Improving Sepsis Outcomes Through Coordinated Early Recognition, Assessment and Treatment
UM CHARLES REGIONAL MEDICAL CENTER

About Us

• **1939** Founded as Physician’s Memorial Hospital
• **1998** Changed name to Civista Medical Center
• **2011** Joined University of Maryland Medical System
• **2013** Became University of Maryland Charles Regional Medical Center
• Located in Charles County in Southern Maryland
• 121 licensed beds
• 10+ ICU Beds
• 10,000 Bedded patients
• 55,000 ED visits
DR. MINOGUE’S LEGACY OF PATIENT SAFETY

“I would like to take this opportunity to recognize William Minogue, MD, FACP for his distinguished career in medical administration and patient safety in Maryland…His leadership was marked by important efforts to improve healthcare quality and patient safety in such areas as maternal newborn care, healthcare-related infections, and medical errors…The impact of both his work and his leadership on health and healthcare in the State of Maryland was reflected by the Center's receipt of the prestigious John M. Eisenberg Patient Safety Award in 2005.”
Sepsis Prevalence & Financial Impact
AN INCREASING INCIDENCE OF SEPSIS IN MARYLAND HOSPITALS

Maryland Sepsis Cases 2003-2012

Source: HSCRC Database 720
MORTALITY COMPARISON
Considerable disparity between sepsis & other top APR-DRG’s

Maryland FY 2011
• 22.5% Septicemia and Disseminated Infections
• 4.6% Pulmonary Edema and Respiratory
• 4.0% Heart Failure
• 3.3% Respiratory System Diagnosis with Ventilator
• 2.9% CVA and Precerebral Occlusion with Infarct

UM CRMC FY 2011
• 35.4% Septicemia and Disseminated Infections
• 7.3% Pulmonary Edema and Respiratory
• 5.5% Major Respiratory Infections
• 5.5% Tracheostomy with long term ventilator
• 4.9% Heart Failure

Source: HSCRC Inpatient Database.
SEPSIS IS COSTLY

- Approximately 750,000 US Cases Annually
  - 2.26 cases per 100 hospital discharges
  - 51.1% received ICU care
  - $16.7B in cost
  - Costs $22,100 per case

- Severe SEPSIS is associated with approximately 40% of ICU expenditures

- ICU septic patient costs 600% more than non-septic patient.
Sepsis Cascade
SEPSIS CASCADE

SIRS

Sepsis
Severe Sepsis
Septic Shock

Systemic Inflammatory Response Syndrome
• Temperature greater than 100.4 F or less than 96.8 F
• Heart rate greater than 90
• Respiratory rate greater than 20
• WBC greater than 12,000 or less than 4,000
SEPSIS CASCADE

SIRS

Sepsis

Severe Sepsis

Septic Shock

SIRS + Infection

- Symptoms such as dysuria, wound drainage, foul smell, cough, fever or unexpected post-op pain
- Pneumonia documented by x-ray or symptoms such as fever, cough, crackles auscultated and/or tachypnea
- Documented or suspected positive urine, blood, wound or sputum culture results
- Currently receiving an antibiotic or anti-fungal agent
- WBCs present in normally sterile fluid
- Suspicion of a perforated hollow organ
SEPSIS CASCADE

SIRS
Sepsis
Severe Sepsis
Septic Shock

Sepsis + Organ Dysfunction

- Hypotension that responds to fluid
- Arterial hypoxemia: PaO2/FIO2 less than 300
- Urine output less than 0.5 mL/kg/hr greater than 2 hours despite fluid resuscitation
- Creatinine greater than 2.0 mg/dL [176.8 mol/L]
- INR greater than 1.5 or PTT greater than 60 seconds
- Platelets less than 100,000
- Bilirubin greater than 4 mg/dL [70 mol/L]
- Lactate greater than the upper limits of normal
- Altered consciousness or reduced Glasgow Coma Scale
- Skin mottling
- Ileus
ACUTE ORGAN DYSFUNCTION

Neurological
- Altered Consciousness
- Confusion
- Psychosis

Pulmonary
- Respiratory rate
- PaO₂ < 70 mm Hg
- SaO₂ < 90%
- PaO₂/FiO₂ ≤ 300

Hepatic
- Bilirubin
- Enzymes
- Albumin

Cardiovascular
- Heart rate
- Pulmonary Arterial Occlusion Pressure
- Central Venous Pressure
- Blood Pressure

Renal
- Urine Output
- Creatinine

Hematologic
- Platelets
- Protein C
- D-dimer
- PT/PTT
SEPSIS CASCADE

SIRS
Sepsis
Severe Sepsis

Septic Shock

Severe Sepsis + Hypotension

- Hypotension that does NOT respond to fluid (30mL/kg)
Mortality From Sepsis is Mainly Due to Inflammation & Organ Failure
Sepsis Initiative
MULTIDISCIPLINARY SEPSIS TEAM

James Burke  
Mark Dumais, MD, FACP  
Richard Ferraro, MD  
Debbie Shuck-Reynolds, RN  
Ashebir Woldeabezgi, MD  
Julie Shores, RN  
Maggie Eller, RN  
Darin Mann, DO  
Abbas Omais, MD  
Sharon Kiessling, RN  
Philippa J. Sumlin, RN  
Carina Blumer, RN  
Gabe Abiola, PharmD  
Mary Harman, RN  

Chair, Quality Council of the Board  
Administrative Sponsor, Chief Medical Officer  
Chief of Emergency Medicine  
Emergency Department Manager  
Infectious Disease  
Team Leader, ICU Manager  
Team Facilitator, PI Coordinator  
Emergency Medicine  
ICU Medical Director  
Emergency Department  
Intensive Care Unit  
Intensive Care Unit  
Pharmacy  
Infection Prevention
OPPORTUNITIES FOR IMPROVEMENT

• Earlier recognition of sepsis
• More consistent use of evidenced-based practice
• Better coordination of care
• Improved data collection & analysis
• Reduction in mortality
Earlier Recognition of Sepsis
SEPSIS EDUCATION

S - Shifting WBC up or down
E - Elevated or low temperature
P - Pressure - BP is low
S - Speedy heart rate [>90]
I - Infection
S - Speedy respiratory rate [>20]
Sepsis recognition is achieved by utilizing the Sepsis Screening Tool at the first point of contact [Triage].
More Consistent Use of Evidence-Based Practice
EARLY GOAL-DIRECTED THERAPY

Early Goal-Directed Therapy Includes:

• Cultures & Lactate
• Antibiotics
• IV fluid resuscitation
• Hemodynamic stability & airway management when needed
Better Coordination of Care
COORDINATION OF SEPSIS CARE

**EMERGENCY DEPARTMENT**

**ASSESSMENT**
When sepsis suspected, ED staff calls CODE SEPSIS, assesses patient utilizing ED SEVERE SEPSIS SCREENING TOOL.

**SEPSIS CRITERIA**
When criteria met, ED SEVERE SEPSIS ORDER SET initiated through CPOE.

**RX PRIORITIES**
Implement ED SEVERE SEPSIS ORDER with focus on timely:
- Fluid resuscitation
- Hemodynamic stability
- Blood cultures
- Lactate level
- Antibiotics
- Oxygenation/airway management

Disposition: Consider admission to ICU when Lactate 2 or greater

**ICU**

**ASSESSMENT**
SEPSIS patient admitted from ED or transferred from other unit.

**SEPSIS CRITERIA**
Nurse confirms criteria met & notifies Physician to obtain orders.

**RX PRIORITIES**
Implement SEVERE SEPSIS ICU ADULT ORDER SET with focus on timely:
- Fluid resuscitation
- Hemodynamic stability & monitoring
- Blood cultures
- Lactate level
- Antibiotics
- Oxygenation/airway management
- VTE/DVT & GI Prophylaxis

**RAPID ASSESSMENT TEAM**

**ASSESSMENT**
As part of RA Team response, nurse assesses patient for possible sepsis utilizing RAT Sepsis Screening Tool & Protocol.

**SEPSIS CRITERIA**
When criteria met, RA nurse notifies Physician of positive Sepsis Screening.

**RX PRIORITIES**
Implement Protocol interventions with focus on timely:
- Fluid resuscitation
- Lactate level
- Transfer to ICU, if appropriate
COORDINATION OF SEPSIS CARE:
Emergency Department

ASSESSMENT
When sepsis is suspected, ED staff calls CODE SEPSIS, assesses patient utilizing ED SEVERE SEPSIS SCREENING TOOL.

SEPSIS CRITERIA
When criteria are met, ED SEVERE SEPSIS ORDER SET is initiated through CPOE.

RX PRIORITIES
Implement SEVERE SEPSIS ICU ADULT ORDER SET with focus on timely: [if not previously done]
- Fluid resuscitation
- Hemodynamic stability
- Blood cultures
- Lactate level
- Antibiotics
- Oxygenation/airway management

Disposition: Consider Admission to ICU with Elevated Lactate
Similar to the methodology used for CODE STROKE, Emergency Department staff initiates a CODE SEPSIS to rapidly mobilize needed resources for assessment and clinical intervention. CODE SEPSIS is paged overhead to alert ED & Laboratory staff to respond to the patient’s bedside.
Sepsis recognition is achieved by utilizing the Sepsis Screening Tool at the first point of contact [Triage]
When criteria are met, CODE SEPSIS is paged to alert staff to respond to the patient’s location. Responders include 2 ED nurses, ED physician, ED tech and phlebotomist.
CODE SEPSIS

Sepsis Team
Sepsis orders are initiated through Computer Provider Order Entry [CPOE], which standardizes evidence-based diagnostics and interventions.

<table>
<thead>
<tr>
<th>Date</th>
<th>Medication Description</th>
<th>Provider</th>
</tr>
</thead>
<tbody>
<tr>
<td>08/08/23</td>
<td>2026 SODIUM CHLORIDE No Dose IV/ONCE/ONE</td>
<td>OTERI.0</td>
</tr>
<tr>
<td></td>
<td>BOLUS INFUSED OVER 30 MINUTES</td>
<td></td>
</tr>
<tr>
<td>08/08/23</td>
<td>VANCOMYCIN HCL 250 ML PIGGY BACK IV/ONCE/ONE</td>
<td>OTERI.0</td>
</tr>
<tr>
<td></td>
<td>VANCOMYCIN 1 GM IN 250 ML</td>
<td></td>
</tr>
<tr>
<td>08/08/23</td>
<td>PIPERACILLIN/TAZOBACTAM 50 ML PIGGY BACK IV/ONCE/ONE</td>
<td>OTERI.0</td>
</tr>
<tr>
<td></td>
<td>ZOSYNE 3.375 GM in NS 50 ml</td>
<td></td>
</tr>
<tr>
<td>08/08/23</td>
<td>SODIUM CHLORIDE 1000 ML IV/IV..Q2HM</td>
<td>OTERI.0</td>
</tr>
<tr>
<td></td>
<td>BOLUS</td>
<td></td>
</tr>
<tr>
<td>08/08/23</td>
<td>2109 DOPAMINE/DEXTROSE 250 ML BAG IV/STK-MED/ONE</td>
<td>OTERI.0</td>
</tr>
<tr>
<td>08/08/23</td>
<td>2200 FENTANYL CITRATE 50 MG AMPULE IV/ONCE/ONE</td>
<td>OTERI.0</td>
</tr>
<tr>
<td>08/09/23</td>
<td>0120 NOREPINEPHRINE BITARTRATE No Dose IV/IV..STK-MED/ONE</td>
<td>OTERI.0</td>
</tr>
</tbody>
</table>
ED physician may consult with the Intensivist. Intensivist may evaluate the patient while still in the Emergency Department and, if needed, facilitates admission to ICU.
CODE SEPSIS: DEMONSTRATION

video
COORDINATION OF SEPSIS CARE

**EMERGENCY DEPARTMENT**

**ASSESSMENT**
When sepsis suspected, ED staff calls CODE SEPSIS, assesses patient utilizing ED SEVERE SEPSIS SCREENING TOOL.

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**ICU**

**ASSESSMENT**
SEPSIS patient admitted from ED or transferred from other unit.

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Nurse confirms criteria met & notifies Physician to obtain orders.

**RX PRIORITIES**
Implement SEVERE SEPSIS ICU ADULT ORDER SET with focus on timely:
- Fluid resuscitation
- Hemodynamic stability & monitoring
- Blood cultures
- Lactate level
- Antibiotics
- Oxygenation/airway management
- VTE/DVT & GI Prophylaxis

**RAPID ASSESSMENT TEAM**

**ASSESSMENT**
As part of RA Team response, nurse assesses patient for possible sepsis utilizing RAT Sepsis Screening Tool & Protocol.

**SEPSIS CRITERIA**
When criteria met, RA nurse notifies Physician of positive Sepsis Screening.

**RX PRIORITIES**
Implement Protocol interventions with focus on timely:
- Fluid resuscitation
- Lactate level
- Transfer to ICU, if appropriate
COORDINATION OF SEPSIS CARE:
Inpatients & Rapid Assessment Team

**ASSESSMENT**
As part of RA Team response, nurse assesses patient for possible sepsis utilizing
RAT Sepsis Screening Tool & Protocol.

**SEPSIS CRITERIA**
When criteria are met, RA nurse notifies Physician of positive Sepsis Screening.

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Implement Protocol interventions with focus on timely:
- Fluid resuscitation
- Lactate level
- Transfer to ICU, if appropriate
RAPID ASSESSMENT TEAM MEMBERS
# SEPSIS

## Rapid Assessment Team Screening Tool & Protocol

<table>
<thead>
<tr>
<th>SEPSIS ASSESSMENT CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INFECTION: Does patient have any ONE of the following?</strong></td>
</tr>
<tr>
<td>☑ Yes Symptoms such as dysuria, wound drainage, foul smell, cough, fever or unexpected post-op pain?</td>
</tr>
<tr>
<td>☑ Yes Pneumonia documented by x-ray or symptoms such as fever, cough, crackles auscultated and/or tachypnea?</td>
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<td>☑ Yes Documented or suspected positive urine, blood, wound or sputum culture results?</td>
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<td>☑ Yes Currently receiving an antibiotic or anti-fungal agent?</td>
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<td>☑ Yes WBCs present in normally sterile fluid?</td>
</tr>
<tr>
<td>☑ Yes Suspicion of a perforated hollow organ?</td>
</tr>
<tr>
<td><strong>SYSTEMIC INFLAMMATORY RESPONSE [SIRS]: Does patient have any TWO of the following?</strong></td>
</tr>
<tr>
<td>☑ Yes Temperature greater than 100.4°F or less than 96.8°F?</td>
</tr>
<tr>
<td>☑ Yes Heart rate greater than 90?</td>
</tr>
<tr>
<td>☑ Yes Respiratory rate greater than 20?</td>
</tr>
<tr>
<td>☑ Yes WBC greater than 12,000 or less than 4,000?</td>
</tr>
<tr>
<td><strong>ORGAN DYSFUNCTION: Does patient have any ONE of the following?</strong></td>
</tr>
<tr>
<td>☑ Yes Systolic BP under 90 or MAP under 70 for over 1 hour despite fluid resuscitation?</td>
</tr>
<tr>
<td>☑ Yes Arterial hypoxemia: PaO2/FIO2 less than 300</td>
</tr>
<tr>
<td>☑ Yes Urine output less than 0.5 ml/kg/hr greater than 2 hours despite fluid resuscitation</td>
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<td>☑ Yes Bilirubin greater than 4 mg/dL [70 mol/L]</td>
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<td>☑ Yes Lactate greater than the upper limits of normal</td>
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<td>☑ Yes Altered consciousness or reduced Glasgow Coma Scale</td>
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</table>

SEPSIS = 1 Infection criteria + 2 SIRS criteria
SEVERE SEPSIS = 1 infection criteria + 2 SIRS criteria + 1 Organ Dysfunction criteria

- ☑ Yes ☑ No Does patient meet SEPSIS criteria? If YES, initiate interventions 1-5
- ☑ Yes ☑ No Does patient meet SEVERE SEPSIS criteria? If YES, initiate interventions 1-8

1. Notify physician of positive screen and patient status
2. STAT CBC, CMP, and Lactate Level
3. Continuous pulse oximetry. Initiate oxygen at 2 LPM; titrate to keep SpO2 equal or greater than 94%
4. For systolic blood pressure under 90, infuse 1 liter 0.9% Sodium Chloride BOLUS over 30 minutes
5. Vital signs every 10 minutes during event
6. STAT TABG
7. Consider intensivist consult
8. Evaluate patient for transfer to ICU
COORDINATION OF SEPSIS CARE

EMERGENCY DEPARTMENT

ASSESSMENT
When sepsis suspected, ED staff calls CODE SEPSIS, assesses patient utilizing ED SEVERE SEPSIS SCREENING TOOL.

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- Oxygenation/airway management
- Disposition: Consider admission to ICU when Lactate 2 or greater

ICU

ASSESSMENT
SEPSIS patient admitted from ED or transferred from other unit.

SEPSIS CRITERIA
Nurse confirms criteria met & notifies Physician to obtain orders.

RX PRIORITIES
Implement SEVERE SEPSIS ICU ADULT ORDER SET with focus on timely:
- If not previously done:
  - Fluid resuscitation
  - Hemodynamic stability & monitoring
  - Blood cultures
  - Lactate level
  - Antibiotics
  - Oxygenation/airway management
  - VTE/DVT & GI Prophylaxis

RAPID ASSESSMENT TEAM

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RX PRIORITIES
Implement Protocol interventions with focus on timely:
- Fluid resuscitation
- Lactate level
- Transfer to ICU, if appropriate

University of Maryland
Charles Regional Medical Center
COORDINATION OF SEPSIS CARE:
Intensive Care Unit

ASSESSMENT
SEPSIS patient is admitted from ED or transferred from other unit.

SEPSIS CRITERIA
Nurse confirms criteria are met & notifies Physician to obtain orders.

RX PRIORITIES
Implement SEVERE SEPSIS ICU ADULT ORDER SET with focus on timely: [if not previously done]

- Fluid resuscitation
- Hemodynamic stability & monitoring
- Blood cultures
- Lactate level
- Antibiotics
- Oxygenation/airway management
- VTE/DVT & GI Prophylaxis
**ICU ADULT SEVERE SEPSIS ORDERS**

Team-developed, evidence-based orders

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### ICU ADULT SEVERE SEPSIS ORDER

**Date:**

<table>
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<tr>
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**Admit/Transfer to ICU**

- Height: __________ Weight: __________

**Admiting Physician:** __________

**Diagnosis:** __________

**Central Venous Pressure:**

- CVP 8 to 12 mmHg
- MAP 65 mmHg or higher and SBP 90 mmHg or higher

**Medication:**

- Ceftriaxone 1 g IV 12 hour
- Vancomycin 1 g IV 12 hour
- Drotrecoginaa 240 mcg kg / hour
- Hydrocortisone 100 mg IV 12 hour
- Dopamine 10 mcg kg / minute

**Laboratory:**

- Complete Blood Count
- BUN
- Creatinine
- Serum Sodium
- Serum Potassium
- Glucose
- Calcium
- Phosphate
- Albumin
- Total Protein
- Protein Electrophoresis
- Liver Function Tests
- LFTs
- AST
- ALT
- ALP
- Bilirubin
- Direct Bilirubin
- PO2
- PCO2
- Glucose
- pH
- Na
- K
- Cl
- BUN
- Creatinine
- Lipase
- Amylase
- APTT
- INR
- PT
- Na
- K
- Cl
- BUN
- Creatinine
- Urinalysis
- Culture

**Other:**

- Blood Pressure
- Oxygen Saturation
- Heart Rate
- Temperature
- Respiratory Rate
- Pulmonary Artery Pressure

**Pharmacy:**

- Vial
- Injection
- Capsule

**Pharmacy/Other:**

- Medication
- Dose
- Route
- Time

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- Bilirubin
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- PO2
- PCO2
- Glucose
- pH
- Na
- K
- Cl
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**Pharmacy:**

- Vial
- Injection
- Capsule

**Pharmacy/Other:**

- Medication
- Dose
- Route
- Time
24/7 INTENSIVIST PROGRAM

As part of the hospital’s commitment to improving the timeliness of care for patients with sepsis and other conditions, UM CRMC expanded physician staffing in the ICU to 24/7.

Having around-the-clock physician staffing in the ICU is an important element in the optimal coordination of care for patients with severe sepsis.
ICU TEAM

Optimal coordination requires timely admission from the Emergency Department or transfer from an inpatient unit for continued care.
Improved Data Collection & Analysis
ED MEASURE: % BLOOD CULTURE BEFORE ANTIBIOTICS
ED MEASURE: AVERAGE # OF MINUTES
“ED ARRIVAL TO LACTATE MEASURE”

Performance Target: <90 mins

Favorable Trend

Sepsis Guidelines Implemented
Code Sepsis Initiated

Data from Q1 2012 to Dec 2013.
ED MEASURE: AVERAGE # OF MINUTES
“ED ARRIVAL TO ANTIBIOTIC ADMINISTERED”

Performance Target: <180 mins

Favorable Trend

Sepsis Guidelines Implemented
Code Sepsis Initiated

Q1 2012
Jun-12
Jul-12
Aug-12
Sep-12
Oct-12
Nov-12
Dec-12
Jan-13
Feb-13
Mar-13
Apr-13
May-13
Jun-13
Jul-13
Aug-13
Sep-13
Oct-13
Nov-13
Dec-13

0
50
100
150
200
250
300
350
400
450

184
159
142
129
201
145
163
181
104
126
82
102
99
119
105
119
88
ED MEASURE: AVERAGE # OF MINUTES “IV FLUID RESUSCITATION”

Performance
Target: <120 mins

Favorable Trend

Sepsis Guidelines Implemented
Code Sepsis Initiated

- Q1 2012
- Jun-12
- Jul-12
- Aug-12
- Sep-12
- Oct-12
- Nov-12
- Dec-12
- Jan-13
- Feb-13
- Mar-13
- Apr-13
- May-13
- Jun-13
- Jul-13
- Aug-13
- Sep-13
- Oct-13
- Nov-13
- Dec-13

42
60
55
52
37
38
63
27
52
63
73
90
94
96
49
39
71

250
200
150
100
50
0
ICU MEASURE: VTE/DVT PROPHYLAXIS OR DOCUMENT CONTRAINDICATION

Performance Target >90%
ICU MEASURE: GI PROPHYLAXIS OR DOCUMENT CONTRAINDICATION

Performance
Target >90%
Reduction in Mortality
SEPSIS SURVIVAL RATES
Sepsis Survival Rate APR DRG 720

There was an absolute 10% increase in sepsis survival over a three year period.
NEXT STEPS:

- Partner with University of Maryland Medical System and Maryland Patient Safety Center for state wide implementation
- Analyze sepsis re-admissions
- Develop pediatric protocols
Questions & Answers

Thank You For Attending

Panelists

Richard Ferraro, MD, FACEP, Chief of Emergency Medicine
Abbas Omais, MD, ICU Medical Director
Debbie Shuck-Reynolds, RN, BSN, FNE A-P, Nurse Manager, Emergency Department
Julie Shores, RN, Nurse Manager, ICU