Sepsis: Early Recognition

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Objectives

- Current state
- Challenges/opportunities
- New Innovations
- Next Steps
Who Is University Hospitals (UH)?

- Founded in 1866, Not-for-Profit Entity
- Tertiary Care Facility
  - University Hospitals Case Medical Center
- 10 Wholly-owned Community Medical Centers
- 2 Joint Venture Hospitals (Southwest General, Rehab - Centerre)
- 25 Major Outpatient Centers
- ~5,000 Affiliated Physicians, Providers
- UH Revenues $2.8 Bil., With JV’s $3.3 Bil.*
- 2014: 98,856 Discharges* / 90,900 Surgeries*
  * Includes St. John MC JV
Current State

• System-wide complexity
  – EMR
  – Different community groups
  – Teaching and non-teaching facilities

• System-wide variations in workflow
  – ED screening in some facilities
  – Variable stages of implementation
  – Variable content of education
Challenges & Opportunities in early recognition

- Opportunity in recognition → intervention
  - SIRS is non-specific
- Knowledge of SIRS criteria and implications
  - Assistive personnel
  - Nursing
  - Physician
- Lack of standard hand-off in transitions of care
  - ED → inpatient
  - Inpatient → ICU
  - Inter-facility transfers
- Balancing alert sensitivity & specificity
# Surviving Sepsis Campaign

## 3 hour bundle
- Measure lactate level
- Obtain cultures before antibiotic administration
- Administer broad spectrum antibiotics
- Administer 30cc/kg crystalloid for hypotension or lactate $\geq 4$mmol/L

## 6 hour bundle
- Apply vasopressors to maintain mean MAP $\geq 65$mmHg
- If persistent hypotension after initial fluid administration or if initial lactate was $\geq 4$mmol/L, re-assess volume status and tissue perfusion and document findings
- Re-measure lactate if initial lactate elevated

Reassessment of volume status & tissue perfusion with:
- Repeat focused exam (vitals, CP exam, cap refill, pulse, skin findings)
- OR 2 of the following:
  - CVP
  - ScvO2
  - Bedside CVUS
  - Dynamic assessment of fluid responsiveness with passive leg raise or fluid challenge
New Innovations

- ED Screening
- EMR Alert for inpatient screening
  - Clinical instructions for nursing
- Physician order set
  - Clinical decision support
ED Screening

- Standard EMR based screening tool
  - 2 SIRS = verbal notification to MD for evaluation
  - 3 SIRS = triggers nursing conditional orders for evaluation
- Use of standard ED sepsis order set
  - One-time STAT dosing of antibiotics
# Inpatient SIRS Alert Workflow

<table>
<thead>
<tr>
<th>Assistive Personnel</th>
<th>Nurse</th>
<th>Physician</th>
</tr>
</thead>
</table>
| • First to see the alert  
• Enter vitals in the flow sheet  
• Acknowledging the alert puts **1 hour** hold on additional alert | • Auto-generated task in the worklist  
• Signing off tasks places **8 hour hold** on additional alerts  
• RN check of notification to MD | • Gets a call or text page for SIRS Alert  
• Goes to the order set  
• Indicate clinical decision in the order set |
## Graded Electronic Alert

### SIRS Alert
- At least 3 out of 4 SIRS criteria met

### Sepsis Alert
- At least 3 out of 4 SIRS criteria met
  - Blood culture (with status)
- Systolic BP <100 OR labs with evidence of new organ failure

### Severe Sepsis Alert
- At least 3 out of 4 SIRS criteria met
  - Blood culture (with status)
- Systolic BP <100 OR labs with evidence of new organ failure

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**Nursing clinical instructions with each alert**

- Notify Provider
- Consider evaluation for infection
- Consider lactate measurement

- Increase vitals
- Consider lactate
- Strict I&O
- Monitor respiratory and mental status

- Call a rapid response
- Call provider for immediate bed-side assessment
- Initiate bundle
SIRS ALERT

- SIRS alert: at least 3 out of 4 SIRS criteria met
SEPSIS ALERT

- SEPSIS alert: at least 3 out of 4 SIRS criteria met PLUS blood culture ordered/pending/ resulted
SEPSIS ALERT

• SEPSIS alert: at least 3 out of 4 SIRS criteria met PLUS blood culture ordered/ pending/ resulted
  • Ordered
  • Pending
  • Resulted


Blood Cx = Gram positive cocci, clusters @ 02-Sep-2015 08:40:18.
SEVERE SEPSIS ALERT

- SEVERE SEPSIS alert: at least 3 out of 4 SIRS criteria met PLUS systolic BP <100 OR
- Labs showing evidence of organ failure
Nursing Task View

**Task Information**
- **Task**: SEVERE Sepsis Task
- **Administered At**:
  - **Date**: 23-Sep-2015
  - **Time**: 10:20
- **Start Date/Time**: 23-Sep-2015 10:20
- **Stop Date/Time**: 

**RN Clinical Instructions**
- Call a rapid response or Code White, call provider for immediate bedside assessment, consider lactate measurement

**MD Notification**
- Discussed with MD/LIP face to face phone
- Physician Pager (5 digit internal):
- Name of MD/LIP/Team Notified:
- Nurse’s Name:
- Nurse Callback Number:

Comment:

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University Hospitals

Cleveland | Ohio

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Sample MD/LIP Text Page
Physician Work-Flow: Order Set

Select one option

Checking any of these 2 options turns OFF the alert for 24 HOURS
# Additional orders

## Clinical Instructions
Adjust dosage for alterations in renal, hepatic dysfunction and obesity.

## Nursing

<table>
<thead>
<tr>
<th>Order</th>
<th>Comments / Instructions</th>
<th>Frequency</th>
<th>Frequency Qualifier</th>
<th>PRN</th>
<th>PRN Reason</th>
<th>Site Modifier</th>
<th>Site</th>
<th>Priority</th>
<th>Requested Date</th>
<th>Evid</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONAR</td>
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<tr>
<td>Vital Signs</td>
<td>Every 30 minutes, including pulse ox x2, then q1h until pt...</td>
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<td></td>
<td></td>
<td>Routine</td>
<td>21-May-2015</td>
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</tr>
<tr>
<td>Electrocardiogram 12 Lead</td>
<td></td>
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<td></td>
<td></td>
<td>STAT</td>
<td>T</td>
<td></td>
</tr>
<tr>
<td>Urinary Catheter, Insert, to gravity</td>
<td></td>
<td>Once</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Routine</td>
<td>21-May-2015</td>
<td></td>
</tr>
<tr>
<td>IV, Insert</td>
<td>Maintain 2 functional peripheral IVs.</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>Routine</td>
<td>21-May-2015</td>
<td></td>
</tr>
<tr>
<td>Intake &amp; Output</td>
<td>Strict</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Routine</td>
<td>21-May-2015</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>Please obtain weight for accurate medication dosing, if...</td>
<td>Once</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Routine</td>
<td>21-May-2015</td>
<td></td>
</tr>
<tr>
<td>Blood Glucose POCT</td>
<td></td>
<td>Once</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Routine</td>
<td>21-May-2015</td>
<td></td>
</tr>
<tr>
<td>SHS Assessment Complete</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Routine</td>
<td>21-May-2015</td>
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</tbody>
</table>

## Contingency

<table>
<thead>
<tr>
<th>Order</th>
<th>Reason</th>
<th>Less Than</th>
<th>Greater Than</th>
<th>Over</th>
<th>Time Frame</th>
<th>Comments / Instructions</th>
<th>Priority</th>
<th>Requested Date</th>
<th>Evid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Call Physician</td>
<td>mean arterial pressure</td>
<td>85</td>
<td></td>
<td></td>
<td></td>
<td>after initial NS bolus.</td>
<td>Routine</td>
<td>21-May-2015</td>
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<tr>
<td>Call Physician</td>
<td>SaO2</td>
<td>92%</td>
<td></td>
<td></td>
<td></td>
<td>after treatment initiated.</td>
<td>Routine</td>
<td>21-May-2015</td>
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<tr>
<td>Call Physician</td>
<td>heart rate</td>
<td>120</td>
<td></td>
<td></td>
<td></td>
<td>after initial IV fluids.</td>
<td>Routine</td>
<td>21-May-2015</td>
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</tr>
<tr>
<td>Call Physician</td>
<td>urine output</td>
<td>&lt; 3500cc/hr</td>
<td></td>
<td></td>
<td></td>
<td>after starting fluids.</td>
<td>Routine</td>
<td>21-May-2015</td>
<td></td>
</tr>
<tr>
<td>Call Physician</td>
<td>if any BP meds are due</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Routine</td>
<td>T</td>
<td></td>
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</table>
### Pharmacy IV Fluids

<table>
<thead>
<tr>
<th>Solution Name</th>
<th>Rate</th>
<th>Line Type</th>
<th>Frequency</th>
<th>Reference Info</th>
<th>Start Date</th>
<th>Priority</th>
<th>Stop After (Duration)</th>
<th>Clinician Notes to Orders</th>
<th>Evid</th>
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</thead>
<tbody>
<tr>
<td>Sodium Chloride 0.9% IV Bolus</td>
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<td></td>
<td>Once</td>
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<td>STAT</td>
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</tr>
<tr>
<td>Sodium Chloride 0.9% IV Bolus</td>
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<td></td>
<td>Once</td>
<td></td>
<td>STAT</td>
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</table>

### Laboratory and Blood Bank

<table>
<thead>
<tr>
<th>Order</th>
<th>Clinician Instructions</th>
<th>Collection Date</th>
<th>Collection Priority</th>
<th>Floor % Collect</th>
<th>Time</th>
<th>Priority</th>
<th>Source</th>
<th>Evid</th>
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</thead>
<tbody>
<tr>
<td>Complete Blood Count + Differential</td>
<td></td>
<td>21-May-2015</td>
<td>STAT</td>
<td>☑</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Renal Function Panel</td>
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<td>21-May-2015</td>
<td>STAT</td>
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<tr>
<td>Hcgetic Function Panel</td>
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<td>21-May-2015</td>
<td>STAT</td>
<td>☑</td>
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<td></td>
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<tr>
<td>Blood Gas, Arterial</td>
<td></td>
<td>21-May-2015</td>
<td>STAT</td>
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<tr>
<td>Coagulation Screen</td>
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<td>21-May-2015</td>
<td>STAT</td>
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<tr>
<td>Lactate, Level</td>
<td></td>
<td>21-May-2015</td>
<td>STAT</td>
<td>☑</td>
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<td>D Dimer</td>
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<td>21-May-2015</td>
<td>STAT</td>
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<tr>
<td>Fibrinogen Assay</td>
<td></td>
<td>21-May-2015</td>
<td>STAT</td>
<td>☑</td>
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<td></td>
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<tr>
<td>Troponin I, Serum</td>
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<td>21-May-2015</td>
<td>STAT</td>
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<td>CrDP</td>
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<td>STAT</td>
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<tr>
<td>Urinalysis</td>
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<td>21-May-2015</td>
<td>STAT</td>
<td>☑</td>
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</tbody>
</table>

### Microbiology

<table>
<thead>
<tr>
<th>Order</th>
<th>Source</th>
<th>Site</th>
<th>Site/Source</th>
<th>Current Antibiotic Therapy</th>
<th>Special Instructions</th>
<th>Collection Date</th>
<th>Priority</th>
<th>Evid</th>
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</thead>
<tbody>
<tr>
<td>Culture, Blood</td>
<td>Blood (BLD)</td>
<td></td>
<td></td>
<td>Should be drawn from 2...</td>
<td></td>
<td>21-May-2015</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Culture, Blood</td>
<td>Blood (BLD)</td>
<td></td>
<td></td>
<td>Should be drawn from 2...</td>
<td></td>
<td>21-May-2015</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Culture, Urine</td>
<td>Urine (URINE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>21-May-2015</td>
<td>Routine</td>
<td></td>
</tr>
<tr>
<td>Legionella Antigen, Urine</td>
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<td></td>
<td>21-May-2015</td>
<td>Routine</td>
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</tr>
<tr>
<td>Culture, Respiratory Lower, incl smear</td>
<td>Sputum</td>
<td></td>
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<td></td>
<td></td>
<td>21-May-2015</td>
<td>Routine</td>
<td></td>
</tr>
<tr>
<td>Clostridium Difficile Toxin, PCR</td>
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<td>21-May-2015</td>
<td>Routine</td>
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<tr>
<td>Culture, Stool</td>
<td>Stool (STL)</td>
<td></td>
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<td>21-May-2015</td>
<td>Routine</td>
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<tr>
<td>Culture, Body Fluid, includes smear</td>
<td>Fluid (FLU)</td>
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<td>21-May-2015</td>
<td>Routine</td>
<td></td>
</tr>
</tbody>
</table>

### Blood Products

<table>
<thead>
<tr>
<th>Order</th>
<th>Type x Screen</th>
<th># of Units</th>
<th># of mls</th>
<th>Transfusion Indication</th>
<th>Special Needs</th>
<th>Directed/ Autologous</th>
<th>Special Instructions</th>
<th>Requested Date</th>
<th>Priority</th>
<th>Evid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Bank OS</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

### Diagnostic Radiology Xray US NM MRI MRA

<table>
<thead>
<tr>
<th>Order</th>
<th>Portable</th>
<th>Current Signs and Symptoms</th>
<th>Is Pregnant</th>
<th>LMP</th>
<th>Check all Conditions that Apply</th>
<th>Requesting Physician - Contact 2</th>
<th>Special Instructions</th>
<th>Date</th>
<th>Priority</th>
<th>Evid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xray Chest 1 View</td>
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<tr>
<td>Xray Chest 2 View PA - Lateral</td>
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</tbody>
</table>

**University Hospitals**

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Cleveland | Ohio
Ordering antibiotics in SIRS/Sepsis Order Set
### MDR Risk Factors

Hospitalized in last 90 days, nursing home patient with feeding tubes, bed bound, chronic delays, recent antibiotic therapy, immunocompromised, recent surgical procedure.

<table>
<thead>
<tr>
<th>PCN Allergy?</th>
<th>Suspected Source</th>
<th>MDR Risk Factors?</th>
<th>Other Suspected Organisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Lung</td>
<td>Yes</td>
<td>MRSA and Pneumococcal Meningitis</td>
</tr>
<tr>
<td>No</td>
<td>Urinary</td>
<td>No</td>
<td>Viral Encephalitis and Listeria</td>
</tr>
</tbody>
</table>

**Antibiotics Algorithm**

The algorithm will only open antibiotics based on the above selected criteria to guide therapy.

**STAT Default**

- Antibiotics - 26 items(s)
- **Acycticlov IV Piggy Back**: ZOVR, mg Intra/Venous Every 8 Hours
- **Amoxicillin IV Piggy Back**: 2 gram(s) Intra/Venous Every 8 Hours
- **Ampicillin - Sulbactam IV Piggy Back**: LINAR, % Intra/Venous Every 8 Hours
- **Azithromycin IV Piggy Back**: ZITHR, 500 mg Intra/Venous Every 24 Hours
- **Aztreonam 1 gram IVPB Piggy Back Premixed**: AZAC, Intra/Venous Every 8 Hours
- **Aztreonam 2 gram IVPB Piggy Back Premixed**: AZAC, Intra/Venous Every 8 Hours
- **Cefazolin 1 gram IVPB Premixed Soft**: ANCEF, Intra/Venous Every 8 Hours
- **Cefepime 2 gram IVPB Premixed Soft**: MAMPI, Intra/Venous Every 8 Hours
- **Ceftazidime 2 gram IVPB Premixed Soft**: FORT, Intra/Venous Every 8 Hours
- **Ceftriaxone 1 gram IVPB Premixed Soft**: ROCE, Intra/Venous Every 24 Hours
- **Ceftriaxone 2 gram IVPB Premixed Soft**: ROCE, Intra/Venous Every 12 Hours
- **Ciprofloxacin 400 mg IVPB Premixed**: CIPRO, Intra/Venous Every 12 Hours
- **Ciprofloxacin 400 mg IVPB Premixed**: CIPRO, Intra/Venous Every 12 Hours
- **Clindamycin 600 mg IVPB Premixed**: CLEO, Intra/Venous Every 8 Hours
- **Dexamethasone Injectable**: DECA, mg Intra/Venous Every 6 Hours
- **Ertapenem IV Piggy Back**: INVEZAN, 1 gram(s) Intra/Venous Every 24 Hours
- **Levofloxacin 750 mg IVPB Premixed**: LEVA, Intra/Venous Every 24 Hours
- **Moxifloxacin IV Piggy Back**: MERB, 1 gram(s) Intra/Venous Every 8 Hours
- **Moxifloxacin IV Piggy Back**: MERB, 2 gram(s) Intra/Venous Every 8 Hours
- **Metronidazole 500 mg IVPB Premixed**: FLUG, Intra/Venous Every 8 Hours
- **Metronidazole 500 mg IVPB Premixed**: FLUG, Intra/Venous Every 8 Hours
- **Piperacillin - Tazobactam 3.375 gram(s)**: ZOSYN, Intra/Venous Every 6 Hours
- **Piperacillin - Tazobactam 4.8 gram(s)**: ZOSYN, Intra/Venous Every 6 Hours
- **Vancomycin IV Piggy Back**: mg Intra/Venous Every 12 Hours
- **Vancomycin Oral Liquid**: 125 mg Oral Every 6 Hours
Next steps

• ED enhancements
  – Using e-boards to notify MD’s of septic patients

• Inpatient enhancements
  – Clinical instructions → Conditional orders

• Standardize workflow across system
• Standardize workflow across patient continuum of care
• Development of standard response teams/individuals
Thank you!

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Hiloni.Bhavsar@uhhospitals.org