

The STOP Sepsis Bundle Toolkit

Strategies to Timely Obviate the Progression of Sepsis



Department of Emergency Medicine
Division of Pulmonary and Critical Care Medicine
Department of Anesthesiology and Surgical Intensive Care
Department of Quality Resource Management

for the STOP Sepsis Working Group

Loma Linda University Medical Center

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Table of Contents

1. INTRODUCTION
 - a. Definition of a “bundle” and concept description of the STOP Sepsis Bundle.
2. STOP Sepsis Bundle Flowchart (poster, handout, pocket size)
 - a. Treatment algorithms used by clinicians and nurses to recognize, treat, and ensure quality of care for severe sepsis, beginning in the emergency department (6-hour) and continuing in the intensive care unit (24-hour).
3. STOP Sepsis Clinical Outline
 - a. Therapeutic outline to guide clinicians and nurses in recognizing and providing early goal-directed therapy in patients who meet criteria for severe sepsis and septic shock. Other advances in sepsis treatment are also emphasized and referenced.
4. STOP Sepsis Clinical Pathway
 - a. Daily clinical pathway for optimizing patient care, including diagnostics, treatments, and desired outcomes.
5. STOP Sepsis Orders
 - a. Physician Orders printed on hospital order forms including necessary laboratories, hemodynamic monitoring, antibiotics, fluid resuscitation, vasopressors, inotropes, transfusion, corticosteroids, and drotrecogin alfa activated.
6. STOP Sepsis Checklist
 - a. Therapeutic checklist that can be placed bedside including procedures, laboratories, patient monitoring and interventions required, especially in the emergency department.
7. STOP Sepsis ScvO₂ User’s Guide
 - a. A practical guide outlining the clinical applications and benefits of ScvO₂ monitoring.
8. STOP Sepsis Quality Measurement Tool
 - a. A quality improvement checklist to ensure standard of care.
 - b. A list of patients with severe sepsis or septic shock is obtained from admission records and reviewed each month. Each patient’s chart is carefully reviewed to determine the completion of each component of the Bundle.
 - c. Quality is improved as the numerator for each component increases over time.
9. STOP Sepsis Quality Indicators
 - a. Definitions of evidence-based quality indicators applicable in the treatment of severe sepsis.
 - b. These quality indicators are modeled after ongoing efforts by the Surviving Sepsis Campaign, Institute for Healthcare Improvement, Volunteer Hospitals of America, and JCAHO. They serve the basis for the individual components in the Bundle.

INTRODUCTION

What is a bundle?

A bundle is a group of interventions related to a disease that when performed together result in better outcome than when individually done. It increases the use of evidence-based science in clinical practice and provides a mechanism to enforce teamwork. A bundle is not guidelines, but a method to implement the guidelines. In creating a bundle, several rules have to be met: 1) the components of the bundle are solid and accepted into clinical practice, 2) the components must be completed in the same space and time interval, 3) the completion of each component can be answered by a “Yes” or “No”, 4) the delivery of the whole bundle can be answered by a “Yes” or “No”, and 5) the function of the bundle or the disease process it targets needs to be frequently occurring¹.

What is the STOP Sepsis Bundle?

The STOP Sepsis Bundle is an implementation of an early sepsis treatment model specific to the emergency department at Loma Linda University. It focuses on the first 6 hours of care after severe sepsis or septic shock is recognized. While it was designed for the emergency department setting, the bundle can be applied in any location where care is being given to patients with severe sepsis or septic shock; e.g. the medical ward, the recovery room, or the intensive care unit. It has additionally evolved to incorporate care in the intensive care unit, beyond the first 6 hours of disease presentation.

What is the evidence and support for the STOP Sepsis Bundle?

The Surviving Sepsis Campaign guidelines for the management of severe sepsis and septic shock² serve as framework for the bundle. The advances in therapy behind the bundle are early goal-directed therapy (EGDT)³, corticosteroids⁴, and activated protein C⁵. Most important in the first 6 hours of therapy for severe sepsis or septic shock is the implementation of EGDT as originally presented by Rivers et al³. The STOP Sepsis Bundle was not conceived to replace or modify EGDT, but is presented as an adaptation of the original EGDT research, and with the hope of making EGDT as widely implemented as possible. This suggested bundle is a practical application of the sepsis bundles provided by the Institute for Health Care Improvement¹ to the clinical environment at our institution. It also takes into consideration quality indicators being considered as sepsis core measures.

Disclaimer

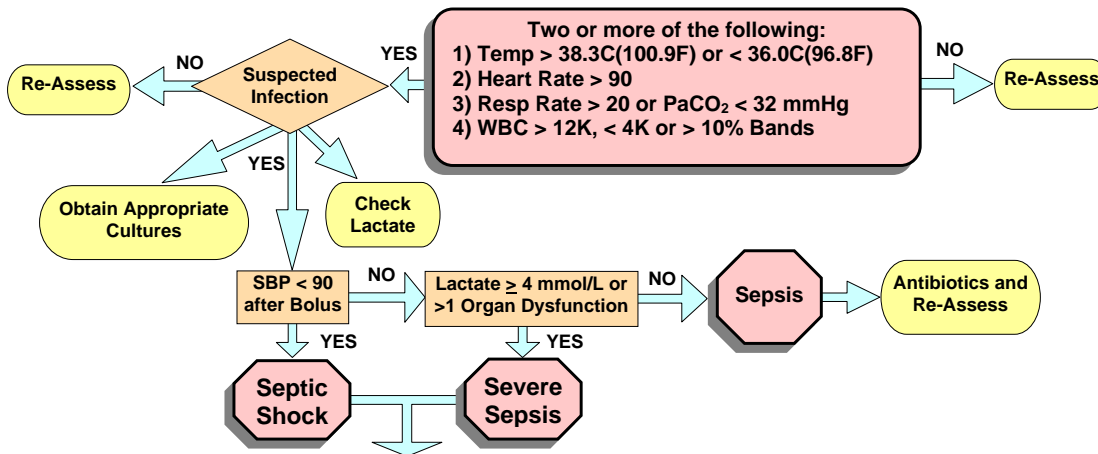
The content of this toolkit is a clinical template and will change with time. The clinician should use judgment for individual patient encounters. We would appreciate any feedback or suggestions to improve on the quality of the toolkit.

H. Bryant Nguyen, MD, MS
hbnguyen@ahs.llumc.edu
for the STOP Sepsis Working Group

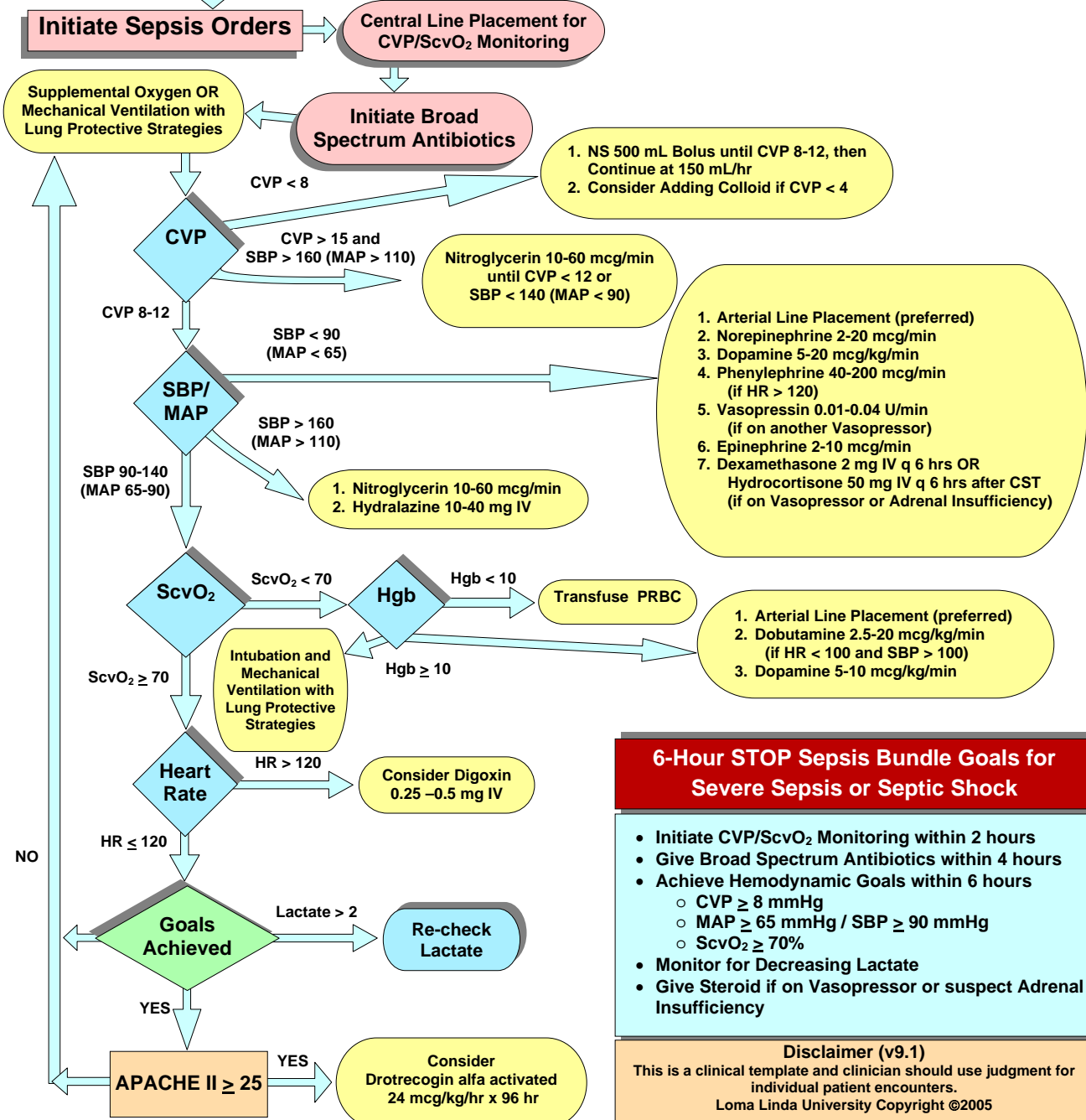
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Strategies to Obviate the Progression of Sepsis

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Early Goal-Directed Therapy



6-Hour STOP Sepsis Bundle Goals for Severe Sepsis or Septic Shock

- Initiate CVP/ScvO₂ Monitoring within 2 hours
- Give Broad Spectrum Antibiotics within 4 hours
- Achieve Hemodynamic Goals within 6 hours
 - CVP ≥ 8 mmHg
 - MAP ≥ 65 mmHg / SBP ≥ 90 mmHg
 - ScvO₂ ≥ 70%
- Monitor for Decreasing Lactate
- Give Steroid if on Vasopressor or suspect Adrenal Insufficiency

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Strategies to Obviate the Progression of Sepsis

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Sepsis has recently received renewed interest, beginning with a revised international definition. Therapies that significantly decrease sepsis mortality include: early antibiotics, early goal-directed therapy, corticosteroid, recombinant human activated protein C, lung protective strategies, and tight glucose control.

These advances have resulted in a management guidelines from the international Surviving Sepsis Campaign. In implementing the new guidelines, the Institute for Healthcare Improvement recommends the development of sepsis change bundles. These bundles include a group of interventions that must be given to patients with severe sepsis as they present and are admitted to the hospital. These efforts are endorsed by 11 international medical societies with the goal of decreasing sepsis mortality by 25 percent.

Levy MM, et al. 2001 SCCM/ESICM/ACCP/ATS/SIS International sepsis definitions conference. Crit Care Med 2003;31:1250-1256.

Dellinger RP, et al. Surviving sepsis campaign guidelines for management of severe sepsis and septic shock. Crit Care Med 2004;32:858-73.

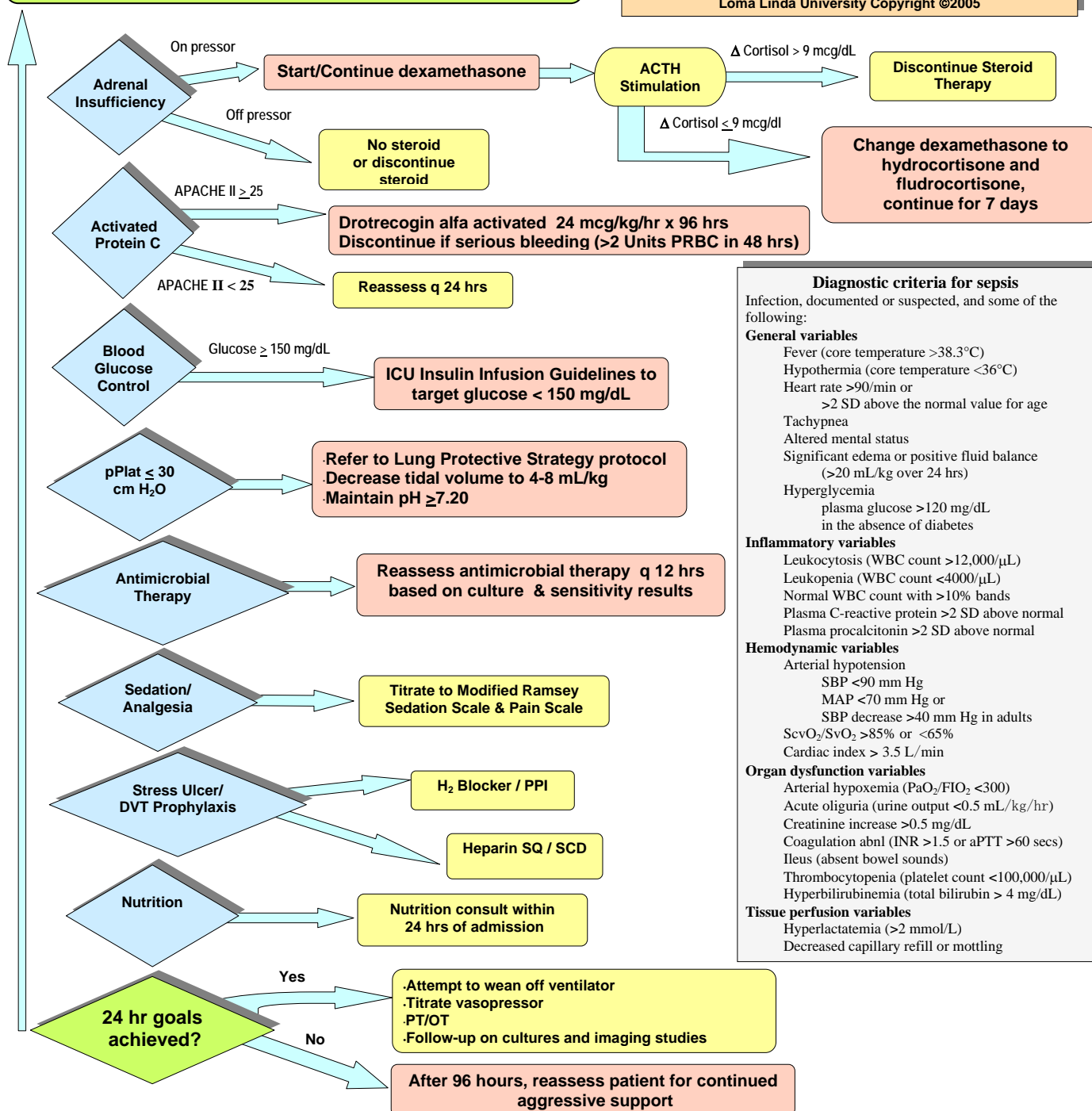
24-Hour STOP Sepsis Bundle Goals for Severe Sepsis or Septic Shock

- Initiate steroids for catecholamine resistance/adrenal insufficiency
- Initiate drotrecogin alfa activated if APACHE II ≥ 25
- Maintain blood glucose control < 150 mg/dL
- Achieve plateau pressure ≤ 30 cmH₂O
- Reassess antimicrobial therapy
- Maintain sedation/analgesia for ventilator synchrony & comfort
- Initiate stress ulcer and DVT prophylaxis
- Nutrition within 24 hours of admission
- Titrate off vasopressors while maintaining:
 - CVP ≥ 8 mmHg
 - MAP ≥ 65 mmHg / SBP ≥ 90 mmHg
 - SvO₂/ScvO₂ $\geq 70\%$ on FiO₂ ≤ 0.5

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Continue 6-hour goals while achieving 24-hour goals



Diagnostic criteria for sepsis

Infection, documented or suspected, and some of the following:

General variables

- Fever (core temperature $>38.3^{\circ}\text{C}$)
- Hypothermia (core temperature $<36^{\circ}\text{C}$)
- Heart rate >90 /min or >2 SD above the normal value for age
- Tachypnea
- Altered mental status
- Significant edema or positive fluid balance (>20 mL/kg over 24 hrs)
- Hyperglycemia
plasma glucose >120 mg/dL in the absence of diabetes

Inflammatory variables

- Leukocytosis (WBC count $>12,000/\mu\text{L}$)
- Leukopenia (WBC count $<4000/\mu\text{L}$)
- Normal WBC count with $>10\%$ bands
- Plasma C-reactive protein >2 SD above normal
- Plasma procalcitonin >2 SD above normal

Hemodynamic variables

- Arterial hypotension
SBP <90 mm Hg
MAP <70 mm Hg or
SBP decrease >40 mm Hg in adults
- ScvO₂/SvO₂ $>85\%$ or $<65\%$
- Cardiac index > 3.5 L/min

Organ dysfunction variables

- Arterial hypoxemia (PaO₂/FIO₂ <300)
- Acute oliguria (urine output <0.5 mL/kg/hr)
- Creatinine increase >0.5 mg/dL
- Coagulation abnl (INR >1.5 or aPTT >60 secs)
- Ileus (absent bowel sounds)
- Thrombocytopenia (platelet count $<100,000/\mu\text{L}$)
- Hyperbilirubinemia (total bilirubin > 4 mg/dL)

Tissue perfusion variables

- Hyperlactatemia (>2 mmol/L)
- Decreased capillary refill or mottling

**A CLINICAL OUTLINE FOR THE CARE OF
PATIENTS WITH SEVERE SEPSIS AND SEPTIC SHOCK**
for the STOP Sepsis Bundle - Strategies to Timely Obviate the Progression of Sepsis
Version 9.1

SEPSIS DEFINITIONS:^{1,2}

Infection: A microbial phenomenon characterized by an inflammatory response to the presence of microorganisms or the invasion of normally sterile host tissue by those organisms. An infection can be recognized as:

1. Presence of white cells in a normally sterile body fluid **OR**
2. Positive culture (urine, blood, sputum) **OR**
3. Perforated viscous **OR**
4. Radiographic evidence of pneumonia in association with the production of purulent sputum

Signs of Inflammation: A systemic response to inflammation and is manifested by two or more of the following:

1. Temperature > 38.3°C/100.9F or < 36°C/96.8F
2. Heart rate > 90 beats/min (sinus rhythm)
3. Respiratory rate > 20 breaths/min or PaCO₂ < 32 mmHg
4. WBC > 12,000 cells/mm³, < 4000 cells/mm³, or > 10% bands

Sepsis: The systemic response to an infection, and can be recognized by the presence of suspected or confirmed infection AND the systemic inflammatory response.

Severe Sepsis: Sepsis associated with more than one acute organ dysfunction or hypoperfusion. Hypoperfusion may include, but are not limited to lactic acidosis (or lactate > 2 mmol/L), oliguria, or an acute alteration in mental status. Organ dysfunction can be defined as: respiratory failure, acute renal failure, acute liver failure, coagulopathy, or thrombocytopenia. Laboratories that will suggest organ dysfunction include:

1. PaO₂(mmHg)/FiO₂ <300
2. Creatinine >2.0 OR Creatinine Increase >0.5 mg/dL
3. INR >1.5
4. PTT >60 s
5. Platelets < 100,000/uL
6. Total bilirubin >4 mg/dL

Septic Shock: Sepsis with hypotension, despite adequate fluid resuscitation of 20 ml/kg crystalloid, along with the presence of perfusion abnormalities that may include, but are not limited to lactic acidosis, oliguria, or an acute alteration in mental status. Patients who are on inotropic or vasopressor agents may not be hypotensive at the time that perfusion abnormalities are measured. *Cryptic* septic shock is sepsis with severe lactic acidosis (lactate ≥ 4 mmol/L) irrespective of blood pressure, and is considered to be equivalent to traditional septic shock (sepsis with hypotension).

Hypotension: A systolic blood pressure (SBP) < 90 mmHg or mean arterial pressure < 65 mmHg or a reduction in SBP of > 40 mmHg from baseline in the absence of other causes for hypotension.

Note: Refer to bibliography for formal definitions.^{1,2}

PATIENTS WHO WILL BENEFIT FROM EARLY GOAL-DIRECTED THERAPY³:

1. Two or more signs of inflammation
AND
2. Suspected or confirmed infection
AND
3. Systolic blood pressure < 90 mmHg after a 20 ml/kg fluid bolus OR
Lactate \geq 4 mmol/L

Exclusion: age < 18 yrs, pregnancy, stroke, acute coronary syndrome, acute pulmonary edema, status asthmaticus, active GI hemorrhage, seizure, drug overdose, burn, trauma, emergent surgery, uncured cancer, immunosuppression, do-not-resuscitate order

LABORATORY DATA OBTAINED WITHIN ONE HOUR AFTER PHYSICIAN EVALUATION:

1. Baseline
 - a. CBC with differential, comprehensive metabolic panel, PT/PTT, D-Dimer, Troponin I, urine analysis, type & screen
 - b. CXR, ECG
 - c. Urine culture, blood culture, sputum culture and sensitivities
2. Baseline and every 3 hours
 - a. ScvO₂ (central venous blood gas if using intermittent measurements)
 - b. Lactate (grey-top tube on ice)

HEMODYNAMIC MONITORING WITHIN 2 HOURS AFTER PHYSICIAN EVALUATION:

1. Cardiac monitoring
2. Pulse oximetry
3. Central venous pressure (CVP) monitoring with intermittent ScvO₂ measurements⁴
 - a. Central venous catheterization via internal jugular or subclavian vein method
4. OR (Preferred) Continuous central venous oxygen saturation (ScvO₂) monitoring⁵
 - a. ScvO₂ catheterization via internal jugular or subclavian vein method
5. Intra-arterial catheterization (preferred)

TREATMENT PROTOCOL (TO BE COMPLETED WITHIN 6 HOURS OR UNTIL ICU ADMISSION):^{3,4}

1. Initiate mechanical ventilation when indicated
 - a. Maintain low tidal volume to achieve peak inspiratory plateau pressure \leq 30 cm H₂O
2. Give appropriate antimicrobial agent(s) within 4 hours
3. Central venous pressure (CVP) - Preload
 - a. CVP < 8 mmHg
 - i. 500 mL bolus of normal saline every 30 minutes until CVP reaches 8-12 mmHg, then continue at 150 mL/hr
 - ii. Consider lactate ringer instead of normal saline if hyperchloremic acidosis is present
 - iii. Consider adding colloid to crystalloid if CVP < 4 mmHg⁶
 - b. CVP > 15 mmHg and MAP > 110 (or SBP > 160) mmHg
 - i. Initiate nitroglycerin 10-60 mcg/min until CVP < 12 mmHg or MAP < 90 (or SBP < 140) mmHg^{7,8}
4. Mean arterial pressure (MAP) - Afterload
 - a. MAP < 65 (or SBP < 90) mmHg after 2 liters of crystalloid
 - i. Initiate vasopressors in the order below until MAP > 65 (or SBP > 90) mmHg^{4,9}
 1. Norepinephrine 2-20 mcg/min (first line therapy in severe sepsis)

2. Dopamine 5-20 mcg/kg/min
 3. Phenylephrine 40-200 mcg/min (preferred if HR > 120 bpm)
 4. Vasopressin 0.01-0.04 U/min¹⁰⁻¹² (if on another vasopressor)
 5. Epinephrine 2-10 mcg/min (may increase lactate)
 - ii. Consider adrenal insufficiency if vasopressor dependent¹³
 1. Perform cosyntropin stimulation test (CST)
 - a. Measure baseline cortisol level
 - b. Administer ACTH (Cosyntropin/Cortrosyn) 250 mcg IV
 - c. Measure cortisol level at 30 min and 60 min after given ACTH
 - i. Change in cortisol \leq 9 ug/dl suggests relative adrenal insufficiency¹⁴
 2. Give Hydrocortisone 50 mg IV (OR dexamethasone 2 mg IV if not performing CST) q 6 hrs
 3. Give Fludrocortisone 50 mcg PQ qd
 - b. MAP > 110 (or SBP > 160) mmHg^{7,8}
 - i. Initiate nitroglycerin 10-60 mcg/min until MAP < 90 (or SBP < 140) mmHg
 - ii. Consider hydralazine 10-40 mg IV
5. Central venous oxygen saturation (ScvO₂)^{3,5} – Contractility and oxygen content
 - a. ScvO₂ < 70% after above therapy and Hb < 10 g/dL
 - i. Transfuse packed red blood cells
 - b. ScvO₂ < 70% after above therapy and Hb \geq 10 g/dL
 - i. Dobutamine 2.5–20 mcg/kg/min titrated until ScvO₂ \geq 70% OR MAP < 70 (or SBP < 100) mmHg OR heart rate > 100 bpm
 1. Caution with starting Dobutamine when MAP < 70 (or SBP < 100 mmHg) OR heart rate > 100 bpm
 - ii. Dopamine 5-10 mcg/kg/min
 - c. Consider intubation and mechanical ventilation to decrease respiratory muscle oxygen consumption
 - i. Maintain low tidal volume to achieve peak inspiratory plateau pressure \leq 30 cm H₂O
6. Heart rate:
 - a. Heart rate > 120 bpm
 - i. Consider digoxin 0.25-0.5 mg IV (possible benefit as inotrope and in controlling heart rate in sepsis with underlying cardiomyopathy)¹⁵
7. Obtain intensive care consult for admission after above goals are met
8. Go back to each step above until patient is transferred to intensive care unit

THERAPEUTIC GOALS TO BE ACHIEVED WITHIN 24 HOURS, AND MAINTAINED AFTER ICU ADMISSION^{4,9,16}:

1. Mechanical ventilation if indicated, with low tidal volume to maintain peak inspiratory plateau pressure \leq 30 cm H₂O
 - a. Decreases absolute mortality by 9 percent¹⁷
2. Hemodynamic monitoring established (within 2 hours)
3. Appropriate broad-spectrum antibiotics administered
 - a. Given within 4 hours decreases length of stay by 2 days, and decreases absolute mortality by 24 percent¹⁸⁻²¹
4. Early goal directed therapy goals
 - a. Achieved within 6 hours decreases absolute mortality by 16 percent³
 - b. Central venous pressure 8-12 mmHg
 - b. Mean arterial pressure 65 to 90 OR systolic blood pressure 90 to 140 mmHg
 - c. Central venous oxygen saturation (ScvO₂) \geq 70%
 - d. Urine output > 0.5 ml/kg/hr
6. Decreased lactic acidosis

- a. Lactate clearance (or decrease) of $\geq 10\%$ after 6 hours of resuscitation in the emergency department is associated with improved outcome²²
 - b. Lactate ≥ 4 mmol/L in non-hypotensive patients has 96% specificity of predicting mortality²³
 - c. Lactate normalized to < 2 mmol/L within 24 hours decreases absolute mortality by 25 percent^{24, 25}
7. Administer steroid if on chronic steroid, vasopressor dependent, or suspect adrenal insufficiency
 - a. Decreases absolute mortality by 10 percent¹³
 8. Consider drotrecogin alfa activated/Xigris (recombinant human activated protein C)
 - a. Decreases absolute mortality by 13 percent in patients with APACHE II score ≥ 25 ²⁶
 - b. ENHANCE Study suggests that Xigris given on day 1 compared to day 2 (or after) is associated with a lower mortality (unpublished data, Chest 2003)
 - c. FDA warning for use in patients with single organ dysfunction and recent surgery within 30 days (ADDRESS Trial).
 9. Consider insulin if required to maintain glucose 80-110 mg/dl
 - a. Decreases absolute mortality by 3 percent at 12 months²⁷

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Clinical Pathway (v9.1)

Case Type: Severe Sepsis or Septic Shock

Target ICU LOS: 7 days

DESIRED OUTCOME	<ol style="list-style-type: none"> 1. Early identification of severe sepsis and septic shock 2. Early hemodynamic monitoring 3. Early intervention of severe sepsis and septic shock 4. Prevent the progression of multi organ failure and increase chances of survival
DAY	0-6 hours
LOCATION	ED/ PACU/ ICU
Assessments	<p>Primary Assessment (nurse Triage): Assign treatment category based on assessment, vital signs every hour</p> <p>Secondary Assessment: vital signs every hour, pain control, physician evaluation, determine sepsis category (sepsis, severe sepsis, or septic shock)</p>
Tests	<p>CBC w/ diff, comprehensive metabolic panel, PT, PTT, D-Dimer, Troponin I, urine analysis, Lactate, type and screen</p> <p>CXR, ECG</p> <p>Appropriate cultures and sensitivities prior to antibiotics</p>
Activity	Bedrest
Treatments	<p>Cardiac monitoring, Pulse oximetry</p> <p>Supplemental Oxygen or Mechanical Ventilation</p> <p>Central Line Placement for CVP/ScvO₂ Monitoring</p> <p>Arterial Line Placement if needed</p> <p>Early antibiotics and Source control</p> <p>Hemodynamic optimization (early goal-directed therapy)</p> <p>Monitor input and output</p>
Medications	<p>Broad-spectrum IV antibiotics</p> <p>Crystalloid, colloid, PRBC</p> <p>Norepinephrine, Dopamine, Phenylephrine, Vasopressin, Epinephrine, Dobutamine</p> <p>Dexamethasone, Hydrocortisone</p>
Nutrition	NPO
Teaching	Review treatment plan with patient/family.
Consults	Intensive care consult, surgical consult if needed
Goals prior to ICU admission	<ol style="list-style-type: none"> 1. CVP/ScvO₂ monitoring within 2 hours 2. Broad spectrum antibiotics within 4 hours 3. Optimal hemodynamics: CVP ≥ 8 mmHg, MAP ≥ 65 mmHg (or SBP ≥ 90 mmHg), ScvO₂ ≥ 70% within 6 hours 4. Resolution of tissue hypoperfusion (decreasing lactate) 5. Initiate corticosteroid if on vasopressor or suspect adrenal insufficiency

Clinical Pathway (v9.1)

Case Type: Severe Sepsis or Septic Shock

Target ICU LOS: 7 days

DESIRED OUTCOME	<ol style="list-style-type: none"> 1. Titrate vasopressor while maintaining optimal hemodynamics and resolving tissue hypoperfusion 2. Assess and initiate optimal therapies for severe sepsis and septic shock 3. Prevent complications of severe sepsis and septic shock
DAY	Admission Day 1
LOCATION	ICU
Assessments	Continuous cardiac monitoring, hemodynamic monitoring, CVP/ScvO ₂ every hour, VS every hour, input/output every hour
Tests	CBC w/ diff, comprehensive metabolic panel, PT, PTT, D-Dimer, Troponin I, Lactate ABG, VBG (for ScvO ₂ monitor calibration) APACHE II calculation Cosyntropin stimulation test CXR, ECG Imaging studies if needed
Activity	Bedrest
Treatments	Mechanical Ventilation if indicated with Lung Protective Strategies CVP/ScvO ₂ or pulmonary artery catheter (SvO ₂) for hemodynamic monitoring Hemodynamic optimization Antibiotics and source control Corticosteroid Recombinant human activated protein C FAST HUG (Feeding, Analgesia, Sedation, Thromboembolic prevention, Head of bed elevation, stress Ulcer prophylaxis, Glucose control)
Medications	Appropriate IV antibiotics Crystalloid, colloid, PRBC Norepinephrine, Dopamine, Phenylephrine, Vasopressin, Epinephrine, Dobutamine Hydrocortisone and fludrocortisone if on vasopressor and adrenal insufficiency Drotrecogin alfa activated Insulin infusion Opiate, Sedative H ₂ -blocker, Proton pump inhibitor, Heparin
Nutrition	Nutrition consult within 24 hours of admission
Teaching	Review treatment plan with patient/family.
Consults	Nutrition, Subspecialties
Goals at 24-hour after ICU admission	<ol style="list-style-type: none"> 1. Optimal hemodynamics CVP ≥ 8 mmHg, MAP ≥ 65 mmHg (or SBP ≥ 90 mmHg), ScvO₂ (or SvO₂) ≥ 70% while titrating vasopressors 2. Corticosteroid if on vasopressor and adrenal insufficiency 3. Drotrecogin alfa activated if APACHE II ≥ 25 4. Glucose < 150 mg/dL 5. Plateau pressure ≤ 30 cmH₂O if mechanical ventilation 6. Sedation/analgesia for patient comfort (using Ramsay Sedation Scale) 7. Antimicrobial appropriateness 8. Stress ulcer and DVT prophylaxis 9. Early nutrition

Clinical Pathway (v9.1)

Case Type: Severe Sepsis or Septic Shock

Target ICU LOS: 7 days

DESIRED OUTCOME	<ol style="list-style-type: none"> 1. Titrate vasopressor while maintaining optimal hemodynamics and resolving tissue hypoperfusion 2. Assess and initiate optimal therapies for severe sepsis and septic shock 3. Prevent complications of severe sepsis and septic shock 4. Weaning from mechanical ventilator 5. Decrease ICU length of stay and in-hospital mortality
DAY	Day 2 until Day 7 (ICU Discharge)
LOCATION	ICU
Assessments	<p>Continuous cardiac monitoring, hemodynamic monitoring, CVP/ScvO₂ every hour, VS every hour, input/output every hour</p> <p>Assess risks for bleeding, DVT, nosocomial infection</p>
Tests	<p>CBC w/ diff, comprehensive metabolic panel, Lactate</p> <p>ABG, VBG (for ScvO₂ monitor calibration)</p> <p>CXR, ECG</p> <p>Imaging studies if needed</p>
Activity	Bedrest
Treatments	<p>Mechanical Ventilation if indicated with Lung Protective Strategies</p> <p>CVP/ScvO₂ or pulmonary artery catheter (SvO₂) for hemodynamic monitoring</p> <p>Hemodynamic optimization</p> <p>Antibiotics and source control</p> <p>Corticosteroid</p> <p>Recombinant human activated protein C (discontinued if bleeding)</p> <p>FAST HUG (Feeding, Analgesia, Sedation, Thromboembolic prevention, Head of bed elevation, stress Ulcer prophylaxis, Glucose control)</p>
Medications	<p>Appropriate IV antibiotics</p> <p>Crystalloid, colloid, PRBC</p> <p>Norepinephrine, Dopamine, Phenylephrine, Vasopressin, Epinephrine, Dobutamine</p> <p>Hydrocortisone and fludrocortisone (total of 7 days)</p> <p>Drotrecogin alfa activated (total infusion of 96 hours)</p> <p>Insulin infusion</p> <p>Opiate, Sedative</p> <p>H₂-blocker, Proton pump inhibitor, Heparin</p>
Nutrition	Enteral versus parenteral feeding
Teaching	Review treatment plan with patient/family. Reassess patient for continued aggressive support.
Consults	Physical Therapy, Occupational Therapy, Case Manager, Subspecialties
Goals on each day after ICU admission	<ol style="list-style-type: none"> 1. Optimal hemodynamics CVP ≥ 8 mmHg, MAP ≥ 65 mmHg (or SBP ≥ 90 mmHg), ScvO₂ (or SvO₂) ≥ 70% while titrating vasopressors 2. Discontinue corticosteroid if not adrenal insufficiency (responder to cosyntropin stimulation test) 3. Assess for bleeding if on drotrecogin alfa activated 4. Glucose < 150 mg/dL 5. Plateau pressure ≤ 30 cmH₂O if mechanical ventilation, weaning off ventilator as appropriate 6. Sedation/analgesia for patient comfort (using Ramsay Sedation Scale) 7. Antimicrobial appropriateness 8. Stress ulcer and DVT prophylaxis 9. Nutrition 10. ICU discharge planning

Adult Severe Sepsis Orders (version 9.1)

√	Attending Physician:
	Diagnosis: <input type="checkbox"/> Severe Sepsis <input type="checkbox"/> Septic Shock
	Condition: Critical Code Status: <input type="checkbox"/> Full <input type="checkbox"/> DNR

Routine Nursing Orders
Cardiac Monitoring & Continuous Pulse Oximetry
Supplement oxygen to keep O ₂ sat > 92%
Vitals q 1 hr with Progress Note Documentation by Nurse or MD
Monitor input and output q 1 hr
Activity: Bed Rest
Diet: NPO
IV Saline lock with flush of Normal Saline 3 mL q 12 hours
Calibrate & Initiate Central Venous Pressure and ScvO ₂ Monitoring after line placement verified by MD
Mechanical ventilator: Mode___, Freq___, V _T ___, FiO ₂ ___, PEEP___, mPaw___, I:E___, PS___, PEEP _H ___, PEEP _T ___, HIGH _T ___, Seconds Amplitude___, %I-time___
Alert MD if Central Venous Pressure is < 8 mmHg or > 15 mmHg
Alert MD if Systolic Blood Pressure < 90 mmHg or > 160 mmHg (Mean Arterial Pressure < 65 mmHg or > 90 mmHg)
Alert MD if ScvO ₂ < 70%
Alert MD if Hemoglobin (or Hemacue) < 10 g/dL
Alert MD if Lactate > 2 mmol/L
Alert MD if O ₂ saturation < 88% or peak-inspiratory plateau pressure > 30 cm H ₂ O (on mechanical ventilation)

Diagnostics
Blood culture & sensitivity, urine culture & sensitivity, sputum culture & sensitivity, urinalysis, CBC with differential, comprehensive metabolic panel, PT/PTT/INR, D-Dimer, Trop I
Lactate level (drawn in grey tube on ice) now and repeat in 6 hours
Venous blood gas from central line & arterial blood gas
Cosyntropin stimulation test: Obtain cortisol level, administer ACTH 250 mcg IV, then obtain cortisol at 30 and 60 min
Measure peak-inspiratory plateau pressure every 4 hours
Glucose level every 4 hours
12-lead ECG
Chest X-ray - Reason:
Ultrasound – Location and Reason:
CT scan - Location and Reason:

Medications (Date and time must be entered for each order)		
Physician Signature	Date and Time	ALLERGIES: Weight (kg):
		Intravenous fluids - NS 500 mL IV bolus until Central Venous Pressure 8 to 12 mmHg, then continue NS to run at 150 mL/hour
		Antibiotics - See Parenteral Antibiotics Order Form
		Tylenol 1 gm PO q 4 hr PRN Temperature > 38.3 °C
		Heparin 5,000 units SQ q 12 hr
		Famotidine 20 mg IV q 12 hr
		Midazolam 100 mg/NS 100 mL at 1-10 mg/hr, titrate to sedation scale
		Morphine 100 mg/NS 100 mL at 1-10 mg/hr, titrate to pain relief
		Vasopressors - (SBP = Systolic Blood Pressure)
		Norepinephrine 8 mg/D ₅ W 250 mL at 2-20 mcg/min, titrate to SBP > 90 mmHg
		Dopamine 800 mg/D ₅ W 250 mL at 5-20 mcg/kg/min, titrate to SBP > 90 mmHg
		Phenylephrine 10 mg/NS 250 mL at 40-200 mcg/min, titrate to SBP > 90 mmHg
		Vasopressin 20 units/NS 100 mL at 0.01-0.04 units/min, titrate to SBP > 90 mmHg
		Epinephrine 1 mg/NS 250 mL at 2-10 mcg/min, titrate to SBP > 90 mmHg
		Dobutamine 500 mg/NS 250 mL at 2.5-20 mcg/kg/min, titrate to ScvO ₂ > 70%, maintaining SBP > 90 mmHg and Heart Rate < 140 per min
		Nitroglycerin 100 mg/D ₅ W 250 mL at 10-60 mcg/min, titrate to SBP < 140 mmHg
		Type & Cross 2 units
		Transfuse ___ unit PRBC
		Hydrocortisone 50 mg IV q 6 hr, and Fludrocortisone 50 mcg PO qd
		Xigris (Drotrecogin alfa activated) 24 mcg/kg/hr for 96 hr - See Institutional Guidelines
		Regular Insulin 100 units/NS 100 mL titrate to keep glucose < 150 mg/dL

MEDICATION ORDER FORM

Xigris (Drotrecogin alfa activated) for Adult Patients with Severe Sepsis or Septic Shock

INDICATIONS (Circle “Yes” or “No” for each of the following below):

NOTE: Patient must have all three indications to receive Xigris (drotrecogin alfa activated)

1. Yes / No - **Patient has high risk for mortality due to severe sepsis or septic shock defined as:**
 - a. (2) and (3) below **AND**
 - b. Cardiovascular dysfunction: Arterial systolic blood pressure < 90 mmHg or the mean arterial pressure < 70 mmHg despite adequate fluid resuscitation, requiring the use of vasopressor **AND**
 - c. Multi-organ dysfunction as defined by APACHE II Score \geq 25
2. Yes / No - **Patient has known or suspected infection defined as:**
 - a. Presence of white cells in a normally sterile body fluid **OR**
 - b. Positive culture (urine, blood, sputum) **OR**
 - c. Perforated viscus **OR**
 - d. Radiographic evidence of pneumonia in association with the production of purulent sputum
3. Yes / No - **Patient has three or more signs of inflammation defined as:**
 - a. Temperature > 38.3°C (100.9F) or < 36.0°C (96.8F)
 - b. Heart Rate > 90 beats per minute
 - c. Respiratory > 20 breaths per minute or PaCO₂ < 32 mmHg
 - d. WBC > 12,000/mm³ or < 4,000/mm³ or > 10% bands

CONTRAINDICATIONS (Circle “Yes” or “No”):

NOTE: Patient **MUST NOT** receive Xigris (drotrecogin alfa activated) if one or more of the absolute contraindications exist

Absolute Contraindications	Warnings
Yes / No - Active internal bleeding process	Yes / No - Initial platelet counts less than 30,000/mm ³
Yes / No - Less than 3 months post hemorrhagic CVA, intracranial/spinal surgery, head trauma	Yes / No - History of bleeding diatheses (deficiency of protein C, protein S, antithrombin III; activated protein C resistance, anticardiolipin antibody, antiphospholipid antibody, lupus anticoagulant, or homocystinemia)
Yes / No - Any history of intracerebral arteriovenous malformation, cerebral aneurysm, or mass lesion of the central nervous system	Yes / No - Administration of direct thrombin inhibitor, unfractionated heparin \geq 15 units/kg/hr in past 8 hours, LMWH greater than prophylaxis dose in past 12 hours, warfarin in past 7 days, ASA > 650 mg/day or antiplatelet agents in past 7 days, or INR > 3.0
Yes / No - Less than 12 hours post surgery requiring general or spinal anesthesia	Yes / No - Administration of thrombolytics in past 3 days, glycoprotein inhibitor agents in past 7 days, or any investigational agents known to affect coagulation
Yes / No - Presence of an epidural catheter	Yes / No - GI bleeding within 6 weeks
Yes / No - Trauma considered to increase the risk of life-threatening bleeding	Yes / No - Less than 3 months from ischemic stroke
	Yes / No - Chronic renal failure requiring hemodialysis or peritoneal dialysis
	Yes / No - Portosystemic hypertension, chronic jaundice, cirrhosis, or chronic ascites
	Yes / No - Recently documented (\leq 3months) or highly suspected DVT or PE
	Yes / No - Acute pancreatitis with no evidence of infection
	Yes / No - HIV (CD ₄ < 50)
	Yes / No - Recent bone marrow or organ transplantation
	Yes / No - Age < 18 years
	Yes / No - Weight > 135 kilograms
	Yes / No - Pregnancy and/or breast feeding
	Yes / No - Single organ dysfunction and recent surgery less than 30 days

Allergies: _____

Patient Weight = _____ kg

APACHE II Score: _____

Patient Weight Range (kg)	Dosing: Check [√] dose that applies to patient’s weight
27-43	[] Xigris 10 mg in NS 100 mL to run at 8 mL/hour for 8 bags total
44-60	[] Xigris 15 mg in NS 150 mL to run at 13 mL/hour for 8 bags total
61-78	[] Xigris 20 mg in NS 200 mL to run at 17 ml/hour for 8 bags total
79-95	[] Xigris 25 mg in NS 250 mL to run at 21 ml/hour for 8 bags total
96-113	[] Xigris 30 mg in NS 300 mL to run at 25 ml/hour for 8 bags total
114-130	[] Xigris 35 mg in NS 350 mL to run at 29 ml/hour for 8 bags total
131-135	[] Xigris 40 mg in NS 400 mL to run at 33 ml/hour for 8 bags total

Attending Physician Signature: _____

Date and Time: _____

APACHE II Score Calculation

1. Temperature (°C / F)	Points	6. Arterial pH	Points	11. White Blood Count (per mm ³)	Points
≥ 41°C / ≥ 105.8F	4	≥ 7.70	4	≥ 40	4
39-40.9 / 102.1-105.7	3	7.60-7.69	3	20-39.9	2
38.5-38.9 / 101.3-102	1	7.50-7.59	1	15-19.9	1
36-38.4 / 96.8-101.2	0	7.33-7.49	0	3-14.9	0
34-35.9 / 93.1-96.7	1	7.25-7.32	2	1-2.9	2
32-33.9 / 89.5-93	2	7.15-7.24	3	< 1	4
30-31.9 / 85.9-89.4	3	< 7.15	4	12. Glasgow Coma Scale (GCS)	
≤ 29.9 / ≤ 85.8	4	7. Serum Sodium (mmol/L)		Eyes Opening	
2. MAP = [(2 * DBP) + SBP] / 3 (mm Hg)		≥ 180	4	Spontaneous	4
≥ 160	4	160-179	3	To voice	3
130-159	3	155-159	2	To pain	2
110-129	2	150-154	1	Absent	1
70-109	0	130-149	0	Verbal Response	
50-69	2	120-129	2	Converses / Oriented	5
≤ 49	4	111-119	3	Converses / Disoriented	4
3. Heart Rate (beats per min)		≤ 110	4	Inappropriate	3
≥ 180	4	8. Serum Potassium (mmol/L)		Incomprehensible	2
140-179	3	≥ 7	4	Absent	1
110-139	2	6-6.9	3	Motor Response	
70-109	0	5.5-5.9	1	Obeys commands	6
55-69	2	3.5-5.4	0	Localizes pain	5
40-54	3	3-3.4	1	Withdraws from pain	4
≤ 39	4	2.5-2.9	2	Decorticate (flexion) rigidity	3
4. Respiratory Rate (breaths per min)		< 2.5	4	Decerebrate (extension) rigidity	2
≥ 50	4	9. Serum Creatinine (mg/dL)		Absent	1
35-49	3	≥ 3.5 & acute renal failure	8	GCS Score =	
25-34	1	2.0-3.4 & acute renal failure	6	GCS Points = 15 – GCS Score =	
12-24	0	1.5-1.9 & acute renal failure	4	APS Points (Sum of 12 points above) =	
10-11	1	≥ 3.5 & chronic renal failure	4	Age Points	
6-9	2	2.0-3.4 & chronic renal failure	3	≥ 75	6
≤ 5	4	1.5-1.9 & chronic renal failure	2	65-74	5
5. Oxygenation		0.6-1.4	0	55-64	3
a. A-a gradient if FiO ₂ ≥ 0.5		< 0.6	2	45-54	2
≥ 500	4	10. Hematocrit (%)		≤ 44	0
350-499	3	≥ 60	4	Chronic Health Points*	
200-349	2	50-59.9	2	Yes, Non-operative	5
< 200	0	46-49.9	1	Yes, Emergency post-operative	5
b. PaO ₂ if FiO ₂ < 0.5		30-45.9	0	Yes, Elective post-operative	2
> 70	0	20-29.9	2	No	0
61-70	1	< 20	4	APACHE II Score =	
55-60	3			APS Points +	
< 55	4			Age Points + Chronic Health Points	

NOTE: Points are determined from the worst physiologic variables in the first 24 hours after patient presentation.

***Chronic Health:**

Organ insufficiency or immunocompromised state must have been evident prior to this hospital admission and conform to the following criteria:
LIVER: Biopsy-proven cirrhosis and documented portal hypertension; episodes of past upper GI bleeding attributed to portal hypertension; or prior episodes of hepatic failure/encephalopathy/coma.

CARDIOVASCULAR: New York Heart Association Class IV

RESPIRATORY: Chronic restrictive, obstructive, or vascular disease resulting in severe exercise restriction; i.e. unable to climb stairs or perform household duties, or documented chronic hypoxia, hypercapnia, secondary polycythemia, severe pulmonary hypertension (>40 mm Hg), or respiratory dependency.

RENAL: Receiving chronic dialysis.

IMMUNOCOMPROMISED: Patient has received therapy that suppresses resistance to infection; e.g. immunosuppression, chemotherapy, radiation, long-term or recent high-dose steroids, or has a disease that is sufficiently advanced to suppress resistance to infection; e.g. leukemia, lymphoma, AIDS.

STOP SEPSIS BUNDLE EMERGENCY DEPARTMENT / 6-HOUR CHECKLIST (Version 9.1)

CRITERIA FOR INITIATING BUNDLE

- | |
|---|
| 1) Two or more signs of inflammation: <ul style="list-style-type: none">a) Temperature $>38.3^{\circ}\text{C}$ (100.9F) or $<36^{\circ}\text{C}$ (96.8F)b) Heart rate >90 beats/minc) Respiratory rate >20 breaths/min or $\text{PaCO}_2 <32$ mmHgd) WBC $> 12,000$ cells/mm³, <4000 cells/mm³, or $>10\%$ bands |
| 2) Suspected or confirmed infection |
| 3) Systolic blood pressure < 90 mmHg after fluid bolus OR
Lactate ≥ 4 mmol/L OR
Evidence of > 1 organ dysfunction |

LABORATORIES AND PROCEDURES (within 2 hours after meeting bundle criteria)

- | |
|--|
| 1) Peripheral IV, cardiac monitor, oxygen, pulse oximetry |
| 2) Obtain Sepsis panel (Blood culture, sputum culture, urine culture, sensitivities, urine analysis, CBC w/differential, comprehensive metabolic panel, PT/PTT, D-Dimer, Troponin I, Lactate) |
| 3) Calibrate and initiate CVP and ScvO₂ monitoring after CXR verification of line placement |
| 4) Obtain central venous blood gas from central line |
| 5) Repeat lactate at 6 hours after 1 st draw |

THERAPY (within 6 hours after meeting bundle criteria)

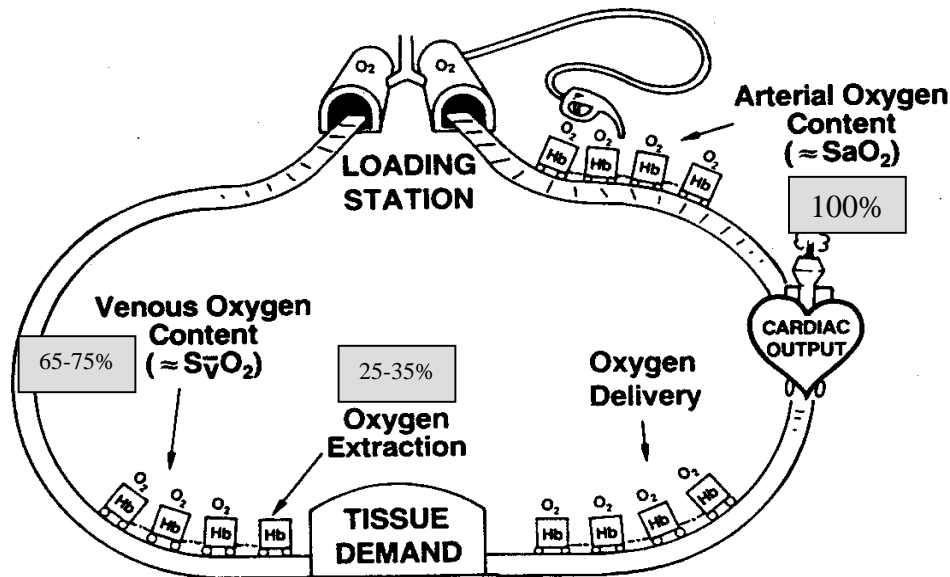
- | |
|--|
| 1) Broad Spectrum Antibiotics within <u>4 hours</u> |
| 2) Normal saline 500 mL bolus until CVP 8-12 mmHg, then continue at 150 ml/hr |
| 3) Intervention is required if: <ul style="list-style-type: none">a) Pulse Ox $< 93\%$ (Consider intubation and mechanical ventilation)b) Peak inspiratory plateau pressure > 30 cm H₂O (Consider decreasing tidal volume)c) Lactate > 2 mmol/L (Repeat lactate in 6 hours)d) CVP > 15 mmHg (Consider nitroglycerin if SBP > 160 mmHg or MAP > 110 mmHg)e) SBP < 90 mmHg (MAP < 65 mmHg) after 2 Liters IVF (Consider vasopressor)f) SBP > 160 mmHg (MAP > 110 mmHg) (Consider afterload reducer)g) ScvO₂ $< 70\%$ (Consider transfusion for hemoglobin < 10 g/dL and/or dobutamine) |
| 4) Target hemodynamic goals by <u>6 hours</u> and maintained until ICU transfer: <ul style="list-style-type: none">a) CVP ≥ 8 mmHgb) MAP ≥ 65 mmHg / SBP ≥ 90 mmHgc) ScvO₂ $\geq 70\%$ |
| 5) If patient is on vasopressor and/or APACHE II score ≥ 25, consider: <ul style="list-style-type: none">a) Corticosteroid and perform Cosyntropin Stimulation Testb) Recombinant human Activated Protein C (Drotrecogin alfa activated) |

SvO₂/ScvO₂ Made Ridiculously Simple – v9.1

For the STOP Sepsis Bundle - Strategies to Obviate the Progression of Sepsis

What is SvO₂?

1. Venous oxygen saturation (SvO₂) reflects a balance between oxygen delivery (DO₂) and oxygen consumption (VO₂).



2. DO₂ comprises of cardiac output and arterial oxygen content:
 - a. $DO_2 = CO \times [(1.34 \times Hb \times SaO_2) + (0.0031 \times PaO_2)]$
 - b. DO₂ results in 100% oxygen delivered to the tissue.
 - c. The tissue will consume (VO₂) with an oxygen extraction ratio of 25-35%.
 - d. The remainder in the venous side (or venous oxygen content) is 65-75%.
3. When DO₂ and VO₂ are balanced, the optimal venous oxygen content will be reflected by a mixed venous oxygen saturation (SvO₂) of 65-75% .
4. SvO₂ is traditionally measured in the pulmonary artery via a pulmonary artery catheter (Swan-Ganz catheter).
5. SvO₂ has diagnostic, prognostic, and therapeutic value in the care of critically ill patients with acute myocardial infarction, severe heart failure, cardiogenic shock, traumatic and hemorrhagic shock, septic shock, and general medical and surgical intensive care.¹

What is ScvO₂ and Why use ScvO₂?

1. The central venous oxygen saturation (ScvO₂) reflects central venous oxygen content, excluding the venous oxygen delivered from the coronary sinus (from the heart).
2. ScvO₂ can be measured in the superior vena cava or right atrium.
3. ScvO₂ has been shown to correlate well with SvO₂.²⁻⁸
4. An accepted normal SvO₂ > 65%.
5. An accepted normal ScvO₂ > 70%, which is about 7% higher than SvO₂, since ScvO₂ does not mix with the de-saturated venous blood of the coronary sinus.³
6. ScvO₂ can be measured via a central venous blood gas or a central venous catheter with oximetry technology (PreSep Catheter, Edwards Lifesciences, Irvine, CA).
7. ScvO₂ measured via a central venous catheter with oximetry technology allows for continuous ScvO₂ monitoring; i.e. analogous to continuous arterial pulse oximetry (SaO₂) monitoring.^{1,9}
 - a. Continuous ScvO₂ allows for monitoring dynamic changes in ScvO₂ in response to treatments.
 - b. Continuous ScvO₂ monitoring via a central venous catheter is practical and more easily performed than continuous SvO₂ monitoring via the pulmonary artery catheter.
8. The addition of continuous ScvO₂ monitoring in a protocolized approach to resuscitation of severe sepsis and septic shock has been shown to significantly improve outcome.¹⁰

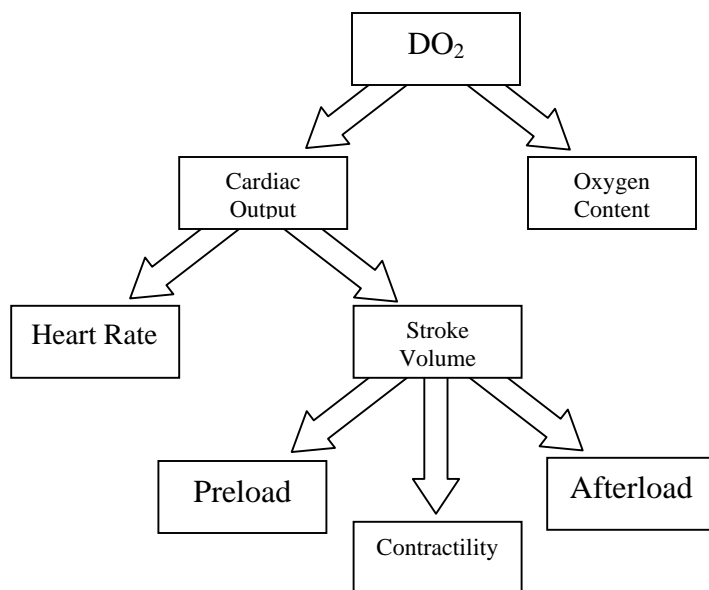
What do abnormalities in ScvO₂ mean?

1. Troubleshooting an abnormal ScvO₂ requires understanding of the causes of abnormal DO₂ and VO₂.¹¹
 - a. For example, a low DO₂ in the presence of normal VO₂ will result in less oxygen delivered to the venous circulation; therefore, a low ScvO₂.
 - b. A critically ill patient will have various combinations of DO₂ and VO₂.
 - i. For example, sepsis patients can have a hypodynamic low DO₂ state resulting in low ScvO₂; or a hyperdynamic high DO₂ state combined with a low VO₂ state from cellular mitochondria defect, resulting in high ScvO₂.

Low ScvO ₂ (<< 70%)		High ScvO ₂ (>> 70%)	
Low DO ₂	High VO ₂	High DO ₂	Low VO ₂
Hypoxia, Suctioning (low SaO ₂)	Exercise	Hyperoxia (high FiO ₂)	Hypothermia
Anemia, Hemorrhage (low Hb)	Pain	Erythrocytosis (high Hb)	Anesthesia, Pharmacologic paralysis
Cardiac dysfunction, Hypovolemia, Shock, Arrhythmia (low CO)	Hyperthermia, Shivering, Seizure	Hyperdynamic state (high CO)	Arterio-venous shunting, Mitochondria defect, Terminal shock

How do we treat an abnormal ScvO₂?

1. Low ScvO₂ – usually results from low DO₂, a scenario that is treatable by optimizing DO₂. Figure below illustrates the components of DO₂. DO₂ is increased to normal range by increasing these various components. Note that normalizing DO₂ is not the same as increasing DO₂ to supranormal values.¹²⁻¹⁴



- a. Optimizing Preload – increase central venous pressure (or pulmonary capillary wedge pressure) by increasing end-diastolic volume with fluid resuscitation.
 - b. Optimizing Afterload – increase mean arterial pressure (or systemic vascular resistance) with vasopressor agents. Sometimes a vasodilator may be necessary to decrease afterload in order to optimize DO₂.¹⁵
 - c. Optimizing Oxygen content – $(1.34 \times \text{Hb} \times \text{SaO}_2) + (0.0031 \times \text{PaO}_2)$
 - i. Increase PaO₂/SaO₂ with oxygen supplementation; e.g. mechanical ventilation.
 - ii. Increase hemoglobin with transfusion.
 - d. Optimizing Contractility – increase with inotrope agent; e.g. dobutamine.^{16, 17}
 - e. Oxygen content and contractility should be targetted when ScvO₂ is persistently low after preload and afterload have been optimized.
 - i. For example, transfusion and/or inotrope should be considered when CVP > 12 mmHg, MAP > 90, and ScvO₂ < 70%. Simply giving a fluid bolus when ScvO₂ < 70% in this scenario may not be appropriate.
2. High ScvO₂ – resulting from high DO₂, or low VO₂.
 - a. Usually it is difficult to treat a high ScvO₂, except to optimize the current therapies: maintaining optimal preload, afterload, contractility and oxygen content.
 - i. For example, prognosis is poor when a patient is on multiple vasopressors with significant lactic acidosis, and ScvO₂ > 90%.^{18, 19}

What other references do we have about SvO₂/ScvO₂ or organ hypoperfusion in sepsis:

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The STOP Sepsis Bundle Quality Measurement Tool Version 9.1 Loma Linda University Copyright ©2005	Date of Admission:	Time of ED / ICU Arrival:
	Patient Name:	
	MRN:	
	Age:	Sex:

<input type="checkbox"/> Signs of Inflammation: Manifested by two or more of the following conditions: <input type="checkbox"/> Temperature >38.3°C or <36°C (value=) <input type="checkbox"/> Heart rate >90 beats/min (value=) <input type="checkbox"/> Respiratory rate >20 breaths/min or PaCO ₂ <32 mmHg (value=) <input type="checkbox"/> WBC > 12,000 cells/mm ³ , <4000 cells/mm ³ , or >10% bands (value=)	CRITERIA FOR SEVERE SEPSIS BUNDLE: 1. <input type="checkbox"/> Two or more Signs of Inflammation AND 2. <input type="checkbox"/> Suspected infection OR positive cultures AND 3. <input type="checkbox"/> SBP < 90 mmHg after fluid bolus OR Lactate ≥ 4 mmol/L OR evidence of ≥ 2 acute organ dysfunction* PATIENT MET ALL THREE CRITERIA: Y / N Date & Time meeting Criteria: Location meeting Criteria: ED / Ward / PACU / ICU
<input type="checkbox"/> Sepsis: Signs of inflammation & suspected infection+	
<input type="checkbox"/> Severe Sepsis: Sepsis associated with ≥ 2 organ dysfunction, or hypoperfusion (lactate > 2 mmol/L)	
<input type="checkbox"/> Septic Shock: Sepsis with hypotension (BP < 90/60), despite a fluid bolus of 20 mL/kg	

+Infection may represent meningitis, pneumonia, uti, cellulitis, line infection, abdominal infection, etc...

*Organ dysfunction = resp failure, acute renal failure, acute liver failure, coagulopathy, or thrombocytopenia

1) Early recognition of high risk patient – Lactate measured	LA:	Y / N
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Within 2+1 hours of meeting Bundle Criteria	Time	Completed by 2 hrs
2) Initiate hemodynamic monitoring <input type="checkbox"/> Triple lumen catheter <input type="checkbox"/> Pulmonary artery catheter (Swan-Ganz) <input type="checkbox"/> CVP monitoring <input type="checkbox"/> ScvO ₂ monitoring <input type="checkbox"/> SvO ₂ monitoring		Y / N

Within 4+1 hours of meeting Bundle Criteria	Time	Completed by 4 hrs
3) Cultures obtained prior to antibiotic administration		Y / N
4) Give broad spectrum antibiotic(s)		Y / N

After 6+1 hours of meeting Bundle Criteria and/or at ICU adm	Time	Completed after 6 hrs
5-7) Achieve and maintain hemodynamic goals (all three goals below)		Y / N
<input type="checkbox"/> CVP ≥ 8 mmHg	Y / N	
<input type="checkbox"/> MAP ≥ 65 mmHg or SBP ≥ 90 mmHg	Y / N	
<input type="checkbox"/> ScvO ₂ (or SvO ₂) ≥ 70%	Y / N	

After 24+2 hours of meeting Bundle Criteria and/or ICU adm	Time	Completed after 24 hrs
8a) Cosyntropin Stimulation Test Performed	ΔCortisol:	Y / N
8b) Corticosteroid if on Vasopressor and/or ΔCortisol ≤ 9 mcg/dL		Y / N
9) Drotrecogin Alfa (activated) Eligibility Assessed APACHE II Score computed	APACHE II:	Y / N
10) Drotrecogin Alfa (activated) Indicated and Administered (within 48hrs) if APACHE II ≥ 25 and/or Vasopressor Dependent		Y / N
11) Achieve and maintain median glucose level < 150 mg/dL Glucose (0hr)____ (2hr)____ (4hr)____ (6hr)____ (8hr)____ (10hr)____ (12hr)____ Glucose (14hr)____ (16hr)____ (18hr)____ (20hr)____ (22hr)____ (24hr)____		Y / N
12) Achieve and maintain median plateau pressure ≤ 30 cm H₂O if mechanical ventilation Pplat (0hr)____ (4hr)____ (8hr)____ (12hr)____ (16hr)____ (20hr)____ (24hr)____		Y / N

STOP Sepsis Bundle Quality Achieved (All Quality Indicators Met): Y / N

Bundle Quality was NOT targeted because of patient advanced directive or clinician judgment (noted in the chart)

TOTAL LENGTH OF STAY IN THE EMERGENCY DEPARTMENT (if applicable) _____ (hrs)
TOTAL DAYS OF MECHANICAL VENTILATION (if applicable) _____ (days)
TOTAL LENGTH OF STAY IN THE ICU _____ (days)
TOTAL LENGTH OF HOSPITAL STAY _____ (days)
IN-HOSPITAL MORTALITY Died / Lived

Adult Severe Sepsis and Septic Shock Quality Indicators (v9.1) *For the STOP Sepsis Bundle Working Group*

Denominator: Number of patients (monthly) meeting criteria for septic shock or severe sepsis with lactate ≥ 4 mmol/L.

Numerator: Percentage of patients having each of the following *process measures* completed within the first 48 hours of meeting criteria for septic shock or severe sepsis with lactate ≥ 4 mmol/L.

LLU-SS-1 – Lactate measured

LLU-SS-2 – CVP/ScvO₂ monitoring within 2 hours

LLU-SS-3 – Cultures obtained prior to antibiotics

LLU-SS-4 – Antibiotics within 4 hours

LLU-SS-5 – CVP ≥ 8 mmHg within 6 hours

LLU-SS-6 – MAP ≥ 65 mmHg or SBP ≥ 90 mmHg within 6 hours

LLU-SS-7 – ScvO₂ (or SvO₂) $\geq 70\%$ within 6 hours

LLU-SS-8 – Corticosteroid if vasopressor dependent and/or adrenal insufficiency

LLU-SS-9 – Assess for drotrecogin alfa activated (APACHE II calculated) within 24 hours

LLU-SS-10 – Drotrecogin alfa activated within 48 hours if indicated

LLU-SS-11 – Median glucose maintained < 150 mg/dL

LLU-SS-12 – Median plateau pressure maintained ≤ 30 cmH₂O if on mech ventilation

Outcome measures for all patients in the denominator:

LLU-SS-13 – Mechanical ventilator days

LLU-SS-14 – ICU length of stay

LLU-SS-15 – In-hospital mortality

Note: These indicators are measurable at our institution, and are derived from ongoing efforts by the Surviving Sepsis Campaign / Institute for Healthcare Improvement (Adv Sepsis 2005;4(3):108-111), Volunteer Hospitals of America Transforming the ICU (TICU) Project, JCAHO, and the STOP Sepsis Quality Improvement Project (LLUMC).