SURVIVING SEPSIS IN 2015

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INCIDENCE - 10TH LEADING CAUSE OF DEATH

• ADULTS
  • 571,000/year in the US
  • Mortality
    • Severe Sepsis: 15-30%
    • Septic Shock: 20-60%

• PEDIATRICS
  • 40,000/year in the US
  • Mortality
    • Severe Sepsis: 4-7%
    • Septic Shock: 13-34%

Wang et al. 2007, Critical Care Medicine, Noah, 2014 Clinical Pediatric Emergency Medicine
EMS INTERACTION

- Retrospective review of admissions between 2000-2009 at a single center
  - 13,249 /407,176 EMS encounters resulted in hospitalizations for severe sepsis
  - Pre-hospital care length of treatment: Average > 45 minutes for those hospitalized with severe sepsis
  - Received pre-hospital intravenous access (n = 4,842; 37%)
  - Greater than 40% of all severe sepsis hospitalizations arrived at the emergency department after EMS transport
  - Mortality: 2,596 (19.6%)
  - Incidence rate of severe sepsis was 3.3 per 100 EMS encounters


PATHOPHYSIOLOGY
SYSTEMIC INFLAMMATORY RESPONSE SYNDROME (SIRS)

- Two or more of the following:
  - Temperature > 100.4 ° or < 96.8 °
  - Heart Rate > 90 beats/min
  - Respiratory Rate > 20 or PaCo$_2$ < 32
  - WBC > 12,000 or < 4,000

SEPSIS AND SEVERE SEPSIS

- SEPSIS
  - Known or suspected infection
  - 2 or more SIRS criteria

- SEVERE SEPSIS
  - Sepsis plus one or more organ dysfunction
SEPTIC SHOCK

- Severe sepsis with hypotension unresponsive to fluid resuscitation

MULTI ORGAN DYSFUNCTION SYNDROME (MODS)

- Homeostasis can not be maintained
- Altered organ function
  - Cardiovascular
  - Respiratory
  - Urinary
  - Hepatic
  - CNS
  - Hematological
UNDERSTANDING OF SEPSIS PATHOPHYSIOLOGY

Sepsis

Coagulation
↓ Fibrinolysis

Endothelial Injury

↑ Inflammation

Organ Dysfunction

Death

IDENTIFYING ACUTE ORGAN DYSFUNCTION AS A MARKER OF SEVERE SEPSIS

- Tachycardia
- Hypotension
- Jaundice
- Enzymes
- Albumin
- Platelets
- PT/INR
- Protein C
- D-dimer

- Altered Consciousness
- Confusion
- Psychosis
- Tachypnea
- PaO₂ < 70 mm Hg
- SaO₂ < 90%

- Anuria
- Creatinine
- CVP

- Oliguria

- PT/INR
PHYSIOLOGIC RESPONSE TO SEPSIS

• Poor tissue oxygenation is the core problem in sepsis.
  • “TIME IS TISSUE”

• Rapid Treatment: Start BEFORE arrival!

TREATMENT PROTOCOL EVIDENCE EVOLUTION
EARLY GOAL DIRECTED THERAPY

- Single Center (Henry Ford)
- 263 Patients
- Severe Sepsis/Septic Shock
- Reduction in mortality of 12.6%
- NNT of 8

Concerns
- Difficult to parse out the individual impact of each intervention
- Use of invasive central venous monitoring difficult to demonstrate benefit


CURRENT LITERATURE

- ProMISE  
  (April 2015)
- ARISE  
  (October 2014)
- ProCESS  
  (May 2014)
PROCESS TRIAL

31 Academic Centers
United States

ARISE TRIAL

51 Hospitals
Varied Settings
5 Countries
PROMISE TRIAL

56 Sites
United Kingdom

PRACTICE RECOMMENDATIONS
PATHWAY OF CARE

- Rapid Recognition
- Rapid Initiation of Treatment
- 3 Hour Bundle
- 6 Hour Bundle
- Reassessment parameters
- Critical Monitoring and Targeted Therapies

HOW DO PATIENTS CALL US?

- Three Major Themes
  - Deterioration
  - Physical Signs and Symptoms
  - Difficulty Establishing Satisfactory Contact with the Patient

HOW DO WE RECOGNIZE THE PATIENT?

GENERAL KNOWLEDGE OF EMS PROVIDERS

- 2 Studies
  - Seattle (2012)
    - 786 Pre-hospital providers
    - EMT, Firefighter-EMT, Paramedics
    - Attitudes and awareness of sepsis
  - Japan (2014)
    - 208 Pre-hospital providers
    - 45% Certified
    - Competency of EMS personnel to diagnose and manage sepsis

Understanding of sepsis among emergency medical services: a survey study. Seymour CW, Carlbom D, Engelberg RA, Larson J, Bulger EM, Copass MK, Rea TD. - J Emerg Med - June 1, 2012; 42(6); 666-77
A Survey of the Competency of Ambulance Service Personnel in the Diagnosis and Management of Sepsis. Shime N. - J Emerg Med - August 1, 2015; 49(2); 147-51
WHAT BENEFIT DOES EMS TRANSPORT PROVIDE IN SEVERE SEPSIS?

- Prospective, observational study of patients treated with EGDT in the ED
- EMS arrivals
  - Greater organ failure
  - Shorter time to antibiotic administration (111 vs 146 min)
  - Shorter time from triage to EGDT initiation (119 vs 160 min)
- Key Successes: EMS documentation of impression of sepsis
  - Shorter time to antibiotic administration (70 vs 122 min)
  - Shorter time from triage to EGDT initiation (69 vs 131 min)
IS RECOGNITION AND DOCUMENTATION CRITICAL?

- Retrospective review of sepsis patients (EMS and Walk-In)
- Common Characteristics
  - Older (71.5 vs 55.7 years old)
  - Higher Admission Rate (97.2 vs 85.4%)
  - Higher Frequency of Severe Sepsis (47.4 vs 25.8%)
  - Higher Frequency of Septic Shock (12.4 vs 4.0%)
  - Higher Mortality within 28 days (17.9 vs 7.2%)
- Not Identified as Septic by EMS
  - Higher overall mortality (25.7 vs 12.9%)
  - Temperature is critical to identification as being septic (OR 11.2)

RECOGNITION APPLIED: SCREENING TOOLS
ROBSON SCREENING TOOL

- Identify and isolate patients to initiate therapy
- 2 Criteria to screen as positive
  - Temperature $> 38.3^\circ C$ or $< 36.0^\circ C$
  - Heart Rate $> 90$ beats/min
  - Respiratory Rate $> 20$ breaths/min
  - Acutely altered mental status
  - Serum glucose $< 120$ mg/dL or 6.6 mmol/L

- Modified Robson Tool
  - History suggestive of a new infection


THE PRESS SCORE

- Objective was to derive and validate a predictive model and novel emergency medical services screening tool for severe sepsis
- Two or more of the criteria for a positive screen
  - Heart rate $> 90$ beats/min
  - Respiratory rate $> 20$ beats/min
  - Systolic blood pressure $< 110$ mmHg

**THE PRESEP SCORE**

- Goal was to develop and evaluate an early sepsis detection score for the prehospital setting.
- Retrospective Model: Cutoff value for a possible existing septic disease was ≥4
  - Temperature > 38°C = 4
  - Temperature < 36°C = 1
  - HR > 90 beats/min = 2
  - RR > 22 breaths/min = 1
  - SaO₂ < 92% = 2
  - Systolic BP < 90 mm Hg = 2


**SEPSIS ALERT PROTOCOL**

- Objective was to determine the feasibility of EMS providers recognizing a severe sepsis patient and initiating therapy.
- First protocol that incorporated the use of point of care lactate.

BAS 90-30-90 SCREENING TOOL

- Swedish tool for evaluating potentially septic patients
- 1 or more criteria to screen as positive
  - Systolic blood pressure < 90 mmHg
  - Respiratory rate > 30 breaths/min
  - Oxygen saturation < 90%

MODIFIED ROBSON VS BAS & CLINICAL JUDGMENT

- Modified Robson Tool (2 Criteria to screen as positive)
  - Temperature > 38.3°C or < 36.0°C
  - Heart Rate > 90 beats/min
  - Respiratory Rate > 20 breaths/min
  - Acutely altered mental status
  - Serum glucose < 120 mg/dL or 6.6 mmol/L
  - History suggestive of a new infection
- BAS 90-30-90 & Clinical Judgment
TREATMENT INITIATION

3 HOUR BUNDLE
DOES FIELD TREATMENT IMPROVE SURVIVAL IN SEPSIS?

- 1350 Patients with Severe Sepsis
  - 23% IVF from EMS
  - 7% IV Catha Only from EMS
  - Median IVF administered: 500mL

- Administration of any IVF was associated with reduced hospital mortality (OR 0.46)
- Placement of an IV associated with reduced hospital mortality (OR 0.3)

LACTATE SAMPLING- BEST SAMPLE CHOICE

- Comparison of microsamples of arterial, venous and capillary blood
- Correlations with lab tested arterial sample
- Venous sample most effective at early detection of severe sepsis
HOW MUCH CAN WE PUSH?

- “Sepsis Kit”
  - Blood Cultures
  - 2 grams Ceftriaxone
  - IVF Administration

- Therapy initiated if sepsis suspected by the physician in the ambulance/helicopter
- Median time to IVF/ABX: 19 min (18-24)
- Median transport time: 56 min (46-67)
- Sepsis Diagnosis confirmed in 87.5%
  - 46.4% Severe Sepsis/Septic Shock
  - Correct ABX: 69%
  - Median IVF Prior to ED: 2.5 L (1.5-3)
FLUID BALANCE

- Initial aggressive fluid resuscitation is gold standard
- Prospective study to determine if fluid balance had an impact on mortality rate in patients with severe sepsis or septic shock
- Daily and accumulated fluid balance at 24, 48, 72 and 96 hours with 28-day mortality
- Non-survivors demonstrated higher accumulated positive fluid balance at 48, 72 and 96 hours
- Higher SOFA scores in the non-survivor group

PEDIATRIC CONSIDERATIONS:
INITIAL RESUSCITATION

- Respiratory Distress/Hypoxemia
  - Face mask, HFNC, NP CPAP
- IV Access
  - PIV, IO access for IVF and inotropes in absence of central lines
- Intubate AFTER Cardiovascular Resuscitation
- Resuscitation End Points
  - Capillary refill < 2 sec, Normal BP for age, Normal pulses with no difference between central and peripheral pulses, warm extremities, urine output > 1mL/kg/hr, normal mental status
- Follow PALS guidelines
- Evaluate for pneumothorax, Tamponade or endocrine emergencies and reverse as appropriate when shock is refractory to treatment
PEDIATRIC CONSIDERATIONS: ONGOING THERAPY

- Empiric antibiotic coverage with blood cultures (but do not delay abx)
  - Aggressive source control
- Consider ECMO for refractory shock with respiratory failure
- Corticosteroid administration if fluid refractory, catecholamine resistant or adrenal insufficiency
- Monitor sedation drug toxicity (narrower therapeutic window)
- Glucose infusions with insulin therapy in newborns (secondary to insulin resistance or failure to produce insulin)
- Avoid DVT or Stress Ulcer Prophylaxis in pre-pubertal children
CASE 1

- 57 y/o female (Ms. J)
- Dispatched for: Decreased LOC at home at 0913
- EMS Arrival: 0918
  - VS: BP 108/45, HR 96, RR 20, GCS:12
  - FSBG: “HIGH”
  - Pt found in bathroom with bloody vomit all over her and approx. 2 L in the toilet. No other history known. Left leg BKN. ECG NSR
  - Attempted D-Stick x 5 en-route and no result. IV attempted – unsuccessful
- Arrived in the ED at 0940

CASE 1: 57 Y/O FEMALE, ALTERED LOC

- Would this trigger a “sepsis alert” presentation by the initial call?

- Triggers:
  - Deterioration: Yes
  - Physical Signs and Symptoms: Trending Tachycardia
  - Difficulty Establishing Satisfactory Contact with the Patient: Yes- GCS=12

- EMS Treatment
  - Attempted IV without success
  - Glucose: Critical High
  - Short transport time

- Suggested Treatments:
  - Lactate
  - IO Access
CASE 1: 57 Y/O FEMALE, ALTERED LOC

Home Medication List
- Losartan potassium 100 mg
- Omeprazole 20 mg
- Lasix 80 mg
- Atorvastatin calcium 40 mg
- amLODIPine 10 mg
- Spironolactone 25 mg
- Carvedilol 12.5 mg
- Buproprion XR 150 mg
- Lantus
- Humalog

Past Medical History
- BKA
- CHF
- Diabetes
- GERD
- Hypertension

CASE 1: 57 Y/O FEMALE, ALTERED LOC

- 10:00: VS 37.2 0 90 24 114/52 L 93 RA
- 1048: Started IV Fluids (required a central line prior to initiation) 1000mL bolus
- 10:45: VS 84 23 98/45 97% RA
- 11:02: VS 90 22 94/32 96% RA, Glucose: >600
- 11:12: VS 88 22 91/39 91% RA
**CASE 1: 57 Y/O FEMALE, ALTERED LOC**

- **Initial Labs**
  - What would you want/order?
  - What was ordered?
    - CBC
    - BMP
    - Finger Stick Blood Glucose
    - PT/PTT/INR
    - Type and Screen
    - Finger stick Ketone
    - Troponin
    - UA

- **Initial Results**

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<tr>
<th>Parameter</th>
<th>Value</th>
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<td>Sodium</td>
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<td>Potassium</td>
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<td>Chloride</td>
<td>81</td>
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<td>Total CO2</td>
<td>&lt;5</td>
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<td>Anion Gap</td>
<td>unable to measure</td>
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<td>Glucose</td>
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<td>BUN</td>
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<tr>
<td>Ketones</td>
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</table>

- **Treatment Orders**
  - What would you order?
  - What was done:
    - 12 Lead ECG
    - Chest Xray
    - Q1 hour FSBG
    - Repeat Potassium, Ketones

- **12 Lead Results**
  - Rhythm: NSR (normal sinus rhythm);
  - Rate: 83; Axis: normal axis; Interval:
  - QT prolonged; Ischemia: Nonspecific T
  - wave abnormality; Classification:
  - Moderate risk ACS

- **Chest Xray**
  - Worsening Pneumonia, Right
  - Lung opacity
CASE 1: 57 Y/O FEMALE, ALTERED LOC

- 1211: IVF Initial Bolus complete, Glucose: >600
- 12:13: VS 82 22 96/33 S 94% 2 L/Min NC
- 1210: Additional IVF Bolus started: 2000mL
- 1211: Insulin drip started at 7u/hour : Glucose at start: 1760 from BMP
- 1213: Foley catheter placed
- 1215: Lorazepam 1 mg: agitation
- 1226: Calcium Gluconate 1 gm
CASE 1: 57 Y/O FEMALE, ALTERED LOC

- 12:32: VS 86 19 95/40 L 96% 2 L/Min NC
- 1251: Vancomycin 1250 mg started
- 12:55: Repeat Potassium: 4.5, Ketone: 3.3, Glucose: >600
- 1307: Azithromycin 500 mg started
- 13:37: VS 68 26 69/35 L 96% 2 L/Min NC
- 13:39: VS 69 29 77/40 L 98% 2 L/Min NC
- 13:50: VS 88 24 111/52 L 100% 2 L/Min NC
- 1350: Norepinephrine started at 5 mcg/min

- 1353: Patient Intubated with RSI meds (Etomidate, Succinylcholine)
- 14:02: VS 92 22 105/61 L 100 FIO2 50 % Vent
- 1418: 2nd IVF Bolus Complete
- 14:32: VS 91 18 108/45 L 100 FIO2 50 % Vent, Glucose: >600
- 15:02: VS 83 18 122/49 L 100 FIO2 50 % Vent
- 16:00 Admitted to MICU
CASE 1: 57 Y/O FEMALE, ALTERED LOC

• Admitting Diagnosis and Plan

• Septic Shock
• DKA
• NSTEMI
• HCAP

Admit to Medical ICU

Hospital Course: Length of Stay: 8 days  ICU: 6 Days

• DKA: Pt was initially managed in the intensive care unit with an insulin infusion, but was ultimately transitioned to basal/bolus insulin once her anion gap closed. The Diabetes Service was consulted, and they assisted in the management of her diabetes, and ultimately, a new regimen of Lantus 10 qam and Humalog 2 TID with meals was chosen for both at home and inpatient

• Septic Shock: Pt initially intubated and on pressors for septic shock, likely due to HCAP vs aspiration PNA. Pt's initial presentation of "hematemesis" most likely hemoptysis in reality due to pneumonia. Pt completed a 7 day course of antibiotics (Vanc, Mero) for pneumonia, and a 5 day course of Azithromycin as well. At time of discharge, leukocytosis had resolved, pt was afebrile, without respiratory complaints.

• NSTEMI: Pt with trop elevation upon admission to 23. Pt was initially medically managed, and once renal function improved, pt underwent LHC 1/28/15, which showed moderate diffuse disease and small caliber vessels.
CASE 1: 57 Y/O FEMALE, ALTERED LOC

- AKI on CKD: Pt with AKI, likely pre-renal in etiology, returned to baseline with hydration. Following LHC, pt had slight increase in Cr from 2.0 to 2.2, but she refused all IV hydration. Pt was encouraged to pursue aggressive PO fluid intake for 48 hours.
- AMS: Pt initially altered, likely 2/2 septic shock and DKA. Improved following extubation. Pt with some permanent short-term memory deficits due to repeated episodes of critical illness.
- Anemia: Pt received one transfusion in the setting of ABLA, likely 2/2 hemoptysis vs hemodilution, in the setting of ACS. Hgb then remained stable at 8.0-8.5, likely representing her new baseline due to CKD and anemia of chronic disease. Pt had no further episodes of melena or hemoptysis, no hematemesis.
- GOC: Pt is DNR/DI

- Patient has been readmitted twice and is receiving home health services

CASE 2

- 56 y/o male (Mr. D)
- Dispatched for: Unconscious at 1125 to Nursing Home
- EMS Arrival: 1126
  - VS: BP 108/74, HR 86, RR 18 GCS:14
  - FSBG: 317
  - Pt found in shock position on a ventilator with hospital personnel present, A+O x 2-3 but nods head to commands. EMS called b/c pt hypotensive (SBP 40) and pt nauseated. Pt on dopamine (35 mcg) and Levo drip (30 mg).
- Arrived at the ED at 1148
CASE 2: 56 Y/O MALE NAUSEA/EMESIS

- Would this trigger a “sepsis alert” presentation by the initial call?

- Triggers:
  - Deterioration: Yes
  - Physical Signs and Symptoms: Requiring Dopamine and Levophed
  - Difficulty Establishing Satisfactory Contact with the Patient: Yes

**EMS Treatment**
- Short transport time
- Critical Care Transport
- Drip Titration

**Suggested Treatments:**
- Lactate

**Home Medication List**
- Multiherbs
- Furosemide 40 mg Q Day
- Dumotrin 5 mg/kg/hr
- Ondansetron 4 mg Q 4-6 hr
- Megestrol acetate 60 mg Q Day
- Bisoprolol 10 mg Q Day
- Docusate sodium 100 mg BID
- Ipratropium Bromide/Albuterol 3 mL Q 6 hours
- IV Liptin 200, 250 mL/hr
- Spironolactone 25 mg Q Day
- Magnesium Oxide 465 mg Q Day
- Chlorpropam 20 mg Q Day
- Furosemide subcut 40 mg Q Day
- ASA 81 mg Q Day
- Antidotone 400 mg BID
- Asperin Insulin Q 6

**Past Medical History**
- AICD
- CHF
- COPD
- MI
- Osteoarthritis
- Tracheostomy
CASE 2: 56 Y/O MALE NAUSEA/EMESIS

- 11:56: VS 83 24 111/66 100%
- 12:00: Norepinephrine drip at 30 mcg/min, Dopamine drip at 30 mcg/kg/min
- 12:03: VS 83 21 64/24 84%
- 12:10 Norepi drip increased to 40 mcg/min
- 12:11: VS 85 23 103/57 100%
- 12:16: Additional IV placed, IVF Bolus 500 mL
- 12:24: VS 85 24 85/70 99%

Initial Labs
- What would you want/order?
  - Lactate
  - CBC
  - BMP
  - Finger Stick Blood Glucose
  - PT/PTT/INR
  - Type and Screen
  - Troponin
  - Blood Cultures
  - Mixed Venous Oxygen Saturation
  - ABG

Results
- Sodium: 116
- Potassium: 5.5
- Chloride: 79
- Total CO2: 24
- Anion Gap: 14
- Glucose: 442
- BUN: 49
- Creatinine: 0.49
- Total Calcium: 8.0
- Lactate: 4.53
- ScVO2: 69.1

- WBC: 23.5
- Hgb: 6.9
- Hct: 21.9
- Platelets: 241
- PT: 55.3
- INR: 5.06
- PTT: 41.8
- Troponin: < 0.03
- pH: 7.18
- pCO2: 63
- HCO3: 24
- pO2: 119
CASE 2: 56 Y/O MALE NAUSEA/EMESIS

• Treatment Orders
  • What would you order?

• What was done:
  • 12 Lead ECG
  • Chest Xray
  • Q 4 hour lactate
  • Repeat ABG

12 Lead Results
V-paced rhythm, rate 83, qrs .21 qt .48
No old to compare for Non-specific ST
and T wave changes

Chest Xray
Pulmonary Edema
CASE 2: 56 Y/O MALE NAUSEA/EMESIS

- 12:34: VS 86 22 112/58 100%
- 12:42 IVF Bolus completed, IVF Infusion at 250 mL/hr started
- 12:52: VS 85 23 121/69 100%
- 12:54: Dopamine decreased to 25 mcg/kg/min
- 13:25: Foley Catheter placed, Cefepime 1000mg IVPB started, Vancomycin 2000 mg IVPB started
- 13:29: VS 82 25 114/69 99%

CASE 2: 56 Y/O MALE NAUSEA/EMESIS

- 13:30: Aterial Line Placed
- 14:00: VS 80 26 119/68 96 %, Azitromycin 500 mg IVPB Started
- 14:21: VS 82 27 103/66 95 %
- 14:23: Repeat Lacate: 5.1
- 14:28: VS 82 26 96/62 94 %
- 14:49: Dopamine decreased to 15 mcg/kg/min
- 14:52: VS 84 27 88/59 92 %
- 14:59 IVF 2nd Liter finishes
- 15:05: VS 84 28 79/56 96 %
- 15:12: VS 82 27 82/59 94 %
CASE 2: 56 Y/O MALE NAUSEA/EMESIS

• 15:28: Dobutamine drip started at 5 mcg/kg/min, Albumin 25g IVPB administered
• 15:29: VS 80 26 84/58 95 %
• 15:34: VS 80 26 81/57 94 %
• 15:55: VS 86 27 74/51 %
• 15:58: Dobutamine increased to 10 mcg/kg/min
• 16:09: Admission to MICU

CASE 2: 56 Y/O MALE NAUSEA/EMESIS

• Admitting Diagnosis and Plan
  • Septic Shock
  • Hypotension
  • Acute Respiratory Failure
  • Acute Renal Failure
  • Hyponatremia
  • Hyperglycemia
  • Cardiogenic Shock
  • Adrenal Insufficiency
  • Supratherapeutic INR

Admit to Medical ICU
CASE 2: 56 Y/O MALE NAUSEA/EMESIS

- **Hospital Course:** Patient Expired within 24 hours of admission
- **Chief Complaint:** Septic shock
- **History of Present Illness:** 56 yo male with CHF and AICD placement transferred from OSH in severe shock. Had nausea and vomiting in morning then became unresponsive, resistant to pressors. Abdomen distended on KUB, uptrending bill's, NG tube with blood, CXR also with multiple infiltrates.
- **Significant Findings at Time of Expiration:** Called to see patient for unresponsiveness. On exam the patient did not respond to verbal or physical stimuli. Absent heart and breath sounds. Absent peripheral pulses. Pupils are fixed and dilated. Patient pronounced dead at 19:24 Next of kin/family notified. Autopsy declined.
- **Hospital Course:** Pt arrived and resistant to pressors. Family discussion, no escalation or aggressive interventions. Antibiotics were discontinued. Remained on pressors. Subsequently passed.

CASE 3

- 41 y/o male (Mr. H.)
- Dispatched for: Nausea at 1321 to SNF
- EMS Arrival: 1341
  - VS: BP 132/90, HR 128, RR 18 GCS:15
  - FSBG: 157
  - Pt has been experiencing emesis for 3 days, has been 6-7 times a day and now is almost constant. Pt afebrile and no diarrhea. Pt has G-tube, PICC line, foley, colostomy. Pt is s/p CVA with left sided weakness. Pt placed on 2LNC en-route.
- Arrived at the ED at 1410
CASE 3: 41 Y/O MALE NAUSEA

- Would this trigger a “sepsis alert” presentation by the initial call?

- Triggers:
  - Deterioration: Yes
  - Physical Signs and Symptoms: Requiring Dopamine and Levophed
  - Difficulty Establishing Satisfactory Contact with the Patient: Yes

EMS Treatment
12 Lead ECG
Blood Glucose
Oxygen 2l /NC

CASE 3: 41 Y/O MALE NAUSEA

Home Medication List
None Available?????

Past Medical History
GSW to R Eye with Cerebral Hemorrhage and Stroke
Colostomy
G Tube
CASE 3: 41 Y/O MALE NAUSEA

Initial Labs
- What would you want/order?
- What was ordered?
  - Lactate
  - CBC
  - BMP
  - Finger Stick Blood Glucose
  - PT/PTT/INR
  - Type and Screen
  - Troponin
  - Blood Cultures
  - UA

Results
- Sodium: 134
- Potassium: 4.4
- Chloride: 90
- Total CO2: 25
- Anion Gap: 19
- Glucose: 142
- BUN: 21
- Creatinine: 0.93
- Total Calcium: 9.6
- Lactate: 4.09

CBC:
- WBC: 26.9
- Hgb: 12.9
- Hct: 42.3

Platelets: 1059
- PT: 17.1
- INR: 1.55
- PTT: 27.5
- Troponin: < 0.03
- pH: 7.39
- pCO2: 38
- HCO3: 24
- pO2: 110

Treatment Orders
- What would you order?
- What was done:
  - Chest Xray: Aspiration Pneumonia
  - Chest/Abd/Pelvis CT
    - Segmental thickened and dilated segments of small bowel in the right mid abdomen, suspicious for enteritis. Subcutaneous gas with extensive stranding in the left inguinal canal and left groin; correlation for evidence of skin infection is recommended, and if no open wound is identified, this is concerning for necrotizing infection.
    - Postsurgical changes of left partial colectomy with Hartmann pouch creation and colostomy. Extra peritoneal fluid collection along the left abdominal wall drainage catheter in place, decreased in size since the prior examination.
    - Aspiration pneumonia and/or pneumonitis in the lungs.

- Repeat Lactates
- ABG post intubation
CASE 3: 41 Y/O MALE NAUSEA

- 14:33: VS 37.1 0 140 22 133/92
- 14:38: Foley catheter placed, PICC accessed
- 15:28: IVF Bolus 2000mL Started
- 15:29: VS 144 20 151/100 92% 3 L/Min NC
- 17:15: IVF bolus 1st liter done, 2nd liter started
- 17:23: VS 134 28 112/74 L 94% 3 L/Min NC
- 17:31: Cefepime 2 grams IVPB started
- 18:31: VS 135 24 116/83 L 85%
- 19:02: VS 153 25 107/76 L 91%
- 19:11: 2nd Liter IVF completed

CASE 3: 41 Y/O MALE NAUSEA

- 19:31: VS 88 22 164/98 L 97%
- 20:01: VS 147 22 148/83 L 97% 6 L/Min NC, Vancomycin 1000 mg IVPB Started, LR 2000 mL started.
- 20:12: Zosyn 4.5 gm IVPB started
- 20:21: VS 137 23 85% 10 L/Min NC
- 20:24: VS 140 23 97% 15 % NRB, repeat lactate: 3.8
- 20:43: VS 146 21 141/89 99%, Patient Intubated
- 20:52: VS 141 23 88/42 87% 40 % Vent, Propofol drip started 5 mcg/kg/min
- 21:11: VS 144 27 118/62 99%
- 21:31: VS 146 31 102/59 99%
CASE 3: 41 Y/O MALE NAUSEA

- 21:51: VS 142 20 104/73  100% 40 % Vent, 1st Liter LR completed, 2nd Liter started
- 22:11: VS 137 20 119/77
- 23:13: VS 125 20 143/75  100% 40 % Vent, Repeat lactate 3.48
- 00:06: Fentanyl continuous infusion started 50 mcg/hour
- 01:34: VS 132 20 109/76  100% 40 % Vent
- 01:40: 2nd Liter IVF LR Bolus complete, 3rd Liter IVF NS Started
- 02:02: Metronidazole 500 mg IVPB Started, 600 mg Clindamycin IVPB Started
- 02:08: VS 38.1 A 123 20 137/76  100% 40 % Vent, Repeat lactate 2.9
- 02:31: VS 120 20 104/68 A 100 40 % Vent
- 02:57: Admit to SICU

CASE 3: 41 Y/O MALE NAUSEA

- Admitting Diagnosis and Plan
  
  - Septic Shock

  Admit to Surgical ICU / Planned OR
CASE 3: 41 Y/O MALE NAUSEA

- Hospital Course: Length of Stay 13 days, ICU 5 days
- Debridement and washout of necrotic left groin.
- The infectious disease service helped manage his sepsis due to +Blood cultures from 3/5 eventually grew Candida albicans in 1/2 sets. The source was unclear, as he had no intravascular devices in place at the time and wound cultures failed to grow C. albicans. However, he was also found to have Candiduria, though the significance of this remains unclear, particularly as to whether this is the source of the blood stream infection and associated with any urinary tract pathology. Wound cultures showed mixed aerobic and anaerobic flora, including E. coli and B. fragilis. He was treated with Vancomycin and Meropenem, along with Micafungin for the blood stream infection. Micafungin was subsequently changed to Fluconazole for ease of administration and urine penetration.

SUMMARY

- Rapid early recognition- at home/on scene
- Early screening: lactate, SIRS
- Rapid IV fluids (30mL/kg IVF bolus challenge)
- Early source identification and management (IV abx, broad spectrum, source control)
- Vasopressors/Intubation/Critical Care management for persistent shock
- Family/Patient Education for at risk conditions