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Sepsis

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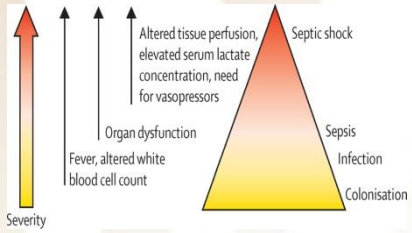
Introduction

- Sepsis is a major heath concern in the world today.
- Sepsis was chosen as it affects 1-1.5 million people in the United States each year and exceeds 24 billion dollars a year (Plevin & Callcut, 2017).
- Patients experiencing sepsis have a mortality rate of 20-50% and it is the most expensive reason for hospitalization (Laszlo et al., 2015).
- Sepsis is defined as a life-threatening organ dysfunction caused by a disregulated host response to infection (Plevin & Callcut, 2017).
- Many patients with sepsis develop multi-organ dysfunction syndrome.
- Early recognition of sepsis is crucial, as the mortality rate for patients is high.

Signs and Symptoms

- The diagnosis of sepsis includes two or more criteria of the systemic inflammatory response syndrome (SIRS): temperature greater than 38 ºC or less than 36º C, heart rate greater than 90, respiratory rate greater than 20 and white blood cell count greater than 12,000 uL or less than 4,000 uL (Plevin & Callcut, 2017).
- Sepsis is also characterized by early and acute changes in mental status (Postelnicu & Evans, 2017).
- Severe sepsis is related to other organ dysfunction such as renal, respiratory, and hepatic failure and could potentially lead to septic shock.



Picture 1: Septic shock (Vinvent, 2015).

Pathophysiological Processes

Underlying Pathophysiology

- The pathophysiology of sepsis is related to the patient's immune response (Keegan & Wira, 2014).
- It involves an imbalance between pro-inflammatory and anti-inflammatory responses, causing damage by a variety of mechanisms (Keegan & Wira, 2014).
- Sepsis occurs after invasion of the host's first line defenses such as skin or mucous membranes. At this point, the innate immune system becomes activated including complement proteins, phagocytes and natural killer cells (Laszlo et al., 2015).
- The innate system is activated by sensing pathogen-associated molecular patterns (PAMP) on the surface of pathogens (Laszlo et al., 2015).
- An inflammatory response may also occur after trauma, burns, ischemia or major surgery, leading to damage associated molecular patterns (DAMP) (Laszlo et al., 2015).
- DAMP and PAMP lead to activation of neutrophils, macrophages, and monocytes (Laszlo et al., 2015).
- Under normal circumstances, these inflammatory responses remain localized to the source of injury or infection (Laszlo et al., 2015).
- When immune response becomes unbalanced, the localized inflammatory process becomes systemic and can potentially cause damage to vital organs unassociated with the disease or illness (Laszlo et al., 2015).
- With a systemic immune response, there becomes a mismatch between tissue oxygen demand and delivery to cells. The oxygen delivered to the tissue is inadequate for tissue needs. This may be due to decreased afterload caused by vasodilation from bacteria endotoxins, decrease in cardiac output, loss of vasomotor tone, and inadequate catecholamine production (Laszlo et al., 2015).
- The overactive immune response leads to a lack of perfusion to vital organs, causing the end organ dysfunction that is seen in sepsis.
- Poor perfusion leads to the development of lactic acid and metabolic acidosis.
    - Anaerobic metabolism occurs when there is inadequate perfusion to cells. Lactic acid is a by-product of anaerobic metabolism (Keegan & Wira, 2014).

Significance of Pathophysiology

•The pro-inflammatory and anti-inflammatory mismatch leads to an overactive immune response and systemic hypo-perfusion (Keegan & Wira, 2014).

•The pro-inflammatory process overwhelms the anti-inflammatory process which can lead to immunoparalysis (Sagy et al., 2013).

- •Leads to an immune deficiency and the inability of the body's natural defenses to neutralized pathogenic invasion leading to possible secondary infections (Sagy et al., 2013).

•Systemic hypo-perfusion leads to end organ damage and the increase in lactic acid production.

•The degree of lactic acidosis is strongly correlated with prognosis and organ dysfunction (Keegan & Wira, 2014).

•The loss of cardiac output and vasomotor tone require medical intervention to reduce the impact of this process.

- •This may include administration of intravenous fluids, vasopressors, steroids, and antimicrobial therapy (Taeb et al., 2017) .

Implications for Nursing Care

•Early identification of signs of sepsis saves lives by early administration of antibiotics which is shown to reduce mortality. (Laszlo et al., 2015).

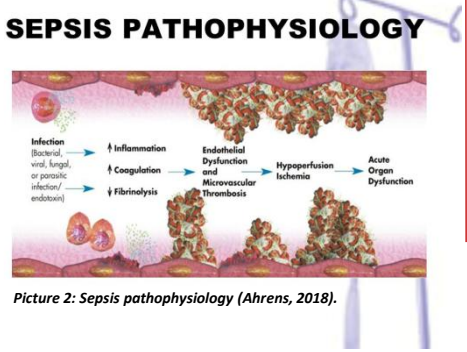
•Nurses in the intensive care unit are assigned the task of administering vasoactive drugs to sustain blood pressure and prevent further organ damage and potential death.

•Advanced nurses play a vital role as physical examination is an important part in the diagnosis and management of sepsis (Postelnicu & Evans, 2017).

Conclusion

•Sepsis affects millions of individuals every year and is associated with high mortality.

•Understanding the pathophysiology of sepsis will help practitioners initiate interventions to decrease the likelihood of organ damage and mortality.



Picture 2: Sepsis pathophysiology (Ahrens, 2018).

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