

Otterbein University

Digital Commons @ Otterbein

Nursing Student Class Projects (Formerly MSN)

Student Research & Creative Work

Summer 7-2017

Sepsis Pathophysiology

Alex Akers

alex.akers@otterbein.edu

Follow this and additional works at: https://digitalcommons.otterbein.edu/stu_msn



Part of the [Nursing Commons](#)

Recommended Citation

Akers, Alex, "Sepsis Pathophysiology" (2017). *Nursing Student Class Projects (Formerly MSN)*. 213.
https://digitalcommons.otterbein.edu/stu_msn/213

This Project is brought to you for free and open access by the Student Research & Creative Work at Digital Commons @ Otterbein. It has been accepted for inclusion in Nursing Student Class Projects (Formerly MSN) by an authorized administrator of Digital Commons @ Otterbein. For more information, please contact digitalcommons07@otterbein.edu.

Sepsis Pathophysiology

Alex Akers BSN, RN, CCRN

Otterbein University, Westerville, Ohio

Introduction

- Sepsis is the body's uncontrolled inflammatory response to an infection (Amland & Hahn-Cover, 2016).
- Sepsis is a disease process seen frequently in the hospital setting yet public awareness of the disease is much lower when compared to "heart attacks" and "strokes."
- Sepsis is defined "as life-threatening organ dysfunction caused by a dysregulated host response to infection" (Singer et al, 2016).
- Sepsis occurs in more than 230,000 patients in the United States annually and is the cause of more than 40,000 deaths per year (Seymour & Rosengart, 2015).
- Despite the prevalence of sepsis in the hospital setting is common, the presentation varies making sepsis difficult to diagnose.
- Both patients and healthcare providers should be educated on sepsis prevention, recognition, and treatment in order to reduce mortality.

Signs & Symptoms

Sepsis manifests as two or more signs of systemic inflammatory response syndrome (SIRS). SIRS is made up of 4 components.

- Heart rate >90
- Respiratory rate >20
- Temperature >38 degrees Celsius or <36 degrees Celsius
- White Blood Cell (WBC) count >12000 or <4000

(Taeb, Hooper, & Marik, 2017).

Additionally, Septic patients can exhibit: Change in level of consciousness, Edema and/or positive fluid balance, Hyperglycemia in the absence of diabetes, SBP <90 mm Hg or MAP <70 mm Hg or decrease in SBP >40 mm Hg, Normal WBC with >10% bands, or Plasma CRP and/or procalcitonin >2 SD above normal value

Underlying Pathophysiology

The pathophysiology of sepsis is a complex and multifaceted process that occurs when "the release of proinflammatory mediators in response to an infection exceeds the boundaries of the local environment, leading to a more generalized response" (Taeb, Hooper, & Marik, 2017). The body's response to infection results in activation of the innate immune system. "The innate system acts by broad recognition of antigens, mainly by sensing pathogen-associated molecular patterns (PAMP) of carbohydrates and fatty acids located on the surfaces of common pathogens" (László, Trásy, Molnár, & Fazakas, 2015). When a pathogen is detected, proinflammatory mediators (macrophages, cytokines, leukotrienes, and chemokines) are sent to the infected area. This results in local inflammation, vasodilation, increased capillary permeability, and clot formation. In some cases, this local response can spread systemically causing the activation of several classes of pattern recognition receptors. This activation generates a "cytokine-chemokine storm" (László, Trásy, Molnár, & Fazakas, 2015). When the immune response becomes generalized, widespread cellular injury occurs and can cause organ dysfunction. Cellular injury occurs due to tissue ischemia, direct cell injury by proinflammatory mediators, and an altered rate of apoptosis. This cellular injury contributes to diffuse endothelial injury that results in increased capillary permeability. Increased capillary permeability causes a shift in fluid from the intravascular space to the interstitial tissues. This shift manifests in the patient as hypotension and results in impaired tissue oxygenation and further cellular injury (Taeb, Hooper, & Marik, 2017). If allowed to progress to septic shock, the profound hypotension and tissue hypoxemia will result in death of the patient.

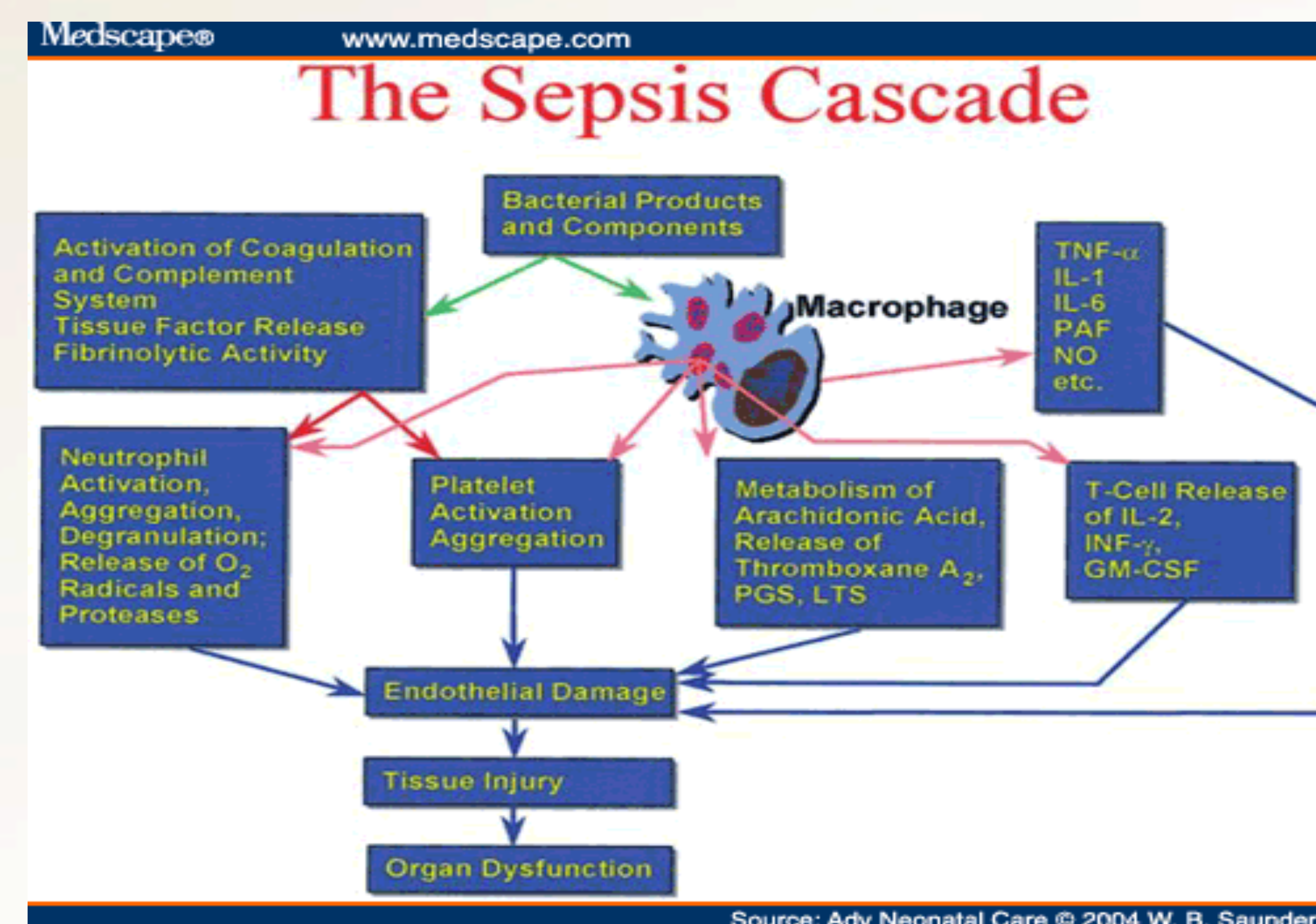


Image Retrieved from <http://img.medscape.com/fullsize/migrated/493/246/adnc493246.fig1.gif>

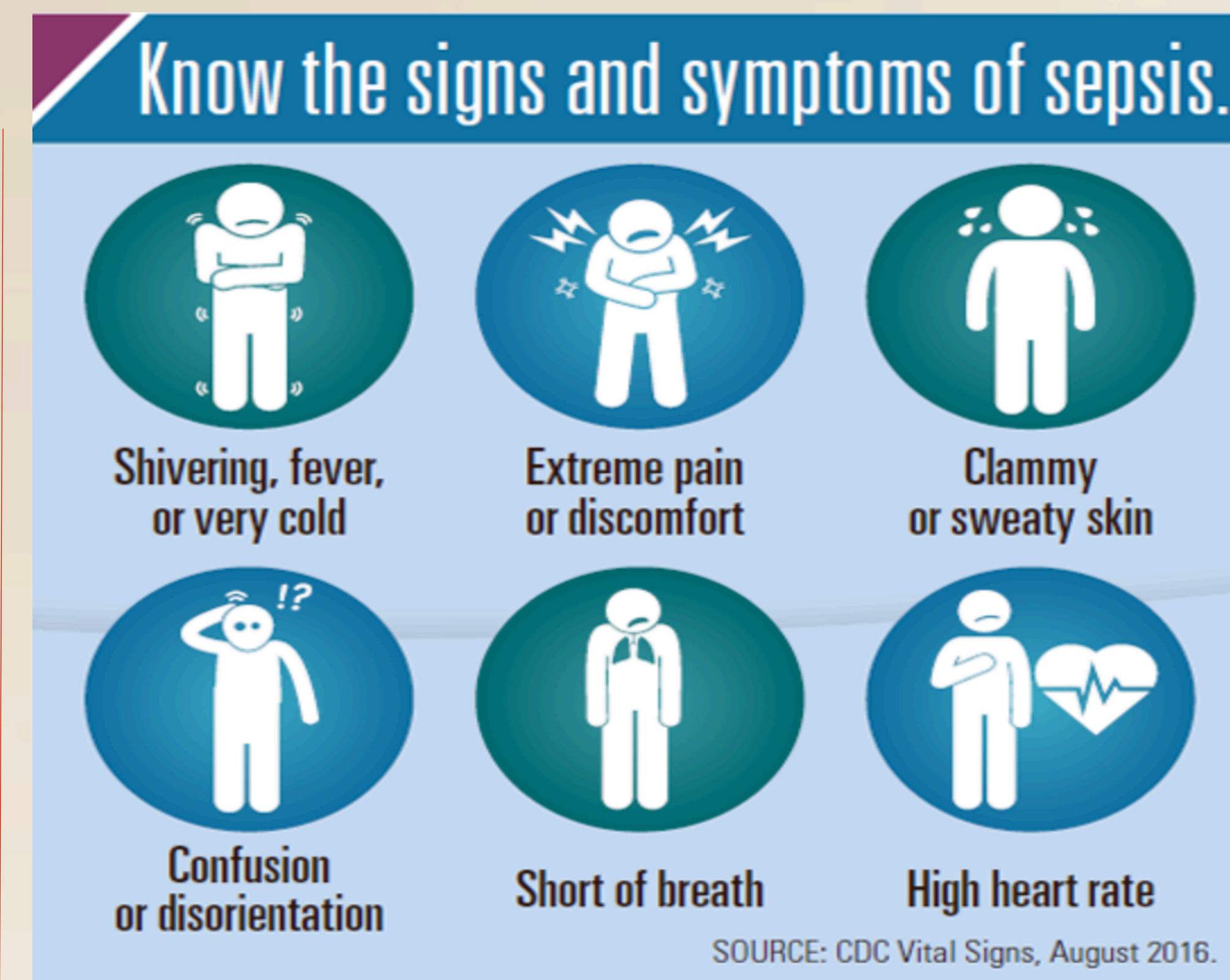


Image Retrieved from <http://www.thepatientssafetyblog.org/2016/09/sepsis-know-signs-and-symptoms.html>

Significance of Pathophysiology

- Sepsis is the 10th leading cause of death in the United States and accounts for 20% of all ICU hospital admissions with 750,000 cases occurring every year (Palleschi, Sirianni, O'Connor, Dunn, & Hasenau, 2014).
- To decrease the number of deaths caused by sepsis annually, it is imperative that healthcare providers be diligent in observing for signs and symptoms of sepsis in their patients.
- By recognizing sepsis, healthcare providers can provide early goal-directed therapy (EGDT), which has been endorsed in the guidelines of the Surviving Sepsis Campaign as a key strategy to decrease mortality (Peake et al., 2014).
- With knowledge of the pathophysiology of sepsis, healthcare providers can understand the meaning behind the treatment for sepsis and recognize its importance.
- Through proper education, healthcare providers will recognize and treat sepsis as soon as it is detected and patient mortality will decrease.

Implications for Nursing Care

- Nurses play a vital role in the recognition and treatment of patients with sepsis
- By understanding sepsis pathology and treatment, the nurse can notify the physician and advocate and prepare for the treatment that should be provided for patients diagnosed with sepsis.
- Development of a sepsis bundle that states within three hours of sepsis diagnosis the patient must receive at least 30ml/kg crystalloid solution.
- Blood cultures drawn prior to antibiotic administration, obtain lactate level, and broad-spectrum antibiotics administered within one hour of diagnoses.
- Vasopressors must be used for hypotension that is not responsive to fluid
- By recognizing sepsis, nurses can provide early treatment to save lives.

Conclusion

Sepsis is an often-overlooked disease by the general public and healthcare professionals alike despite the devastating number of deaths it causes per year. In order to improve sepsis diagnoses and treatment, it is imperative that the public and healthcare providers be educated. With proper education, sepsis can be recognized early and goal directed therapy can be initiated immediately. Nurses are at the forefront in the treatment of sepsis and must be diligent to ensure patients' get the care they need to overcome a diagnosis of sepsis.

References

- Amland, R. C., & Hahn-Cover, K. E. (2016). Clinical Decision Support for Early Recognition of Sepsis. *American Journal Of Medical Quality*, 31(2), 103-110. doi: 10.1177/1062860614557636
- Benedict, L. (2015). Surviving Sepsis in the Critical Care Environment. *Critical Care Nursing Quarterly*, 38(2), 137-142. doi:10.1097/CNQ.0000000000000054
- László, I., Trásy, D., Molnár, Z., & Fazakas, J. (2015). Sepsis: From Pathophysiology to Individualized Patient Care. *Journal Of Immunology Research*, 2015510436. doi:10.1155/2015/510436
- Palleschi, M. T., Sirianni, S., O'Connor, N., Dunn, D., & Hasenau, S. M. (2014). An Interprofessional Process to Improve Early Identification and Treatment for Sepsis. *Journal For Healthcare Quality: Promoting Excellence In Healthcare*, 36(4), 23-31. doi:10.1111/jhq.12006
- Peake, S. L., Delaney, A., Bailey, M., Bellomo, R., Cameron, P. A., Cooper, D. J., & ... Williams, P. (2014). Goal-directed resuscitation for patients with early septic shock. *New England Journal Of Medicine*, 371(16), 1496-1506. doi:10.1056/NEJMoa1404380
- Rhodes, A., Evans, L. E., Alhazzani, W., Levy, M. M., Antonelli, M., Ferrer, R., & ... De Backer, D. P. (2017). Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016. *Critical Care Medicine*, 45(3), 486-552. doi:10.1097/CCM.0000000000002255
- Seymour, C. W., & Rosengart, M.R. (2015). Septic shock: Advances in diagnosis and treatment. *Journal of the American Medical Association*, 314(7), 708-717.
- Singer, M., Deutschman, C. S., Seymour, C. W., Shankar-Hari, M., Annane, D., Bauer, M., & ... Angus, D. C. (2016). The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). *JAMA: Journal Of The American Medical Association*, 315(8), 801-810. doi:10.1001/jama.2016.0287
- Sirvent, J., Ferri, C., Baró, A., Murcia, C., & Lorencio, C. (2015). Fluid balance in sepsis and septic shock as a determining factor of mortality. *American Journal Of Emergency Medicine*, 33(2), 186-189. doi:10.1016/j.ajem.2014.11.016
- Taeb, A. M., Hooper, M. H., & Marik, P. E. (2017). Sepsis: Current Definition, Pathophysiology, Diagnosis, and Management. *Nutrition In Clinical Practice*, 32(3), 296-308. doi:10.1177/0884533617695243



OTTERBEIN
UNIVERSITY