2200

Daughter arrived from out of town
10/13 - 2400

Peak inspiratory pressures ↑ suddenly 77

SpO2 35%

What contributed to the sudden increase in peak pressure and hypoxia?

10/14 - 0115

Family made decision to withdraw life support. Expired at 0120
Final blood cultures

VIBRIO VULNIFICUS
Sepsis Bundles

To be completed within 3 hours of presentation

- Measure serum lactate
  - All patients with elevated lactate >4mmol/L should be treated with the sepsis bundles regardless of blood pressure
- Obtain blood cultures prior to antibiotics
- Administer broad spectrum antibiotics
- Administer 30 ml/kg crystalloid for hypotension or lactate ≥4mmol/L
Sepsis Bundles

To be completed within 6 hours of presentation

- Apply vasopressors for hypotension not responding to initial fluid resuscitation to maintain MAP ≥ 65 mm Hg
- In the event of persistent hypotension after initial fluid administration (MAP < 65 mmHg) or if initial lactate was ≥ 4 mmol/L, reassess volume status & tissue perfusion
- Re-measure lactate if initial lactate elevated
CONCLUSION

Early identification

Early antibiotics

Early (aggressive) fluid resuscitation

To Save Lives.....
References