EMS & Sepsis Management

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Objectives

- Upon completion of this course, the learner will be able to understand the:
  - Pathophysiology of sepsis
  - SIRS assessment criteria
  - Current best practices in patient treatment and management in the prehospital environment

What is sepsis?

- According to Dellinger, et al, sepsis is defined as the presence (probable or documented) of infection together with systemic manifestations of infection.
  - www.ccmjournal.org; Surviving Sepsis Campaign: International Guidelines, February 2013, Volume 41, Number 2.

Septic Shock

- Dellinger, et al (2012) definitions:
  - Septic shock as sepsis-induced hypotension persisting despite adequate fluid resuscitation.
  - Sepsis-induced tissue hypoperfusion is defined as infection-induced hypotension, elevated lactate, or oliguria.

Quick Facts about Sepsis

- Suspected severe sepsis patients account for more than 500,000 ED visits annually, with respiratory and genitourinary infections being the most common causes of sepsis.[4]
- Hospitalizations for septicemia more than doubled over the past decade:
  - 326,000 in 2000
  - 727,000 in 2008[5]
- Mortality rates for sepsis:
  - close to 50% when sepsis is not recognized early and appropriate therapies initiated!
- Approximately 0.7% of emergency department patients present with suspected severe sepsis.
  - >2/3 of all sepsis patients initially present to EDs and ~ 17% of these patients reside in nursing homes.[3]

Quick Facts about Sepsis

- 7th leading cause of infant mortality
- 11th-leading cause of death in adults (34,843 total) in 2010.[6]
- Incidence of sepsis/related mortality are significantly higher in the elderly population compared to younger persons.
- >50% of all sepsis patients presenting to EDs are over 65 years of age.[3]

Diagnostic Criteria for Sepsis

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

- **General variables**
  - Fever (> 100.9°F)
  - Hypothermia (core temperature < 96.8°F)
  - Heart rate > 90/min or more than two above the normal value for age
  - Tachypnea
  - Altered mental status
  - Significant edema or positive fluid balance (> 20 mL/kg over 24 hr)
  - Hyperglycemia (plasma glucose > 140 mg/dL or 7.7 mmol/L) in the absence of diabetes
- **Inflammatory variables**
  - Leukocytosis (WBC count > 12,000 μL^{-1})
  - Leukopenia (WBC count < 4000 μL^{-1})
  - Normal WBC count with greater than 10% immature forms
  - Plasma C-reactive protein more than twoabove the normal value
  - Plasma procalcitonin more than two above the normal value

Diagnostic Criteria for Sepsis

- **Hemodynamic variables**
  - Arterial hypotension
    - SBP < 90 mmHg, MAP < 70 mmHg, or an SBP decrease > 40 mm Hg in adults or less than two Standard Deviations below normal for age
- **Tissue perfusion variables**
  - Hyperlactatemia (>1 mmol/L)
  - Decreased capillary refill or mottling

Diagnostic Criteria for Sepsis

- **Organ dysfunction variables**
  - Arterial hypoxemia (Pao2/Fio2 < 300)
  - Acute oliguria (urine output < 0.5 mL/kg/hr for at least 2 hrs despite adequate fluid resuscitation)
  - Creatinine increase > 0.5 mg/dL or 44.2 µmol/L
  - Coagulation abnormalities (INR > 1.5 or aPTT > 60s)
  - Ileus (absent bowel sounds)
  - Thrombocytopenia (platelet count < 100,000 µL)
  - Hyperbilirubinemia (plasma total bilirubin > 4 mg/dL or 70 µmol/L)

SIRS Criteria—100 Rule

- What is the simplest way to tell if a patient meets SIRS criteria in the field?
  - Remember the “100 rule”: a general guide to assist with remembering SIRS criteria
    - **Heart rate** greater than 100
    - **Systolic blood pressure** less than 100
    - **Temperature** greater than 100
  - Remember: this is for patients with a known or suspected infection, ie. urinary tract infection, pneumonia, or a visible wound/ulcer that appears infected.

Positive for SIRS--??Sepsis

- Not all patients that meet SIRS criteria will have sepsis. The SIRS criteria are indicators of possible sepsis not a diagnosis!

- Example:
  - 70 yr old male complaining of a fever since this morning, heart rate 110, BP 98/62, states that he is having nausea and has not been drinking fluids in the past day and a half, no other signs of infection

Severe Sepsis

- Dellinger, et al (2012) defined severe sepsis as sepsis-induced tissue hypoperfusion or organ dysfunction (any of the following* thought to be due to the infection)
  - Sepsis-induced hypotension
  - Lactate above upper limits of laboratory normal
  - Urine output < 0.5 mL/kg/hr for more than 2 hrs despite adequate fluid resuscitation
  - Acute lung injury with PaO2/FIO2< 250 in the absence of pneumonia as infection source
  - Acute lung injury with PaO2/FIO2< 200 in the presence of pneumonia as infection source
  - Creatinine > 2.0 mg/dL (176.8 µmol/L)
  - Bilirubin > 2 mg/dL (34.2 µmol/L)
  - Platelet count < 100,000 µL
  - Coagulopathy (international normalized ratio > 1.5)

(*Adapted from Levy MM, Fink MP, Marshall JC, et al: 2001 SCCM/ESICM/ACCP/ATS/SIS International Sepsis Definitions Conference. Crit Care Med 2003; 31:1250–1256).

Risk Factors for SEPSIS

- Familiarity with risk factors can help identify patients who are at high risk, such as the elderly and very young.

- Other risk factors include:
  - Recent trauma or surgeries
  - Indwelling devices such as central venous catheters, arterial catheters, urinary catheters, feeding tubes and endotracheal tubes.
  - Immunosuppressed patients
  - Patients taking medications such as steroids, antibiotics or immunosuppressants

The Importance of the EMS Role & Identifying Infection

- Identification of an infection site significantly increases your suspicion for sepsis; look during the clinical exam.
  - The respiratory system is the most common location of infection in the septic patient.[7]
  - Inspect bedridden patients for pressure ulcers or other open wounds and diabetics for wounds on their legs and feet.
  - Assess for the presence of pulmonary, genitourinary, gastrointestinal or musculoskeletal infections.
  - Assess any indwelling devices for indications of infection such as redness and irritation around the insertion site or pus in urine.

EMS Assessment

- Patients with sepsis may or may not present with fever. This may seem counterintuitive.
  - Patients may experience chills or shivering as they try to compensate for the loss of heat.
- Patients progressing from sepsis to severe sepsis become profoundly dehydrated.
  - Assess for signs of dehydration such as poor skin turgor, dry mucus membranes and decreased urine output.

EMS study Related to Sepsis

- A study from Colorado looked at the role of prehospital care providers in the treatment of sepsis.
  - Paramedics were trained to recognize sepsis in the field through identification of SIRS criteria and alert the hospital in advance, similar to a STEMI notification.
  - Patients whose caregivers provided those alerts had a median arrival-to-antibiotic time of 24 minutes less than those whose caregivers did not notify the ED.
  - While 24 minutes may seem unimpressive, in the context of previous research demonstrating a 7.6% increase in mortality for every one hour delay to antibiotics, it becomes more significant.[11]

EMS Management of the Sepsis Patient

- Initial management of all critically ill patients should start with ensuring that there is an open airway and adequate ventilation and oxygenation.
  - When ventilating the patient with severe sepsis or septic shock, avoid hyperventilation or the use of too much tidal volume (TV) or pressure.
  - Increased TVs and airway pressures are associated with increases in intrathoracic pressure, which can lead to hypotension and barotrauma.
  - Maintaining as low an airway pressure as possible while increasing end-expiratory pressure by providing PEEP has been shown to increase arterial oxygen delivery.[12]

EMS Management of the Sepsis Patient

- Early Goal Directed Therapy!!
  - Obtain intravenous or intraosseous access with two large bore IVs to assist with volume replacement.
  - Patients with severe sepsis will require aggressive fluid volume resuscitation (30mL/kg) to correct the hypovolemia that can occur with the third-spacing of fluids and profound vasodilation[10].
  - Patients with severe sepsis may require 2 liters or more of an isotonic crystalloid during their initial therapy (first 30–60 minutes), and may receive as much as 6–10 liters within the first 24 hours of treatment.[13]

EMS Management of the Sepsis Patient

- Administer fluid rapidly as needed to restore adequate perfusion (as measured by a systolic blood pressure of 90 mmHg or a mean arterial pressure (MAP) greater than 65mmHg).
- Consider aggressive fluid volume replacement even in patients for whom you would normally consider withholding it, such as in those with renal or heart failure.
- Refer to local protocols or consult with online medical control when determining fluid volume administration rates.

EMS Management of the Sepsis Patient

- The Emergency Department will continue fluid resuscitation and may use medications to increase the patients blood pressure if needed.
  - Vasoactive agents to correct hypotension in the patient who remains refractory to fluid volume administration after the first 2 liters.
  - These drugs may also be indicated earlier when there are signs of fluid overload (such as pulmonary edema).
  - Common medications used are dopamine, dobutamine and norepinephrine. Norepinephrine tends to be the preferred drug for patients with sepsis because they are likely to already be tachycardic.
    - Dopamine can exacerbate tachycardia and dobutamine is generally more indicated for patients with heart failure.

EMS Management of the Sepsis Patient

- Additional treatment for the patient with severe sepsis or septic shock includes maintaining body temperature.
  - Patients with sepsis can present hyper or hypothermic. Regardless of presenting core temperature, patients with sepsis are susceptible to heat loss. Protect them by employing warming measures such as blankets and turning up the heat in the patient compartment.
- Monitor the blood sugar of patients with suspected sepsis closely. During the cascade of events that occur systemically during severe sepsis, profound hyperglycemia becomes common—even in patients without prior histories of diabetes.

SEPSIS

Questions?

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