

EM CASE OF THE WEEK

BROWARD HEALTH MEDICAL CENTER DEPARTMENT OF EMERGENCY MEDICINE



Sepsis refers to symptomatic bacteremia, with or without organ dysfunction. Approximately 20–35% of people with severe sepsis and 30–70% of people with septic shock will die. Early recognition and proper treatment are imperative to decrease mortality from this potentially life-threatening condition. This week's case will focus on sepsis and septic shock and discuss the appropriate steps to diagnose and treat this condition.

EM CASE OF THE WEEK

EM Case of the Month is a monthly "pop quiz" for ED staff. The goal is to educate all ED personnel by sharing common pearls and pitfalls involving the care of ED patients. We intend on providing better patient care through better education for our nurses and staff.



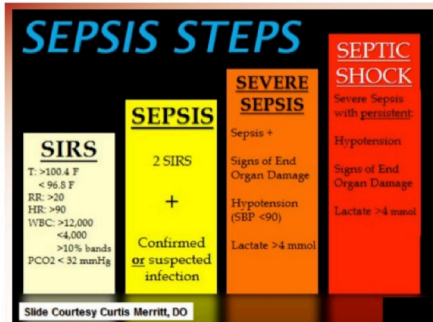
Sepsis

A 57-year-old African American male presents to the ED with a one-week history of an increase in frequency and dysuria, which then developed into oliguria. Patient states that he has also been experiencing fever and suprapubic pain. Patient states that he has a history of diabetes, HTN and BPH. His vital signs are T 101.8, HR 110, RR 24, BP 142/86, O2 sat 99%. A CBC, CMP and UA are ordered on this patient. The UA shows large leukocyte esterase and the patient's WBC is 21,000. Which of the following criteria are required for a diagnosis of sepsis?

- A. Temperature greater than 100.4 F or less than 96.8 F.
- B. Respiratory rate greater than 20.
- C. Heart rate greater than 90.
- D. White blood cell count greater than 12K, less than 4K and/or 10% bands.
- E. Two of the above.
- F. Two of the above, with a confirmed or suspected source of infection.
- G. Two of the above, with a confirmed or suspected source of infection and evidence of hypoperfusion.



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SIRS > Sepsis > Severe Sepsis > Septic Shock > MODS

The correct answer is F. Sepsis is a consequence of a dysregulated inflammatory response to an infectious insult that exists on a continuum.

Discussion: The sepsis continuum begins with SIRS (systemic inflammatory response syndrome). In SIRS the patient will present with two of the following criteria: (1) Temperature greater than 100.4 F or less than 96.8 F, (2) respiratory rate greater than 20, (3) heart rate greater than 90, (4) white blood cell count >12K, <4K, and/or 10% bands, but *without* the presence of an infectious source. SIRS occurs secondary to trauma, burns, pancreatitis or other autoimmune or inflammatory responses that are not infectious in nature.

Take Home Points

- Sepsis is the consequence of a dysregulated inflammatory response to an infectious insult.
- Sepsis exists on a continuum, which begins with systemic inflammatory response syndrome (SIRS), follows into sepsis, severe sepsis, septic shock and ultimately ends with multi-organ dysfunction syndrome (MODS).
- The work up for sepsis focuses largely on identifying the source of infection, along with establishing a baseline measurement for any end organ damage that has resulted.
- Treatment of sepsis focuses on the return of hemodynamic stability through fluid resuscitation and vasopressors as well as empirical antimicrobial therapy.

However, once an infectious source is either suspected or identified in the presence of two of the above criteria, you have moved along the spectrum into sepsis. If the patient develops signs of hypoperfusion (i.e. systolic blood pressure drops below 90mmHg), or develops evidence of end organ damage, or a lactate level >4 mmol/L the patient now fits the criteria for severe sepsis. End organ or target organ damage usually refers to damage occurring in major organs fed by the circulatory system (i.e. heart, kidneys, brain, eyes), which can sustain damage due to uncontrolled hypertension, hypotension, or hypovolemia. It is at this stage that patients need to be treated with fluid resuscitation.

If efforts to give fluids fail to reverse the patient’s state of hypoperfusion and stabilize the patient, this patient is considered to be in a state of septic shock. It is at this stage that the patient must be placed on vasopressive agents and transferred to the intensive care unit. If the patient is still refractory to treatment and develops irreversible multiple end organ failure, this patient has entered into the last and final stage of the sepsis continuum, which is multi-organ dysfunction syndrome (otherwise known as MODS). Patients who develop MODS have only an estimated 10 to 20% survival rate.

For a list of educational lectures, grand rounds, workshops, and didactics please visit

<http://www.BrowardER.com>

and click on the “Conference” link. All are welcome to attend!

Work Up: The work up for sepsis focuses largely on indentifying the source of infection, along with establishing a baseline measurement for any end organ damage that may have resulted. If the source of infection is not readily identifiable, these patients will need a full sepsis work up. This will include a complete blood count to measure the patient's white count blood cell count with differential as well as the hemoglobin and hematocrit. At least 2 sets of blood cultures (both aerobic and anaerobic with gram stain) should be ordered to help guide targeted anti-microbial therapy.

A complete metabolic panel with a lactate level should be obtained to help to determine baseline renal function and electrolyte status. This will help to show evidence of end organ renal damage as well as assess for a lactic acidosis. These patients should also receive an EKG along with cardiac enzymes to help measure evidence of cardiac end organ damage.

A urinalysis and culture should be obtained to rule out urosepsis or to help in with targeted anti-microbial therapy. These patients should also receive a chest-x-ray and sputum culture if the infection is thought to be respiratory in origin. A lumbar puncture can also be obtained if meningitis is suspected as the infectious etiology.

Imaging studies such as CT scans of the chest, abdomen and/or pelvis may also be helpful in identifying pleural effusions, bacterial peritonitis or an abscess formations that maybe responsible for the patients septic state. These imaging studies can also help to guide invasive interventions such as thoracentesis, paracentesis, or surgical drainage of an abscess. All of these procedures can serve as diagnostic in that you can obtain a culture directly from the source of the infection as well as therapeutic in that you can manually eliminate a large contributing factor to the patient's condition.

Treatment: The treatment of septic patients will revolve mainly around aggressive anti-microbial therapy plus stopping or reversing end organ damage with volume and vasopressors if needed. Anti-microbial therapy will begin with empiric coverage and then be modified to a more targeted regimen once the source of infection has been identified and/or confirmed and sensitivities have been processed.

The initial resuscitation goals for the first six hours of presentation include, central venous pressure (CVP) of 8-12 mmHg, a mean arterial pressure (MAP) of > 65mmHg, a urine output of > 0.5 ml/kg/hr and a central venous oxygen saturation of > 75% (measured via a swan ganz catheter in the pulmonary artery) and a patients lactate level should be maintained above 4 mmol/L, which represents adequate tissue perfusion. The initial fluid administration should be initialed at 30 ml/kg fluid challenge of crystalloid solution (e.g. NS) over 30 minutes, rate and volume may need to be increased based on the patients need, as long as hemodynamic improvement it noted. Patients must also be carefully monitored for evidence of pulmonary and systemic edema during the fluid resuscitation. If fluid resuscitation fails to improve the patient's hemodynamic state the patient must be then placed on vasopressive agents, norepinephrine (Levophed) being the first line choice. Epinephrine or vasopressin can also be used in conjunction with norepinephrine if necessary.

Intravenous empiric anti-microbial therapy of one or more agents with activity against the most likely pathogens (bacterial/fungal/viral) should be administered within one hour of the recognition of shock. Lastly, any catheters, intravascular devices or drains that could potentially be harboring infectious material should be removed and/or replaced. Patients who ultimately suffer end organ damage may require hemodialysis in the case of renal failure, ventricular assisted devices in the case of cardiac failure, or mechanical ventilation in the case of respiratory failure.



ABOUT THE AUTHOR:
This month's case was written by Jessica Schwartz. Jessica is a 4th year medical student from NSU-COM. She did her emergency medicine rotation at BHMC in September 2015. Jessica plans on pursuing a career in Internal Medicine after graduation.