



## SEVERE SEPSIS

### Expected Practice:

- Assess all patients and immediately notify physician when a patient presents with risk factors for sepsis, which includes documented or suspected infection and 2 or more of the following SIRS criteria.
  - Heart rate > 90 beats per minute
  - Temperature < 36 C (96.8 F) or > 38 C (100.4 F)
  - Respiratory rate > 20 breaths per minute or PaCO<sub>2</sub> <32mm Hg or mechanical ventilation
  - White blood cell count > 12,000/mm<sup>3</sup> or < 4000mm<sup>3</sup> or <10% mature neutrophils
- Obtain serum lactate measurements.
- Obtain blood cultures as well as cultures from all potential sites of infection prior to initiating broad-spectrum antibiotics.
  - Evaluate for and remove other potential sources of infection (ie, obviously infected invasive devices).
- Administer fluids to maintain mean arterial pressure at > 65 mm Hg, central venous pressure (CVP) 8-12 mm Hg and central venous or mixed venous oxygen saturation >70%.
- Administer vasopressors if necessary to achieve a mean arterial blood pressure of 65 mm/Hg if fluid replacement is not successful.
- Obtain cortisol stimulation test and start continuous low-dose steroid infusion.
- Maintain cardiac output at normal physiologic levels.
- Maintain blood glucose levels at < 150mg/dL.
- Consider administration of human recombinant activated protein C (drotrecogin alfa activated) for patients at risk for dying and presenting with septic shock, sepsis with multiple organ failure and sepsis induced acute respiratory distress syndrome.

### Supporting Evidence:

- More than 750,000 cases of severe sepsis occurred annually (year 2000) and mortality ranges from 28%-50% with an overall hospital mortality of about 30%.<sup>1</sup> Sepsis (infection and 2 of the 4 SIRS criteria) can rapidly progress to severe sepsis (infection + organ dysfunction + SIRS criteria) to septic shock (persistent tissue hypoxia with vasopressors on board) within 24 hours.<sup>1-4</sup> Treatment should be initiated regardless of where the patient is located within the hospital. A prospective randomized study of 263 emergency department patients diagnosed with severe sepsis or septic shock showed that patients treated aggressively with a goal direction towards tissue oxygenation within the first 6 hours of presentation had a 16% improvement in mortality. Another small retrospective study showed a decrease in mortality in patients identified with signs of severe sepsis and treated within the first 6 hours.<sup>3,5,6</sup> (Level V)
- Serum lactate levels can be elevated in the setting of a normal or increased cardiac output. The measurement of serum lactate can reflect occult decreases in global tissue perfusion and as such may be an indicator of organ dysfunction. The presence and the clearance rate of lactate are associated with increases in patient morbidity and mortality.<sup>3,7</sup> (Level IV)
- Early administration of appropriate antibiotics decreases mortality in patients with Gram positive and negative bacteremias. Empiric broad spectrum antibiotics should be initiated prior to identification of the infecting organism and reassessed after 48-72 hours based on culture results and clinical data.<sup>8</sup>
- According to the Surviving Sepsis Campaign guidelines, during the first 6 hours of treatment the goal is to achieve and maintain a CVP of 8-12 mm Hg or 12-15 mm Hg for patients receiving mechanical ventilation and a MAP of at least 65 mm Hg. with fluid resuscitation.<sup>7</sup> Dobutamine is identified as the medication of choice to increase cardiac output to normal levels or to improve lactate clearance when cardiac output is

not being measured. Two large clinical trials did not show a benefit from increasing CO above physiologic normal levels in order to increase oxygen delivery to the tissues.<sup>9-11</sup> Available data do not support the use of low dose dopamine for renal protection.<sup>12</sup> (Level V evidence)

- Colloids have not been shown to be of more benefit than crystalloid for fluid resuscitation. One large randomized controlled trial compared 4% albumin with normal saline in the treatment of patients requiring volume resuscitation found no significant difference in mortality between the groups. Several literature reviews have concluded that choice of fluids does not appear to change outcomes.<sup>13,14</sup> (Level V)
- In the setting of hypotension fluid replacement should be optimized before vasopressors are started. No high-level evidence exists to identify the most appropriate vasopressor to use for the treatment of septic shock and selection is based on multiple clinical parameters. However, in the Surviving Sepsis Campaign Guidelines for the Management of Severe Sepsis and Septic Shock norepinephrine or dopamine are identified as the initial vasopressors of choice to increase vascular tone and blood pressure.<sup>7</sup>
- Two meta analyses concluded that administration of high dose corticosteroids are of no benefit or may be detrimental to patients with septic shock.<sup>15,16</sup> (Level VI) In vasopressor dependent shock, the addition of low-dose exogenous cortisol has been shown to improve the uptake of the patients own and the exogenously administered sympathetic stimulants when serum cortisol levels are low.<sup>17</sup> (Level IV)
- Maintaining glucose levels within normal range (80-110 mg/dL) but at least < 150mg/dL has been shown to decrease morbidity and mortality in a surgical population but did not focus on septic patients. Maintaining glucose levels < 150mg/dL showed reduced morbidity but not mortality in critically ill medical patients with sepsis.<sup>18-19</sup> (Level V)
- In a large double blind study, human recombinant activated protein C (drotrecogin alfa activated) decreased mortality by 6% in patients with severe sepsis and decreased mortality by 13% for patients at high risk for death (ie, patients having an APACHE II score of 25 or greater).<sup>20,21</sup> (Level V)

#### **What You Should Do:**

- Educate all nursing staff on the risk factors and clinical signs of sepsis.
- Create an interdisciplinary team including but not limited to physicians, pharmacist, respiratory care practitioner, nursing and dietitian to develop protocols or guidelines for the initial identification and management of the patient presenting with signs of sepsis. Consider development of a rapid response team to facilitate prompt identification and treatment of patients with sepsis.

#### **AACN Grading of Evidence System**

Level I:	Manufacturer's recommendations only
Level II:	Theory based, no research data to support recommendations; recommendations from expert consensus group may exist
Level III:	Laboratory data, no clinical data to support recommendations
Level IV:	Limited clinical studies to support recommendations
Level V:	Clinical studies in more than one or two patient populations and situations to support recommendations
Level VI:	Clinical studies in a variety of patient populations and situations to support recommendations.

#### **Need More Information or Help?**

Talk with a clinical practice specialist for additional information / assistance at [www.aacn.org](http://www.aacn.org) then select PRN.

#### **REFERENCES:**

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