The Pathophysiological Process of Sepsis

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Sepsis is a medical emergency and can be a life-threatening illness that results as a complication of an infection from a source unknown, which occurs when chemicals have been released because of a breakdown by the body’s defense system work to fight off an infection (Mayo Clinic, 2015).

One of the leading causes of deaths in patients in the hospital setting worldwide, becoming more common that breast and bowel cancer combined (Nursing2014).

Sepsis can affect anyone; however, it is more common in the elderly or in individuals with weakened immune systems.

Health care providers (RHCs) must fully understand this disease process to assure that proper treatment is being implemented. According to Centers for Disease, sepsis has become more common than heart attacks, while claiming more lives than cancer (2016).

• At the national level, morbidity for sepsis ranges from 25 to 50 percent, and more than 220,000 people in the United States die from this illness each year (Butcher, 2016).

• Understanding the pathophysiology of sepsis allows HCPs to provide adequate care and treatment to patients.

Significance of Pathophysiology

It is important for APNs to understand the signs and symptoms of sepsis. When a diagnosis is made in a timely manner, complications are decreased and prognosis is increased (Mayo Clinic, 2016).

Sepsis screening tools are essential to the outcome of patient’s health. Early identification by the use of systematic screening tools can be helpful for diagnosis and urgent treatments.

Introduction and Overview of Sepsis

Sepsis can begin anywhere that a bacteria or virus can enter the body.

Many symptoms must be identified and explored for diagnosis, as there is no single sign or symptom.

Can be identified as a systemic response to infection that displays two or more of the following symptoms as a result of infection: Temperature >38°C or <36°C, Heart rate >90 bpm, Respiratory rate >20 breaths/min or a PaO2 <80mmHg and white blood cell count >12,000 cells/ml or <4,000 cells/ml or 10% immature (band) forms (Nursing2014).

Can display symptoms of infection including: vomiting, diarrhea, sore throat, fever, shaking pain, shortness of breath, tachypnea, and tachycardia (Centers for Disease Control and Prevention, 2016).

Past medical history is important for diagnosis. Sepsis can mimic symptoms of other infections or disease processes, resulting in a more difficult diagnosis.

Individuals who have been receiving antibiotics are sometimes more difficult to diagnose with sepsis because a blood test may produce a false negative.

Blood tests are performed to look for abnormal numbers of white blood cells, elevated lactate levels, or the presence of infectious agents (U.S. National Library of Medicine, 2016).

Sepsis can lead to permanent organ damage, making early identification of sepsis crucial. Understanding the pathophysiology of this disease process and starting appropriate treatment is an important aspect of being a patient advocate.

Sepsis can be life-threating, providers should always be looking for organ dysfunction as well as the source of infection anywhere infection is suspected (Society of Critical Care Medicine, 2016).

With sepsis being a major cause of hospitalizations worldwide, mortality rates are also steadily increasing (Society of Critical Care Medicine, 2016).

Underlying Pathophysiology

Sepsis is one of the leading causes of mortality and morbidity worldwide; defined as a systemic inflammatory response initiated by a source of infection.

The pathophysiology of sepsis involves, “the stimulation of the innate immune system, activation of complement, and release of endothelial cells, and response of endothelial cells can lead to the release of a number of mediators or cytokines” (Kleinpell, Aitken, & Schorr, 2013, para. 4).

This leads to a variety of physiological changes including vasodilation, enhanced expression of adhesion molecules, increased capillary permeability, increased clot formation, and decreased fibrinolysis. (Merritt, Curtis. (2016).

The overactivity of mediators contribute to endothelial cell damage, change in capillarity, capillary leak, hypotension, and vasodilation; resulting in the progression of severe sepsis, while influencing the development of multiple organ system dysfunction (Kleinpell, Aitken, & Schorr, 2013).

Systemic inflammatory response syndrome (SIRS) refers to a collection of signs that the body exhibits to show that it is reacting to a range of injuries or illness; not specific to infection. (Weissman, 2016).

In response, the body may express signs of infection by raising the heart rate or respiratory rate to increase the amount of oxygen, altering body temperature or increasing white cell production in order to fight infection.

Blood sugar may increase and any altered mental state may present as early signs of systemic stress or hypotension. (Weissman, 2016)

Oxygen demands increase along with intravascular losses, which cause hypoperfusion and ischemia at the cellular levels. When this happens, signs of severe sepsis and evidence of organ dysfunction are present.

Most patients with sepsis present with hypotension and hypoperfusion that usually responds well to fluid replacement. However, patients with severe sepsis that have the blood flow replacement are in septic shock; if not timely managed, then leads to refractory hypotension, tissue injury to the endothelium as well as possible apoptosis of the endothelial cells, which activates coagulation factors.

Cytolesis interact with endothelial cells, causing swelling to the endothelium as well as possible apoptosis of the endothelial cells; which activates coagulation factors.

In the micro-veins, the coagulation response combined with endothelial damage, can interfere with blood flow and cause the vessels to become leaky. Tissues begin to swell as fluid and microorganisms escape into the surrounding tissues.

Tissue edema in the lungs leads to pulmonary edema, and presents as shortness of breath.

Blunting can occur if the supply of oxygen and nutrients are decreased.

Cytolesis also cause blood vessels to dilate, which results in hypotension.

Additional Sources


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References