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Septic Shock

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Background

Sepsis is a frequently seen diagnosis in hospital settings, which when left untreated can progress to severe sepsis and septic shock. Septic shock occurs in more than 230,000 patients in the United States annually and is the cause of more than 40,000 deaths (Seymour & Rosengart, 2015). Septic shock was chosen as a topic due to its prevalence in the intensive care unit. It is very important for hospital staff members to quickly and accurately identify signs of sepsis, severe sepsis, and septic shock so that patients can undergo treatment as quickly as possible. Studies have shown that the early treatment of sepsis may lead to decreased sepsis-related mortality (Benedict, 2015). An educational and informative poster presentation could aid in the understanding of septic shock and increase the knowledge of health care providers who will need to identify it in the future.

For the diagnosis of sepsis, a patient must have either a suspected infection or confirmed infection along with SIRS criteria. If the sepsis does not respond to treatment, or treatment is not begun in a reasonable amount of time, it can progress to severe sepsis and septic shock. When the sepsis cascade has progressed to septic shock, it is identified by a sustained fall in blood pressure. Blood pressure will remain low despite fluid resuscitation. These patients often present with high spiking fevers and respiratory failure (Skrupky, Kerby, & Hotchkiss, 2011). They may need mechanical ventilation during their hospitalization. Patients in septic shock will be cared for in the intensive care unit.

Signs and Symptoms

Sepsis- Sepsis occurs when a patient with SIRS has a presumed or confirmed infection

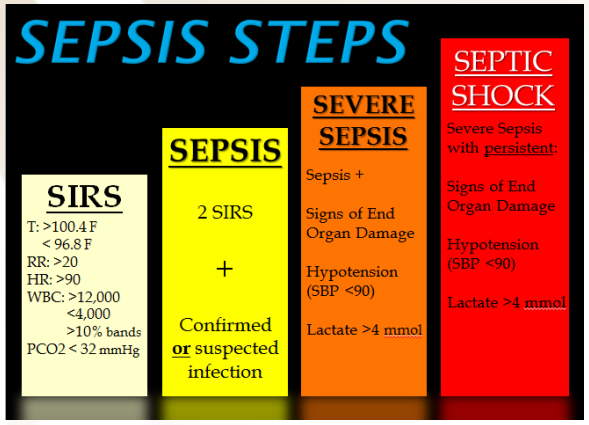
o SIRS definition- inflammatory response that is common in bacterial infections. Based on the presence of at least TWO of eight criteria:
- T > 38 C or < 36 C
- HR >90
- RR >20 or PaO2 <32 mm Hg
- WBC > 12,000 or < 4,000 or > 10% immature neutrophils (Tazbir, 2012)

Severe sepsis is defined as sepsis complicated by at least one organ dysfunction

o Organ dysfunction markers
- Arterial hypoxemia (PaO2:FIO2 <300), Oliguria despite adequate fluid resuscitation (<0.5 mL/kg/h for at least 2 h), Creatinine increase > 0.5 mg/dL, Ileus, Hyperbilirubinemia (> 4mg/dL), Lactate >1 mmol/L, decreased capillary refill or mottling

Septic shock is defined as hypotension requiring use of vasopressors to maintain mean blood pressure of 65 mm Hg or greater and having a serum lactate level greater than 2 mmol/L persisting after adequate fluid resuscitation (Shankar-Hari et al., 2016).

o Symptoms include:
- Low systolic blood pressure (90 mm Hg)
- Low mean arterial blood pressure (65 mm Hg)
- Signs of hypoperfusion such as oluguria, hypoxemia, hyperlactemia, poor peripheral perfusion, or altered mental status (Seymour & Rosengart, 2015).



Septic Shock Pathophysiology

Sepsis:

Sepsis is characterized by an initial hyperinflammatory state, followed by an immunosuppressive phase in response to infection (Dumont, Lyndave, Chong, & Balaan, 2016).

- Excessive release of pro-inflammatory mediators causes inflammation and results in the clinical picture of SIRS (Sagy, Al-Qaqaa, & Kim, 2013).
- There is a failure of the compensatory anti-inflammatory response and an imbalance of pro-inflammatory response and anti-inflammatory response occurs (Sagy, Al-Qaqaa, & Kim, 2013).
- Mediators of inflammation overwhelm the immune system and paralyze it. This leads to a state of immune deficiency (Sagy, Al-Qaqaa, & Kim, 2013).
- Hypotension occurs because of systemic vasodilation as the body attempts to increase blood flow and deliver cytokines to affected areas (Sagy, Al-Qaqaa, & Kim, 2013).

Septic Shock:

Septic shock is a form of distributive shock. Abnormal distribution occurs due to vasodilation, capillary leakage, maldistribution of blood flow, and the release of myocardial depressant factor (Tazbir, 2012).

- Vasodilation results from nitric oxide release and endothelium changes on blood vessel walls (Tazbir, 2012).
- As a result of vasodilation and capillary leakage, the patient's blood pressure lowers which decreases perfusion to vital organs such as the kidney and brain. Perfusion abnormalities such as a decrease in urine output or deterioration of mental status become apparent clinically (Tazbir, 2012).
- On a cellular level, hypoperfusion leads to a change in anaerobic metabolism. This alteration causes changes in the glycolic path and citric acid cycle metabolic pathways, causing high lactate levels and acidosis. As cells continue without oxygen, the sodium potassium pump is impaired and the lysosomal membrane ruptures, and cell death can occur (Tazbir, 2012).

Significance

Understanding the pathophysiology of septic shock can aid in its treatment for many reasons.

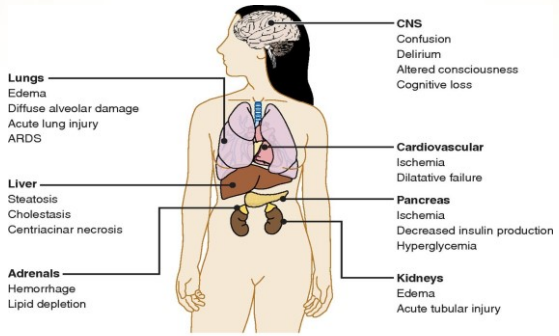
- If health care providers are aware of the importance of early recognition and treatment of the disease, they will be more inclined to act quickly
- If nurses and physicians are aware of the processes involved in sepsis and septic shock, it will help them to understand the rationale and importance of the necessary treatment
- Being aware of the pathophysiological progression from sepsis to severe sepsis and septic shock, health care professionals will be better able to identify symptoms of a sepsis-related situation, which in turn would lead to faster onset of treatment and better outcomes

Implications for Nursing

Nurses need to be aware of the current Surviving Sepsis Campaign (SSC) guidelines and the Early Goal Directed Therapy proposed by the SSC
- o Within three hours of diagnosis of sepsis or septic shock the nurse should
  - administer at least 30 mg/kg of crystalloid solution
  - administer antibiotics within 1 hour of diagnosis
  - obtain blood cultures prior to antibiotic administration
  - obtain lactic acid level (Benedict, 2015).
- o Within six hours or diagnosis
  - Apply vasopressors for hypotension that does not respond to fluid resuscitation to keep MAP > 65 mm Hg
  - Obtain central access and monitor CVP (goal 8-12 mm Hg)
  - Trend lactate levels (Benedict, 2015).

It is very important to educate all nurses and physicians, not just in the intensive care unit. Approximately 24% of patients who develop severe sepsis or septic shock will do so on a medical-surgical unit (Tazbir, 2012).

Nurses and other health care professionals should discuss a hospital-wide alert system to assist in detecting sepsis throughout the hospital. Studies have shown that electronic alerting systems put into place in hospitals have decreased the time to sepsis-related intervention (Kurczewski, Sweet, McKnight, & Halbritter, 2015).



End Organ Damage in Sepsis

Conclusion

- Sepsis results from an infection that triggers the release of inflammatory mediators and induces cellular dysfunction in the affected host (Sagy, Al-Qaqaa, & Kim, 2013).
- Time to treatment is incredibly important. Patients with severe sepsis or septic shock who received Early Goal-Directed Therapy (EDGT) had 16.5% less mortality than patients who did not receive EDGT (Tazbir, 2012).
- Sepsis is a very prevalent and costly diagnosis. According to recent data from the United States, sepsis is the single most expensive reason for hospitalization at present (Laszlo, Trasy, Molnar, & Fazakas, 2015). Sepsis costs were $15.4 billion in 2009 (Tazbir, 2012).
- Education is the key to fast and appropriate treatment of sepsis and septic shock.

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