Surviving Sepsis Campaign Guidelines for Management of Severe Sepsis and Septic Shock

This is a summary of the *Surviving Sepsis Campaign Guidelines for Management of Severe Sepsis and Septic Shock* condensed from Dellinger RP, Carlet JM, Masur H, et al: Surviving Sepsis Campaign guidelines for management of severe sepsis and septic shock. *Crit Care Med* 2004; 32:858-871. This version does not contain the rationale or appendices contained in the primary publication. Please refer to the guidelines for additional information at www.survivingsepsis.org.

ΔIndicates one of the goals chosen for implementation in the Institute of Healthcare Improvement's change package, i.e. part of the "sepsis bundle."

Initial Resuscitation

Δ Begin resuscitation immediately in patients with hypotension or elevated serum lactate. Resuscitation goals:

- Central venous pressure: 8–12 mm Hg
- Mean arterial pressure ≥65 mm Hg
- Urine output ≥0.5 mL.kg^{-1}.hr^{-1}
- Central venous or mixed venous oxygen saturation ≥70%

Δ If central venous oxygen saturation or mixed venous oxygen saturation of 70% is not achieved with a central venous pressure of 8–12 mm Hg, then transfuse packed red blood cells to achieve a hematocrit of ≥30% and/or administer a dobutamine infusion of up to a maximum of 20 μg.kg^{-1}.min^{-1}.

Diagnosis

Before starting antibiotics obtain two or more blood cultures. At least one blood draw should be percutaneous and one should be through each vascular assist device that has been in place longer than 48 hours. Obtain cultures from other sites as indicated – cerebrospinal fluid, respiratory secretions, urine, wounds, and other body fluids.

Antibiotic Therapy

Δ Begin intravenous antibiotics within first hour of recognition of severe sepsis.

Administer one or more drugs that are active against likely bacterial or fungal pathogens. Consider microorganism susceptibility patterns in the community and hospital.

Reassess antimicrobial regimen 48–72 hours after starting treatment with the objective of using a narrow spectrum antibiotic.

Consider combination therapy for neutropenic patients and those with Pseudomonas infections.

Stop antimicrobial therapy immediately if the condition is determined to be a noninfectious cause.

Source Control

Δ Evaluate patient for a focus of infection amenable to source control measures including abscess drainage or tissue debridement.

Choose the source control measure that will cause the least physiologic upset and still accomplish the clinical goal.

Institute source control measures as soon as an infection focus in need of source countrol has been identified.

Remove intravascular access devices that are a potential infection source promptly after establishing other vascular access.

Fluid Therapy

(see initial resuscitation timing recommendations)

Use crystalloids or colloids.

Δ Give fluid challenge to patients with suspected inadequate tissue perfusion at a rate of 500–1000 mL of crystalloids or 300–500 mL of colloids over 30 minutes and repeat if blood pressure and urine output do not increase and there is no evidence of intravascular volume overload.

Vasopressors

Start vasopressor therapy when fluid challenge fails to restore adequate blood pressure and organ perfusion, or transiently until fluid resuscitation restores adequate perfusion.

Either norepinephrine or dopamine administered through a central catheter is the initial vasopressor of choice.

In patients requiring vasopressors, place an arterial catheter as soon as practical.

Consider vasopressin in patients with refractory shock despite adequate fluid resuscitation and high-dose conventional vasopressors. Vasopressin is not recommended as a replacement for norepinephrine or dopamine as a first-line agent. Administer vasopressin at infusion rates of 0.01–0.04 units/minute in adults.

Inotropic Therapy

Consider dobutamine in patients with low cardiac output despite fluid resuscitation. Continue to titrate vasopressor to mean arterial pressure of 65 mm Hg or greater.

Do not increase cardiac index to achieve an arbitrarily predefined elevated level of oxygen delivery.

Steroids

ΔTreat patients who still require vasopressors despite fluid replacement with hydrocortisone 200–300 mg/day, for 7 days in three or four divided doses or by continuous infusion.

Optional:

- Perform 250-microgram adrenocorticotropic hormone (ACTH) stimulation test and discontinue steroids in patients who are responders (increase in cortisol of > 9 μg/dL).
- Decrease steroid dose if septic shock resolves.
- Taper corticosteroid dose at end of therapy.
- Add fludrocortisone (50μg orally once a day) to this regimen.

Do not use corticosteroids >300 mg/day of hydrocortisone to treat septic shock.

Do not use corticosteroids to treat sepsis in the absence of shock unless the patient's endocrine or corticosteroid history warrants.

Recombinant Human Activated Protein C (rhAPC)

ΔrhAPC is recommended in patients at high risk of death (APACHE II(≥25, sepsis-induced multiple organ failure, septic shock, or sepsis-induced acute respiratory distress syndrome) and with no absolute contraindication related to bleeding risk or relative contraindication that outweighs the potential benefit of rhAPC.

Blood Product Administration

Following resolution of tissue hypoperfusion, and in the absence of significant coronary artery disease or acute hemorrhage, transfuse red blood cells when hemoglobin decreases to <7.0 g/dL (<70 g/L) to target a hemoglobin of 7.0 – 9.0 g/dL.

Do not use erythropoietin to treat sepsis-related anemia. Erythropoietin may be used for other accepted reasons.

Do not use fresh frozen plasma to correct laboratory clotting abnormalities unless there is bleeding or planned invasive procedures.

Do not use antithrombin therapy.

Administer platelets when counts are <5000/mm^3 (5 X 10^9/L) regardless of bleeding. Transfuse platelets when counts are 5000 to 30,000/mm^3 (5–30 X 10^9/L) and there is significant bleeding risk. Higher platelet counts (≥50,000/mm^3 [50 X 10^9/L]) are required for surgery or invasive procedures.

Mechanical Ventilation of Sepsis-Induced Acute Lung Injury (ALI)/ARDS

ΔAvoid high tidal volumes coupled with high plateau pressures. Reduce tidal volumes over 1–2 hours to a low tidal volume (6 ml per kilogram of lean body weight) as a goal in conjunction with the goal of maintaining end-inspiratory plateau pressures <30 cm H_2O.

If necessary, minimize plateau pressures and tidal volumes by allowing $PaCO_2$ to increase above normal.

Set a minimum amount of positive end-expiratory pressure (PEEP) to prevent lung collapse at end expiration. Set PEEP based on severity of oxygenation deficit and guided by the F_IO_2 required to maintain adequate oxygenation (ARDSnet guidelines) or titrate PEEP according to bedside measurements of thoracopulmonary compliance.

Prone ARDS patients requiring potentially injurious of F_IO_2 or plateau pressure. Only prone patients high risk from positional changes.

To prevent ventilator-associated pneumonia m mechanically ventilated patients in a semirecu position (head of bed raised 45 degrees), unles traindicated.

Use a weaning protocol and have mechanically ve patients undergo a spontaneous breathing trial (S least daily, to evaluate for ventilation discontinuati

SBT options include a low level of pressure suppc continuous positive airway pressure 5 cm H_2 T-piece. Prior to SBT, patients should: 1) be aro 2) be hemodynamically stable without vasopr 3) have no new potentially serious conditions; 4) h ventilatory and end-expiratory pressure requireme 5) require F_IO_2 levels that can be safely delivered face mask or nasal cannula.

Consider extubation if SBT is successful.

Sedation, Analgesia, and Neuromuscular Blockade in Sepsis

Use sedation protocols for critically ill mecha ventilated patients. Measure the sedation goal standardized subjective sedation scale.

Target sedation to predetermined endpoints (s score). Use either intermittent bolus sedation or c ous infusion sedation with daily interruption/lig to produce awakening. Retitrate if necessary.

Avoid neuromuscular blockers (NMBs), if at all p If NMBs must be utilized for longer than the firs hours of mechanical ventilation, use either inte bolus as required or continuous infusion with mo of depth of block with train of four monitoring.

Glucose Control

ΔMaintain blood glucose <150 mg/dL (8.3m following initial stabilization. Use continuous and glucose infusion. Monitor blood glucose every minutes until stabilized, then monitor every 4 ho

Include a nutritional protocol for glycemic contr

Renal Replacement

Intermittent hemodialysis and continuous veno hemofiltration (CVVH) are considered equ CVVH offers easier management in hemodyna unstable patients.

Bicarbonate Therapy

Do not use bicarbonate therapy for the pur improving hemodynamics or reducing vaso requirements when treating hypoperfusion induc acidemia with pH ≥7.15.

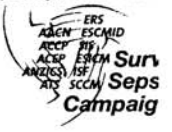
Deep Vein Thrombosis (DVT) Prophylaxis

Use either low-dose unfractionated heparin or lo cular weight heparin. Use a mechanical prop device, such as compression stockings or an inte compression device, when heparin is contrain Use a combination of pharmacologic and me therapy for patients who are at very high risk for

Stress Ulcer Prophylaxis

Provide stress ulcer prophylaxis. The preferrec are H_2 receptor inhibitors.

Consideration for Limitation of Support

Discuss advance care planning with patie families. Describe likely outcomes and set expectations.

Sponsoring Organizations: American Association of Crit Nurses; American College of Chest Physicians; A College of Emergency Physicians; American Thoracic Australian and New Zealand Intensive Care Society; I Society of Clinical Microbiology and Infectious D European Society of Intensive Care Medicine; E Respiratory Society; Infectious Disease Society of International Sepsis Forum; Society of Critical Care M Surgical Infection Society.