SEPSIS PATHOPHYSIOLOGY

Describing the pathophysiology of Sepsis is easier said than done. In fact, Sepsis is actually a broad term that will have to be narrowed down into subcategories to fully describe the disease process. When I was in my ADN Program, such a short while ago in 2004-2006, our course work did not go into sepsis in depth. In fact, I asked my clinical instructor what the diagnosis of Sepsis actually meant. I remember her stating rather nonchalantly that basically it's an infection of the blood. There is truth to that statement although it doesn't even scratch the surface of the true pathophysiology of Sepsis.

Sepsis is actually a cascade of four inter-related disease processes.

1) SIRS-Systemic Inflammatory Response Syndrome. The body's reaction to trauma. This could include burns, MI's, pancreatitis and/or infection to name just a few. The aforementioned must include <u>two</u> of the following to be documented as SIRS.
    a. Core body temperature greater than 100.4F or less than 96.8F
    b. Heart rate greater than 90 beats per minute
    c. Respiratory rate greater than 20 bpm or $Paco_2$ less than 32 mm Hg.
    d. WBC's greater than 12,000 cells/mm^3 or less than 4,000 cells/mm^3. –often with a "Band Shift" of greater than 10% immature band forms
2) Sepsis is at least <u>two</u> of the four SIRS criteria above plus a documented or suspected infection.
3) Severe Sepsis is found in patients with a diagnosis of sepsis AND a dysfunction of one or more organ systems. This would include hypoperfusion and/or hypotension which in turn

can lead to thrombocytopenia, hypoxemia, hyperglycemia, oliguria, lactic acidosis, coagulopathy and altered mental states.

4) Septic Shock is severe sepsis with hypotention that does NOT respond to intravenous fluid resuscitation. [3]

The pathogenesis of sepsis in considered unregulated and self-sustaining. It occurs in the intra-cardiovascular system. Most importantly Sepsis is the result of an out of control inflammatory response that becomes destructive and involves otherwise normal tissue. Ultimately, if not caught early, sepsis can result in MODS-Multiple Organ Dysfunction Syndrome. [2] Sepsis has been added to the list of other conditions, such as MI and CVA, that require medical treatment to be given within a "Golden Hour".[3] I will discuss more about the protocol for early goal-directed treatment (EGDT) in the Nursing Interventions Objective.

Our body's local inflammatory process which is turned on by trauma and/or infection activates macrophages to help rid the body of said infection. These macrophages secrete Tumor Necrosis Factor (TNF). The TNF then stimulates the production of more proinflamatory mediators-a process when under normal circumstances, is followed by tissue repair. In the case of Sepsis, the mediator TNF release exceeds the boundaries of the local area of trauma/infection. This cascade and derangement in metabolic autoregulation begins to affect the microvascular systems of the body. This causes hypoxemia, increased rate of apoptosis, and rigidity of erythrocytes with reduced area for gas exchange, inappropriate vasodilation and most importantly increased microvascular permeability leading to hypotention.[2]

This increased microvascular permeability begins to cause a lack of proper perfusion in the body's organ systems. First off, the red blood cells themselves are less adept to navigate

within the microvascular circulatory system which results in hypoxemia. Within the lungs this contributes to pulmonary edema. Arterial hypoxemia becomes a consequence. The renal system becomes involved due to acute tubular necrosis and is often accompanied with acute renal failure. The heart often can compensate in the early facet of sepsis with internal mechanisms to increase cardiac output, although patents with cardiac disease often do not have this ability. With the effects on the Renal, Cardiac and Respiratory systems the cascading implications of sepsis will only get worse without prompt and competent nursing assessments and the implementation of evidence-based nursing interventions.