Background from Surviving Sepsis Campaign

The leadership of the Surviving Sepsis Campaign (SSC) believes, since its inception, that both the SSC Guidelines and the SSC performance improvement indicators (1) will evolve as new evidence that improves our understanding of how best to care for patients with severe sepsis and septic shock becomes available.

With publication of 3 trials (2,3,4) that do not demonstrate superiority of required use of a central venous catheter (CVC) to monitor central venous pressure (CVP) and central venous oxygen saturation (ScvO2) in all patients with septic shock who have received timely antibiotics and fluid resuscitation compared with controls or in all patients with lactate > 4 mmol/L, the SSC Executive Committee has revised the improvement bundles as follows:

TO BE COMPLETED WITHIN 3 HOURS OF TIME OF PRESENTATION:
- Measure lactate level
- Obtain blood cultures prior to administration of antibiotics
- Administer broad spectrum antibiotics
- Administer 30 mL/kg crystalloid for hypotension or lactate ≥ 4mmol/L

“Time of presentation” is defined as the time of triage in the emergency department or, if presenting from another care venue, from the earliest chart annotation consistent with all elements of severe sepsis or septic shock ascertained through chart review.

TO BE COMPLETED WITHIN 6 HOURS OF TIME OF PRESENTATION:
- Infuse vasopressors (for hypotension that does not respond to initial fluid resuscitation) to maintain a mean arterial pressure (MAP) ≥65mmHg
- In the event of persistent hypotension after initial fluid administration (MAP < 65 mm Hg) or if initial lactate was ≥4 mmol/L, re-assess volume status and tissue perfusion.
- Re-measure lactate if initial lactate elevated.

Of note, the 6-hour bundle has been updated; the 3-hour SSC bundle is not affected.

While no suggestion of harm was indicated with use of a central line in any trial, and published evidence shows significant mortality reduction using the original SSC bundles (5), the committee has taken a prudent look at all current data and, despite weaknesses as in all studies, determined the above bundles to be the appropriate approach at this time.

DOCUMENT REASSESSMENT OF VOLUME STATUS AND TISSUE PERFUSION WITH:
EITHER
- Repeat focused exam (after initial fluid resuscitation) by licensed independent practitioner including vital signs, cardiopulmonary, capillary refill, pulse, and skin findings.

OR TWO OF THE FOLLOWING:
- Measure CVP
- Measure ScvO2
- Bedside cardiovascular ultrasound
- Dynamic assessment of fluid responsiveness with passive leg raise or fluid challenge
Situation: Extensive variability in the management of Sepsis and Septic shock

Additional Background: Nationally, within and outside Ascension, there has been a great deal of variability in the management of sepsis. This led to delays in care, incomplete care, and incorrect care. Nationally, teams have worked to define best practice in the care of sepsis. Based on the likely cause of sepsis, specific studies should be completed and defined therapies should be initiated in a timely fashion. The purpose of this Guidebook is to assist the ministries in creation or refinement of their sepsis order sets to:

- Comply with the National standards
- Meet Ascension directives for standardization
- Reliably achieve best practice in the management of sepsis from various sources

Required sections that must be standardized across Ascension, details of each section below.

- Vital signs
- Fluid therapy
- Antibiotic selection
- Laboratory orders
- Vasopressors/inotropes

The design section will create platform-agnostic essential requirements and present the Ascension Cerner OneChart Standard build.

The expectation is that each ministry will:
- incorporate the essentials of the content into the electronic record
- where possible implement the standard Ascension build
- use local standards where changes will impact workflow and care significantly

The anticipated work effort will be low for those sites that have order sets in place and moderate if new sets need to be created

This single document will include information for both ED and inpatient order sets. A blackbox will help identify differences between ED order set and inpatient order set.

Design Requirements (Recommendations for Orders)

1. Formulary changes
   - Perform gap analysis with “source of sepsis” documents and add, subtract, or modify content as required.

2. Order sets (electronic & paper) – these can be built as multiple or single Subphase (embedded set). The advantage of multiple subphase is first choice meds can be preselected.
   - Note: OneChart sites should utilize order sentence with route of IV Push for any of the following antibiotics: cefazolin, ceftriaxone, cefepime, and meropenem. Non-OneChart sites are advised to incorporate this standard as soon as possible pending TAG directive approval.

3. Order set content (electronic & paper)

Vital Signs
- Vitals Signs will be obtained every 15 minutes during a fluid bolus, within one hour after completion of fluid bolus, and then continue as directed.
Nursing Orders

- Notify: Provider if lactate greater than or equal to 4, SBP less than 90 mmHg, MAP less than 65 mmHg, or SBP decrease greater than 40 mmHg from previously recorded SBP normal for patient.

IV Fluids

- Normal Saline (0.9%) Bolus 30 mL/kg IV Infusion Once (Dose based on 30 mL/kg). Administer at a rate no less than 15 mL/kg/hr
  OR
- Lactated Ringers Bolus 30 mL/kg IV Infusion Once (Dose based on 30 mL/kg). Administer at a rate no less than 15 mL/kg/hr

If fluid bolus has already been started prior to order entry, an additional order for fluid bolus should be placed to ensure that the 30mL/kg total is administered:

- Completion Bolus NS of 30 mL/kg IV if a recorded fluid resuscitation was administered prior to initiation of order set (30mL/kg – Volume administered). Administer at a rate no less than 15mL/kg/hr
  OR
- Completion Bolus LR of 30 mL/kg IV if a recorded fluid resuscitation was administered prior to initiation of order set (30mL/kg – Volume administered). Administer at a rate no less than 15mL/kg/hr

Ongoing management of circulating volume

- Additional fluid bolus is based on an elevated lactate level, CVP less than 8-12 mm/hg or clinical assessment.

Medications

Antimicrobials: Specified by source (broad spectrum antimicrobials should be initiated within one hour of the recognition of sepsis or septic shock). Standard build is to create subphase order sets for each disease state. Acceptable alternative would be to create a single integrated subphase order set. Clinical Decision Support should be in place when ordering source specific medications to verify appropriate labs have been ordered for the following conditions:

- Community Acquired Pneumonia Sepsis
- Hospital Acquired Pneumonia or Ventilator Associated Pneumonia or Structural Lung Disease Sepsis
- Pyelonephritis Sepsis
- Intra-Abdominal Sepsis
- Skin/Soft Tissue Infection Sepsis
- Febrile Neutropenia Sepsis
- Sepsis Unknown Source

Antimicrobials used in the ED and Inpatient are the same, number of doses administered will be once in ED and between 3 and 5 days of therapy in acute care setting. First dose should always be administered stat.

See Appendix I for Antibiotics and Testing guidelines

Vasopressors: Initiated if hypotension does not respond to initial fluid resuscitation to maintain a MAP greater than 65 mm Hg within the first 6 hours of sepsis/septic shock presentation. **(Note: Ascension standardized titration parameters and drip concentrations should always be used at OneChart sites. Non-OneChart sites or “Legacy sites” are advised to incorporate use of these standards as soon as possible.)**
Guidebook for ED and Inpatient Sepsis Order Set Initiatives 2018

First Line Vasopressor

- **NORepinephrine 4 mg/250 mL D5W**
  - Titration Dose: 0.03 mcg/kg/min, Min Titrate Time (min) 2, Maximum Rate: 1 mcg/kg/min, Maintain SBP greater than 90, Maintain MAP greater than 65
  - **Comments:** Begin at 0.1 mcg/kg/min for MAP less than 65 mmHg OR SBP less than 90 mmHg after NS Bolus. Titrate in 0.03 mcg/kg/min increments every 2 minutes up or down (max dose of 1 mcg/kg/min) to maintain MAP greater than 65 mmHg. Notify Provider after starting infusion. In addition, Notify Provider for MAP less than 65 mmHg OR SBP less than 90 mmHg on max dose. Contact physician if infiltration occurs. This drug may cause extravasation injury.

Adjunct/Alternative Vasopressors

- **EPINEPHrine IV additive 5 mg/250 mL NS:**
  - Titration Dose: 0.03 mcg/kg/min, Min Titrate Time (min) 2, Maximum Rate: 1 mcg/kg/min, Maintain SBP greater than 90, Maintain MAP greater than 65
  - **Comments:** Begin at 0.1 mcg/kg/min and titrate in 0.03 mcg/kg/min increments every 2 minutes up or down (max dose of 1 mcg/kg/min) to maintain MAP greater than 65 mmHg. Notify Provider after starting infusion. In addition, Notify Provider for MAP less than 65 mmHg OR SBP less than 90 mmHg on max dose.

- **vasopressin IV additive 20 units/100mL NS, 0.03 unit/min; do not titrate**

**Testing**

This is the minimum testing required. Additional studies will be ordered based on suspected source of infection (see Appendix I)

- Lactic Acid:
  - Perform initial study and repeat within 3 hours if initial Lactate level is greater than 2 mmoles/L

**Design Requirements (Recommendations for Non-Orders)**

**Non-Orders effort:**

2. Documentation
3. Views/mPages – (flowsheets)
   - CDS- Notes or Reminders should be in place to verify the appropriate orders and documents have been entered in a timely fashion. The decision support should notify the provider if these studies have not been ordered.
     - Blood cultures and lactate level with repeat if indicated
     - The fluid bolus had been ordered and completed
   - Eventually there should be CDS tools in the event the reassessment has not been performed after the bolus is completed. This is not a requirement for this Guidebook.
4. Reports - The following should be tracked at regular intervals
   - 3 hour requirements are completed
   - 6 hour requirements are completed
   - Appropriate order sets are used

**Stakeholder Analysis**

<table>
<thead>
<tr>
<th>Stakeholder Name</th>
<th>Stakeholder Role</th>
<th>Specialty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mohamad Fakih</td>
<td>MD</td>
<td>ID</td>
</tr>
<tr>
<td>Florian Daragjati</td>
<td>PharmD</td>
<td>Pharmacy</td>
</tr>
<tr>
<td>Anne LeMaistre</td>
<td>MD</td>
<td>CI</td>
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</tbody>
</table>
**Education Needs**

- Educational requirements will include:
  - Publicity campaign with Medical Executive leadership, providers, Medical Education and clinicians
  - Communication at all huddles
  - Announcements at provider and GME meetings
  - The following tools are needed:
    - Informational flyers and posters
    - Posting on provider portals and announcement boards
    - Key provider individual engagement
    - Tips and Tricks

- Implementation Plan
  - Enter the tentative completion date. Generic timeframe of 90 days may need to be flexed up or down depending on the scope of work and change management impact to stakeholders

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Assigned Party</th>
<th>Start</th>
<th>Stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create an action plan</td>
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<tr>
<td>Perform a gap analysis of current and future state</td>
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<tr>
<td>Identify modifications required</td>
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<tr>
<td>Design, build, and test new sets</td>
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<tr>
<td>Communicate and educate staff on transition</td>
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<tr>
<td>Implement change</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Lessons learned</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Record transition at CLIC-TAG Sharepoint site</td>
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</tbody>
</table>

**References:**


*Consult Clinical Professional Development (CPD) department for assistance as needed*
## Appendix 1: Ascension Antibiotic and Lab Recommendations for Treatment of Sepsis by Source in Adults

<table>
<thead>
<tr>
<th>Suspected Infection Source</th>
<th>Risk Factors</th>
<th>Recommendations: Antibiotics</th>
<th>Recommendations: Additional Studies</th>
</tr>
</thead>
</table>
| **Intra-Abdominal Source (includes Biliary)** | Mild/Moderate Community Onset | Preferred: Ceftriaxone 1g IV q24hr PLUS Metronidazole 500mg IV q8hr  
| | | For biliary tract infection: Ceftriaxone 1g IV q24hr  
| | | For confirmed penicillin and cephalosporin allergy: Ciprofloxacin 400 mg IV q12hr PLUS Metronidazole 500 mg IV q8hr  
| | | CBC with diff, BMP, Blood Culture x2, liver enzymes, amylase, lipase |
| **Intra-Abdominal Source** | Healthcare-associated Severe sepsis/shock | Preferred: Piperacillin-tazobactam 4.5g IV over 30 minutes, then q8hr over 4 hours  
| | | For confirmed penicillin allergy: cefepime 1g IV q6hr PLUS Metronidazole 500mg IV q8hr  
| | | For confirmed penicillin AND cephalosporin allergy, OR confirmed history of ESBL: meropenem 500 mg IV q6hr  
| | | If surgical wound infection with MRSA risk factors, ADD: Vancomycin 25mg/kg IV x1 (max 2g), then Pharmacokinetic Dosing Service (PKDS)  
| | | CBC with diff, BMP, Blood Culture x2, Wound Culture and gram stain (ensure no superficial cultures) |
| **Pneumonia** | Community-acquired pneumonia | Preferred: Ceftriaxone 1g IV q24hr PLUS Azithromycin 500mg IV/PO q24hr  
| | | If allergy/intolerance to azithromycin: Ceftriaxone 1g IV q24hr PLUS Doxycycline 100mg IV/PO q12hr  
| | | For confirmed penicillin and cephalosporin allergy: Levofloxacin 750mg IV/PO q24hr  
| | | If MRSA risk factors (necrotizing pneumonia, recurrent MRSA infections, post influenza infection) present, ADD: Vancomycin 25mg/kg IV x1 (max 2g), then PKDS  
| | | CBC with diff, BMP, CXR, Blood Culture, Sputum Culture, Legionella Urinary Antigen |
| Pneumonia | Hospital-acquired pneumonia or ventilator-associated pneumonia or structural lung disease | Preferred: Cefepime 1g IV q6hr  
Secondary Option: Piperacillin-tazobactam 4.5g IV over 30 minutes, then q8hr over 4 hours  
For confirmed penicillin and cephalosporin allergy:  
Meropenem 500mg IV q6hr  
If MRSA risk factors (necrotizing pneumonia, recurrent MRSA infections, post influenza infection) present, ADD:  
Vancomycin 25mg/kg IV x1 (max 2g), then PKDS  
If double gram negative coverage due to high risk for MDROs necessary, ADD:  
Tobramycin 7mg/kg IV x1, then PKDS | CBC with diff, BMP, CXR, Blood Culture, Sputum Culture |
| --- | --- | --- |
| Skin/Soft Tissue Infection | Non-diabetic | If high streptococcal risk, Low MRSA risk: Cefazolin 1-2g IV q8hr  
If MRSA risk factors present: Vancomycin 25mg/kg IV x1 (max 2g), then PKDS | CBC with diff, BMP, Blood Culture x2, Wound Culture and gram stain (ensure no superficial cultures) |
| Skin/Soft Tissue Infection | Diabetic/Severe Sepsis/Septic Shock/Necrotizing Infection | Preferred: Piperacillin-tazobactam 4.5g IV over 30 minutes, then q8hr over 4 hours PLUS Vancomycin 25mg/kg IV x1 (max 2g), then PKDS  
For confirmed penicillin allergy: Cefepime 1g IV q6hr PLUS Metronidazole 500mg IV q8hr PLUS Vancomycin 25mg/kg IV x1 (max 2g), then PKDS  
For confirmed penicillin and cephalosporin allergy:  
Meropenem 500mg IV q6hr PLUS Vancomycin 25mg/kg IV x1 (max 2g), then PKDS | CBC with diff, BMP, Blood Culture x2, Wound Culture and gram stain (ensure no superficial cultures) |
| Urinary Source | Acute Pyelonephritis- low risk for MDROs | Preferred: Ceftriaxone 1g IV q24hr  
For confirmed penicillin and cephalosporin allergy:  
Ciprofloxacin 400mg IV q12hr | CBC with diff, BMP, UA, UC, Blood Culture x 2 |
<table>
<thead>
<tr>
<th>Source</th>
<th>Acute Pyelonephritis- high risk for MDROs</th>
<th>Febrile Neutropenia</th>
<th>Unknown Source</th>
</tr>
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<tbody>
<tr>
<td><strong>Preferred</strong></td>
<td>Cefepime 1g IV q6hr</td>
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<td>Piperacillin-tazobactam 4.5g IV over 30 minutes, then q8hr over 4 hours</td>
<td>Piperacillin-tazobactam 4.5g IV over 30 minutes, then q8hr over 4 hours</td>
<td>Piperacillin-tazobactam 4.5g IV over 30 minutes, then q8hr over 4 hours</td>
</tr>
<tr>
<td><strong>For confirmed penicillin and cephalosporin allergy</strong></td>
<td>Ciprofloxacin 400mg IV q12hr PLUS Gentamicin 5mg/kg IV x1</td>
<td>Meropenem 500mg IV q6hr</td>
<td>Meropenem 500mg IV q6hr</td>
</tr>
<tr>
<td><strong>For known history of ESBL</strong></td>
<td>Meropenem 500mg IV q6hr</td>
<td>If following risk factors present (known history of MRSA, infiltrates on CXR/pneumonia, suspected line infection, SSTI, or hemodynamic instability), ADD: Vancomycin 25 mg/kg IV x1(max 2g) then PKDS</td>
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</tr>
<tr>
<td><strong>CBC with diff, BMP, UA, UC, Blood Culture x2</strong></td>
<td>CBC with diff, BMP, CXR, Urine culture, Blood Culture, Wound Culture and gram stain (ensure no superficial cultures), Sputum Culture, +/-Influenza (during season), +/-C. diff (if diarrhea present)</td>
<td>CBC with diff, BMP, CXR, Urine culture, Blood Culture, Wound Culture and gram stain (ensure no superficial cultures), Sputum Culture, +/-Influenza (during season), +/-C. diff (if diarrhea present)</td>
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