



# **Sepsis: Prevention, Early Recognition & Intervention**

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**Webinar Presentation**

**October 20, 2017**

# Disclosure

**No conflicts of  
interest to  
disclose.**



# Sepsis Pre-Test

- What age group is the most susceptible to sepsis?
  - A Infants.
  - B Adolescents.
  - C Elderly.
  - D Young adults.

# Sepsis Pre-Test

Physiologic responses to all types of shock include the following EXCEPT:

- A Activation of the inflammatory system.
- B Activation of the coagulation system.
- C Hypoperfusion of tissues.
- D Vasoconstriction.

# Sepsis Pre-Test

Patients receiving fluid replacement therapy should be frequently monitored for:

- A Adequate urinary output.
- B Changes in mental status.
- C Vital sign stability.
- D All of the above.

# Sepsis Pre-Test

Medical management of septic shock includes all of the following EXCEPT:

- A Administration of colloids.
- B Administration of Drotrecogin alfa.
- C Aggressive fluid resuscitation.
- D Aggressive nutritional supplementation.

# Sepsis Pre-Test

The ultimate goal in treating septic shock is:

- A Preserving the myocardium.**
- B Restoring adequate fluid status.**
- C Identification and elimination of the cause of infection.**
- D Identification and elimination of the cause of allergy.**

# Presentation Objectives:

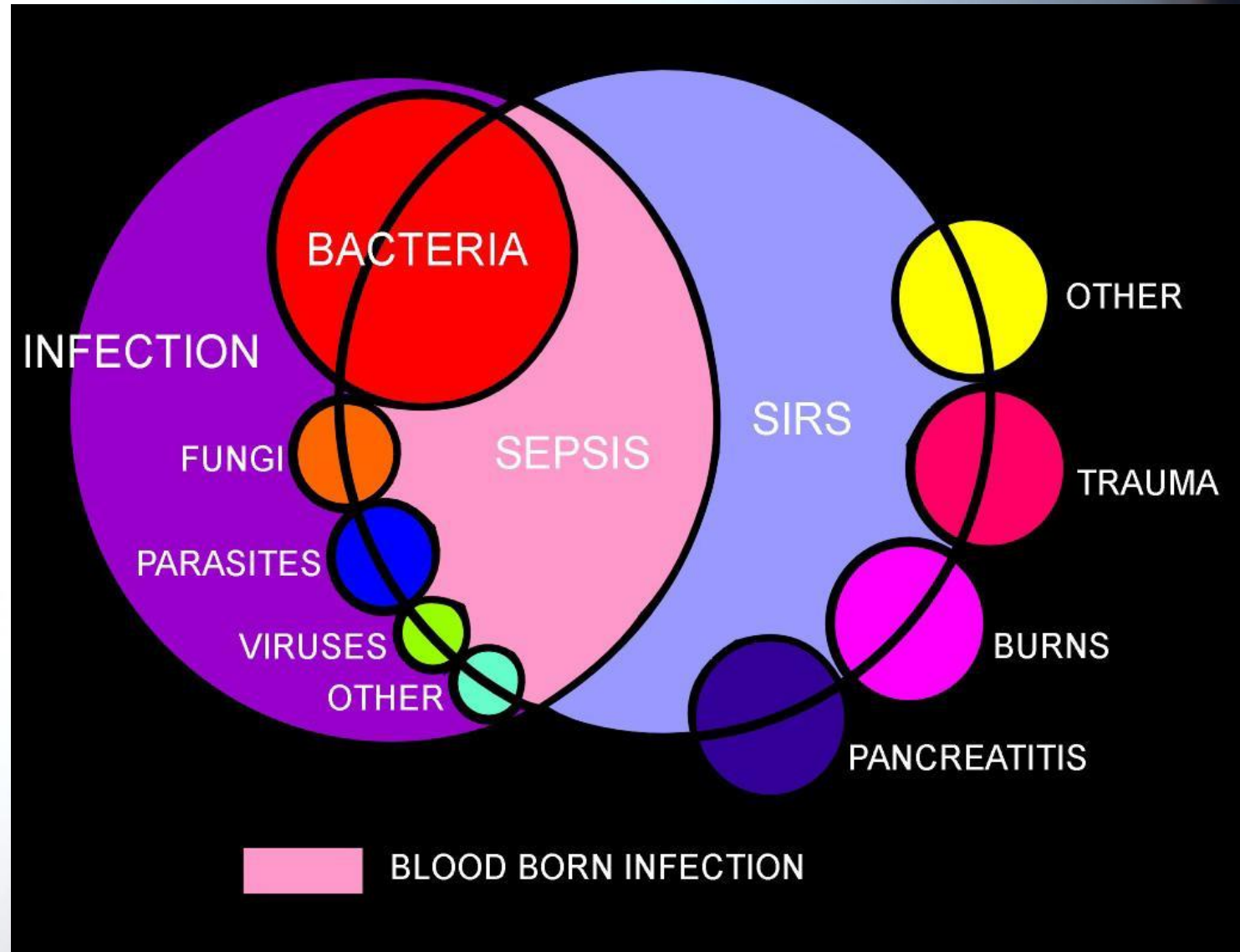
- Describe conditions that promote the development of sepsis.
- Discuss the pathophysiology of sepsis.
- Discuss relationship of sepsis to systemic inflammatory response syndrome (SIRS).
- Describe vulnerable populations susceptible to sepsis.
- Identify signs and symptoms of sepsis.
- Discuss the nurse's role in early recognition and intervention of sepsis.



# Defining Sepsis

- Sepsis is the systemic response to infection.
- Includes the presence of Systematic Inflammatory Response Syndrome (SIRS).
- Condition consists of the presentation of a documented or presumed infection.
- A severe medical condition that is associated with organ dysfunction, hypoperfusion, or hypotension.

# Sepsis



# Sepsis = Serious Illness

- Can progress to circulatory systemic dysfunction, multiple organ system dysfunction, and death
- High morbidity and mortality
- Older persons, infants, and immunocompromised patients are at increased risk
- Incidence is 3 cases per 1,000 people; in hospitalized patients, the incidence is 2%

# Why Focus on Sepsis?

- Sepsis is the leading cause of death in non-coronary care intensive care units, with a mortality rate between 30% and 50%
- From 2007 to 2009, over 2,047,038 patients were admitted with a sepsis-related illness
  - 52.4% are diagnosed in the ED
  - 34.8% on the hospital wards
  - 12.8% in the ICU

# Why Sepsis?

- **The cost to the US healthcare system for sepsis, and pneumonia grew twice as fast as the overall growth in hospital charges**
  - **\$54 billion per year**
  - **Approximately 180 percent increase from 1997 to 2005**



Hall, M.J, et al. NCHS data brief, no 62. Hyattsville, MD: National Center for Health Statistics. 2011  
Reed K et al. Health Grades. June, 2010 2011;The First Annual Report(1):1-28.

# Sepsis Data

- Study conducted by Kaiser Permanente in a national survey in 2010 identified as many as 34.7% to 52% of patients who died in a hospital had sepsis at the time of his or her death.
- More specifically, sepsis was listed as an explicit cause of death in 36.7% of cases and an implicit cause of death in 40.8% of cases.
- Kaiser data showed that about 56% of sepsis deaths were in patients with less severe cases, most of whom were treated in a non-ICU setting. It also showed that most sepsis was present at the time of admission.

# Why Sepsis?

- It's common and increasing in frequency as the population ages
- It's associated with high risk of death and long length of stay
- It's expensive- treatment may last for weeks to months; resulting in physical debilitation, organ failure and permanent lifestyle changes

# Reasons for Increased Incidence

- ✓ Growing number of immunocompromised patients
- ✓ Greater number of invasive procedures
- ✓ Increased number of resistant organisms
- ✓ Rise in number of older patients with critical illnesses





# Prevalence of Sepsis

- **64.9% of all sepsis cases are patients over age 65**
- **Causes of sepsis include: pneumonia, UTI, diarrhea, meningitis, cellulitis, arthritis, wound infection, endocarditis, and catheter-related infection**
- **Sepsis may start as systemic inflammatory response syndrome (SIRS)**

# High Risk Patients

## For Developing Sepsis

- Post op / post procedure / post trauma
- Post splenectomy (encapsulated organisms)
- Cancer
- Transplant / immune suppressed
- Alcoholic / Malnourished

## For Poor Survival

- Genetic predisposition (e.g. meningococcus)
- Delayed appropriate antibiotics
- Yeasts and Enterococcus
- Site

## For Both

- Cultural or religious impediment to treatment

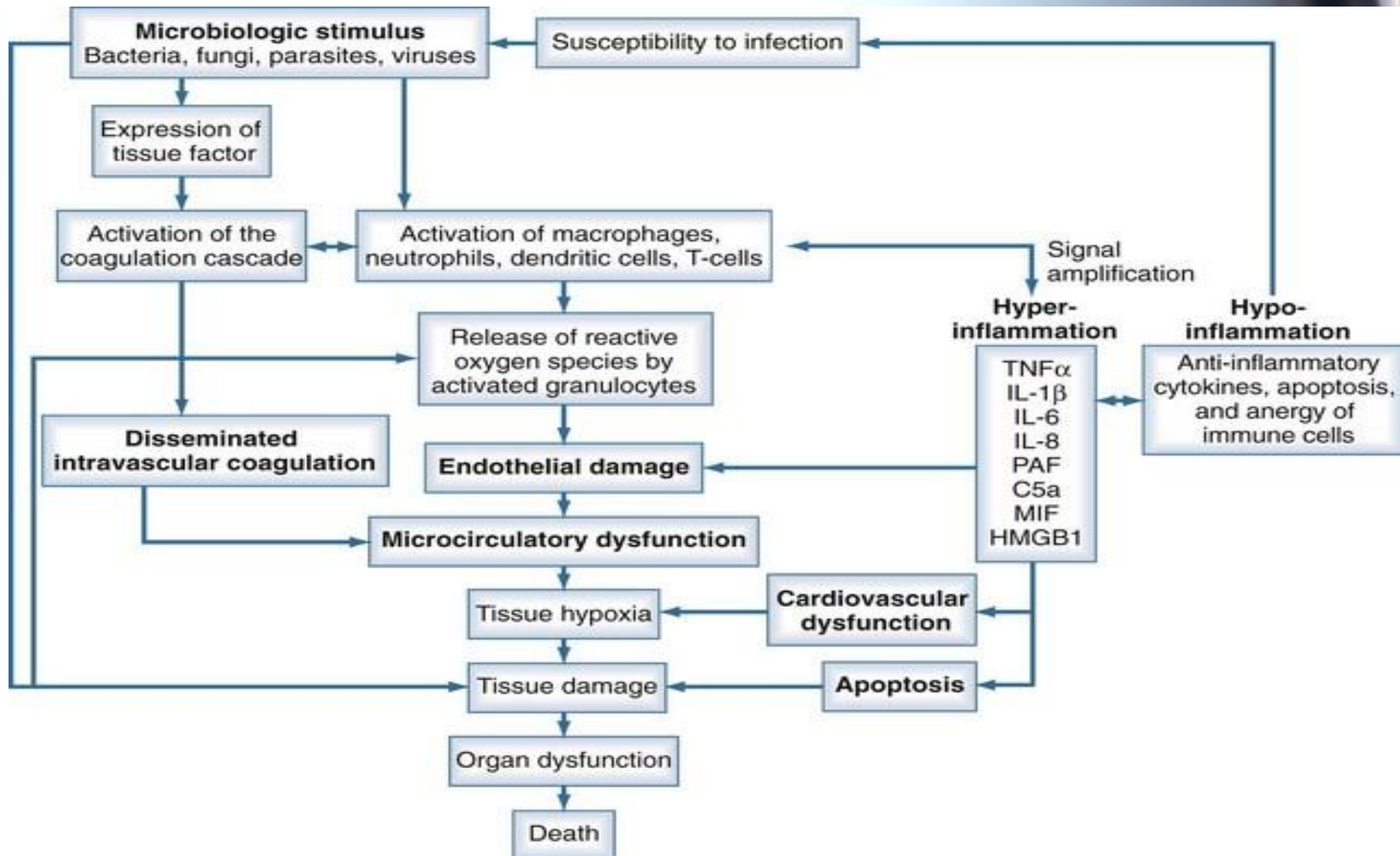
# Pathophysiology of Sepsis: A Complex Immunocompromising Process

- Inflammation is the body's response to a chemical, traumatic, or infectious insult
- The inflammatory cascade is a complex process that involves humoral and cellular responses
- Following an insult, local cytokines are produced and released
- Unregulated release of pro-inflammatory mediators (cytokines) can elicit toxic reactions and promote cellular adhesion
- Cell damaging proteases are released (prostaglandins), leading to fever, tachycardia, ventilation/perfusion abnormalities, acidosis, and activation of the clotting cascade



# **Pathophysiology of Sepsis: A Complex Immunocompromising Process**

- **The presence of wide-spread inflammation disrupts clotting mechanisms.**
  - **Mechanism similar to DIC**
- **Poor tissue perfusion leads to multisystem organ failure (MODS)**



# Clinical Manifestations of Sepsis

- ✓ Fever
- ✓ Chills
- ✓ Joint pain, tenderness, body aches
- ✓ Cough \ SOB
- ✓ Fatigue
- ✓ Dizziness
- ✓ Headache
- ✓ Dysuria
- ✓ Flank pain
- ✓ Abdominal pain



# Diagnosis of Sepsis



**Requires two or more of the following:**

- Body temperature greater than 100.4° F or less than 96.8° F**
- Heart rate greater than 90 beats/minute**
- Respiratory rate greater than 20 breaths/minute**
- Partial pressure of carbon dioxide less than 32 mm Hg**
- White blood cell count greater than 12,000/mm<sup>3</sup> or less than 4,000/mm<sup>3</sup> or greater than 10% immature neutrophils or bands**

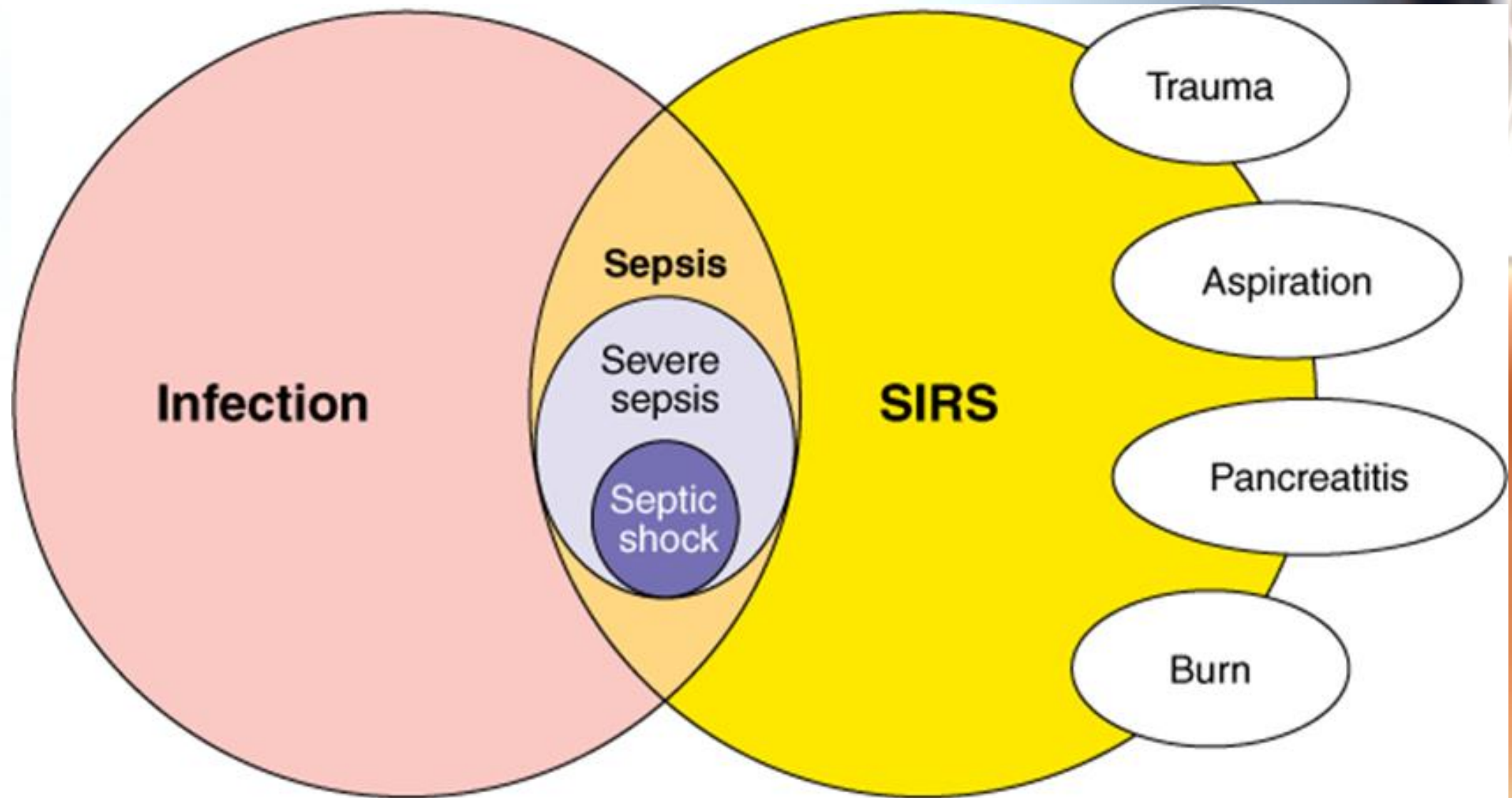


A rose by any other name....



- Sepsis can be referred to as a **Systemic Inflammatory Response** (SIRS)
  - When the response is caused by the presence of bacteria (**Septicemia**).
- **Septic Shock** : a state of severe sepsis that leads to hypotension and poor tissue perfusion= organ failure.





Source: Brunickardi FC, Andersen DK, Billiar TR, Dunn DL, Hunter JG, Matthews JB, Pollock RE: *Schwartz's Principles of Surgery, 9th Edition*: <http://www.accessmedicine.com>

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# Dear SIRS, I don't like you...

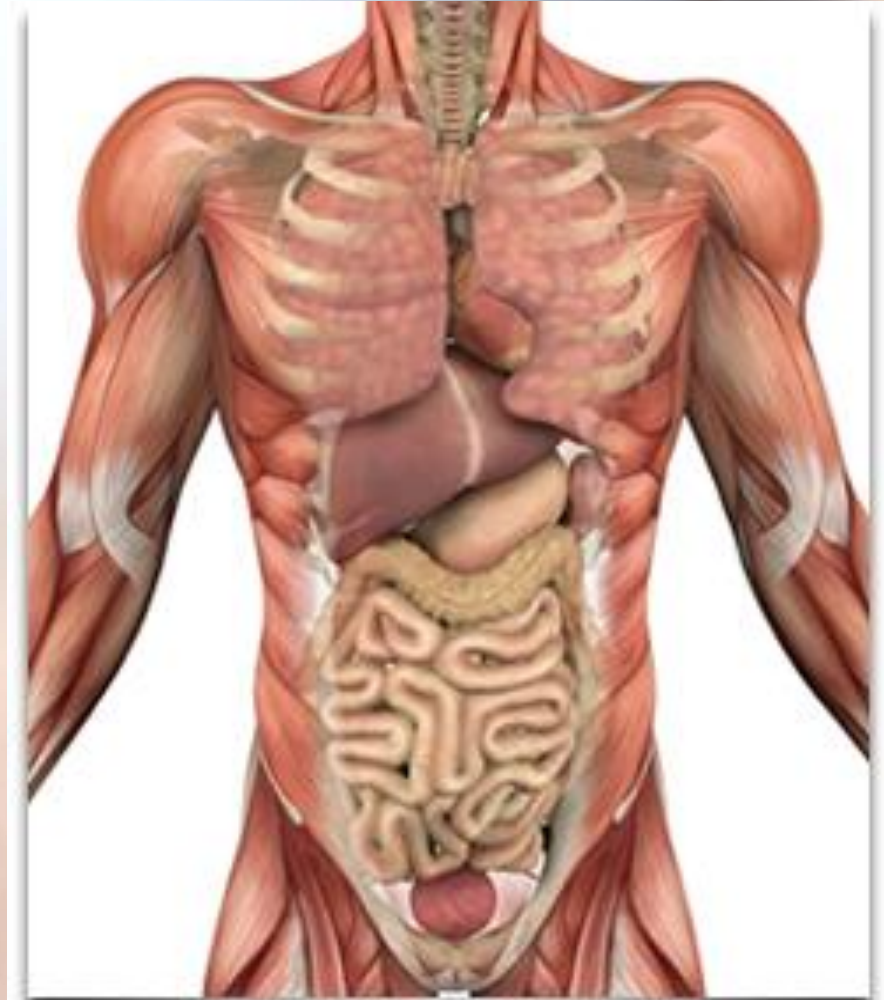
1. New terminology does not help us to understand the underlying problem
2. There are enough problems with the current terminology “sepsis,” “infection,” “septicemia”
3. SIRS is too sensitive, but is not specific (like, “critically ill”)
4. SIRS does not reflect the severity of the disease process
5. SIRS may detract from the search for infection

# Differential Diagnosis

- Pancreatitis
- Ischemic Gut
- Hypovolemic shock
  - GI bleed / AAA rupture / ectopic pregnancy / dehydration
- Cardiogenic shock
  - AMI / Myocarditis / Tamponade
- PE
- Toxic Shock Syndromes
- Staph Aureus
- Group A Strep
- Addisonian crisis (many septic patients have a related adrenocorticoid insufficiency)
- Thyroid Storm
- Toxidromes
- Anticholinergic / serotonergic

# Complications of Sepsis:

- Acute respiratory distress syndrome (ARDS)
- Acute renal failure
- GI complications
- Disseminated intravascular coagulation (DIC)
- Multiple organ dysfunction syndrome (MODS)



# ARDS

*Defined as: Abrupt onset of respiratory distress with three components: severe hypoxemia, bilateral pulmonary infiltrates, and absence of heart failure or fluid overload*

- **Three phases of ARDS:**

- *Acute exudative* – profound hypoxemia, inflammation, and diffuse alveolar damage
- *Fibroproliferative* – decreased compliance and increased dead space
- *Resolution* – may take 6 to 12 months or longer

❖ Results are due to extreme insult on the body

# Acute Renal Failure

- Develops as a result of endotoxins present in the blood , which cause vasoconstriction
- Renal damage is related to the degree and severity of sepsis
- Acute tubular necrosis may occur due to ischemia/ poor renal perfusion
- It's usually reversible with careful monitoring of urine output, serum creatinine, and blood urea nitrogen

# GI Complications

- **Can develop when blood flow is redistributed to vital organs during septic states**
- **Stress ulcers in the stomach may occur due to body response to severe illness**
- **Bleeding is common and can occur 2 to 10 days after the severe infectious insult**

# **DIC/ Disseminated Intravascular Coagulation**

- **Caused by coagulation cascade activation**
- **Clots are formed, blocking small vessels**
- **Depletion of platelets and coagulation factors increases the risk of bleeding**
- **Fibrin deposits in organs can cause ischemic damage and failure**



# **Multi-organ Dysfunction Syndrome/ MODS**

- **Prolong septic states can cause severe organ damage**
- **Occurs when multiple organs are damaged**
- **Mortality rate increases with the number of failing organs**

# Signs of Acute Organ System Failure

- **Cardiovascular**

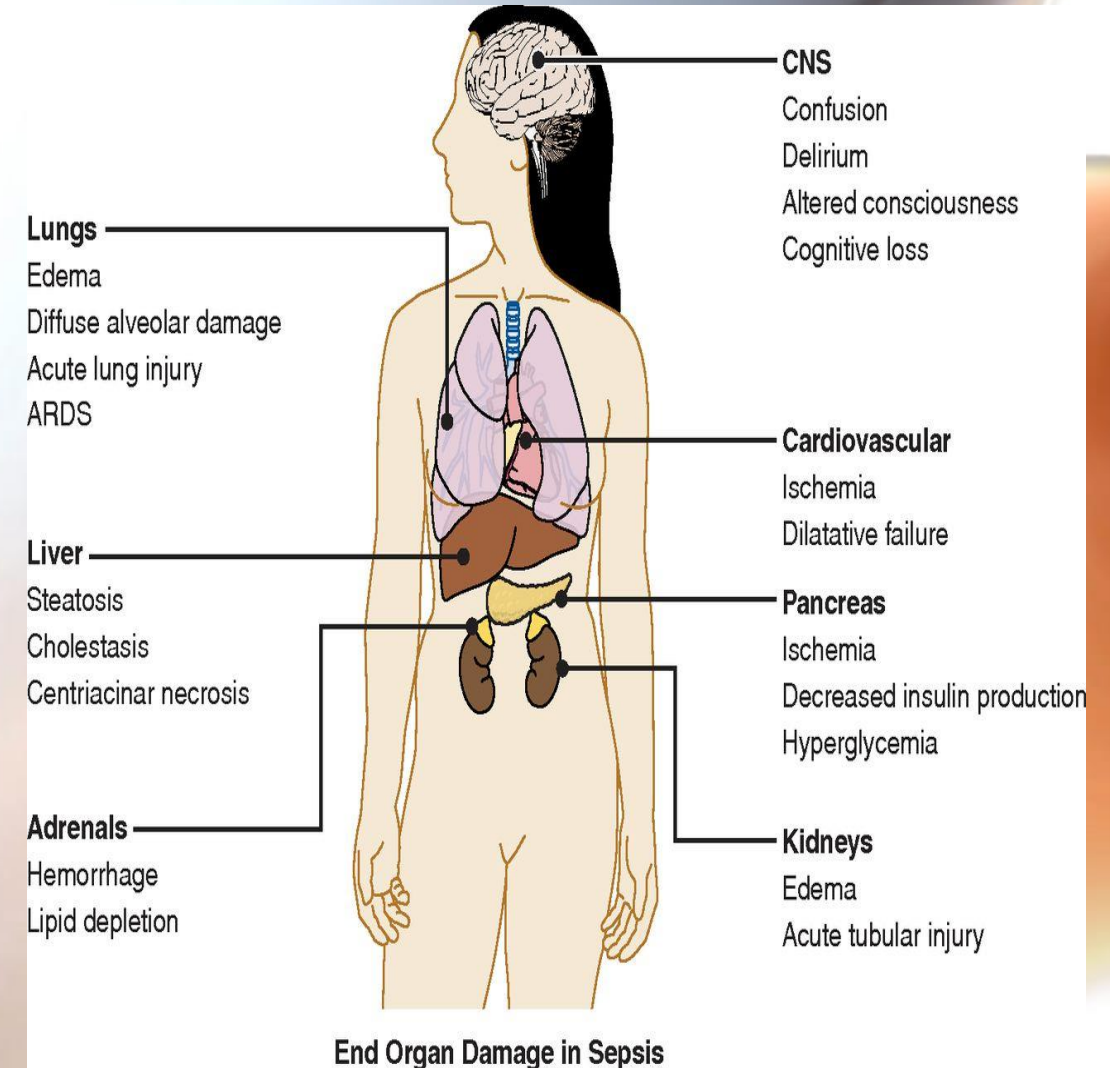
- Tachycardia
- Arrhythmias
- Hypotension
- Elevated central venous and pulmonary artery pressures

- **Respiratory**

- Tachypnea
- Hypoxemia

- **Renal**

- Oliguria
- Anuria
- Elevated creatinine



# Signs of Acute Organ System Failure

- ***Hematologic***

- Jaundice
- Elevated liver enzymes
- Decreased albumin
- Coagulopathy

- ***GI***

- Ileus (absent bowel sounds)

- ***Hepatic***

- Thrombocytopenia
- Coagulopathy
- Decreased protein C levels
- Increased D-dimer levels

- ***Neurologic***

- Altered consciousness
- Confusion
- Psychosis

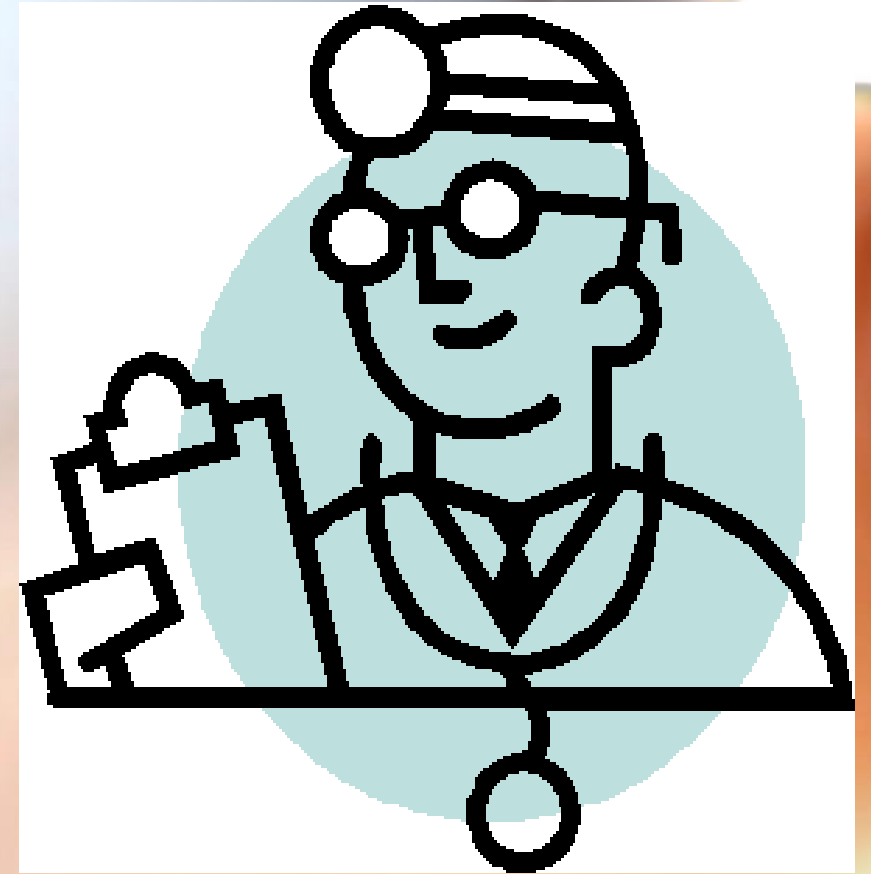
# Treatment



- **Early detection is key!**
- **Aggressive treatment has been shown to decrease mortality by 30% for septic patients and 50% for non-septic patients**
  - **Notify providers early**
- **Lab tests include:**
  - **Serum electrolytes**
  - **Complete blood cells count**
  - **Coagulation studies**
  - **Arterial blood gas (ABG) analysis**
  - **Cultures of sputum, urine, cerebrospinal fluid, and wound drainage**

# Initiation of the Treatment Bundle

- ❖ Initiate oxygen therapy. Give 100% oxygen via non-rebreather mask
- ❖ Transfer to medical center as soon as possible.
- ❖ Obtain two separate blood cultures before antibiotic therapy
- ❖ Initiate antibiotic therapy
- ❖ Initiate fluid resuscitation
- ❖ Measure the patient's lactate and Hemoglobin-A lactate levels
- ❖ Insert a urinary catheter to monitor hourly urine output



# Oxygen & Blood Cultures

- Obtain two separate blood cultures: one percutaneously and one via each vascular access device unless recently inserted
- Metabolic demands may require intubation/mechanical ventilation if ABGs deteriorate or blood pH decreases

# Antibiotic Therapy

- A broad-spectrum antibiotic is used initially; discontinued in 3 to 5 days
- Therapy may be modified after results of cultures are obtained.
- Single antibiotic therapy may last 7 to 10 days; may be longer in immunocompromised patients or in undrainable infections
- The dosage of antibiotics may be adjusted based on renal function- Nephrotoxicity

# Fluid Resuscitation



- Fluid resuscitation is a corner stone of sepsis therapy
- Should begin within 1 hour after admission
- Crystalloid solutions: 0.9 sodium chloride or lactated Ringer's
- Colloids: albumin
- Fluid challenges may be given based on BP and urine output



# Importance of Lactate and Hemoglobin-A Lactate Levels

- **Septic shock** is diagnosed when the lactate level is greater than 4 mmol/L in the presence of severe sepsis
- Consider a blood transfusion for a patient with a hemoglobin value of less than 7 g/dL

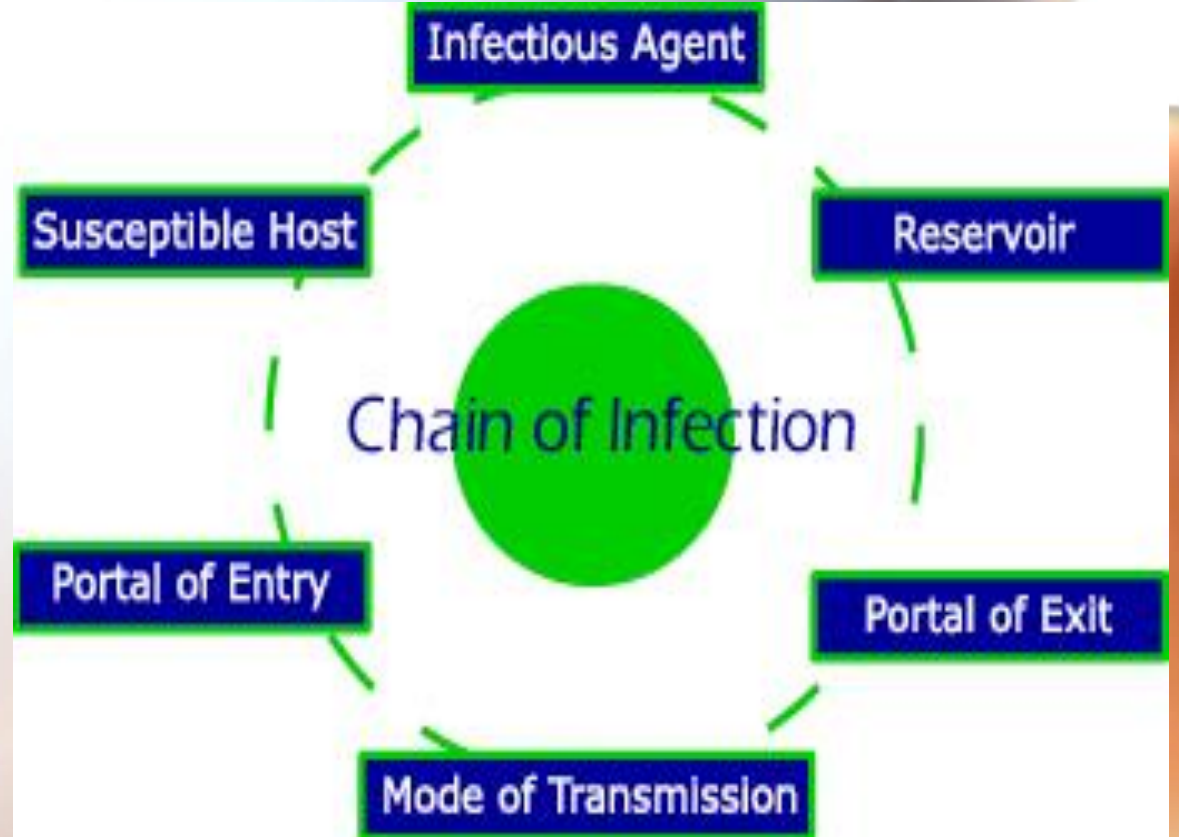


# Medications

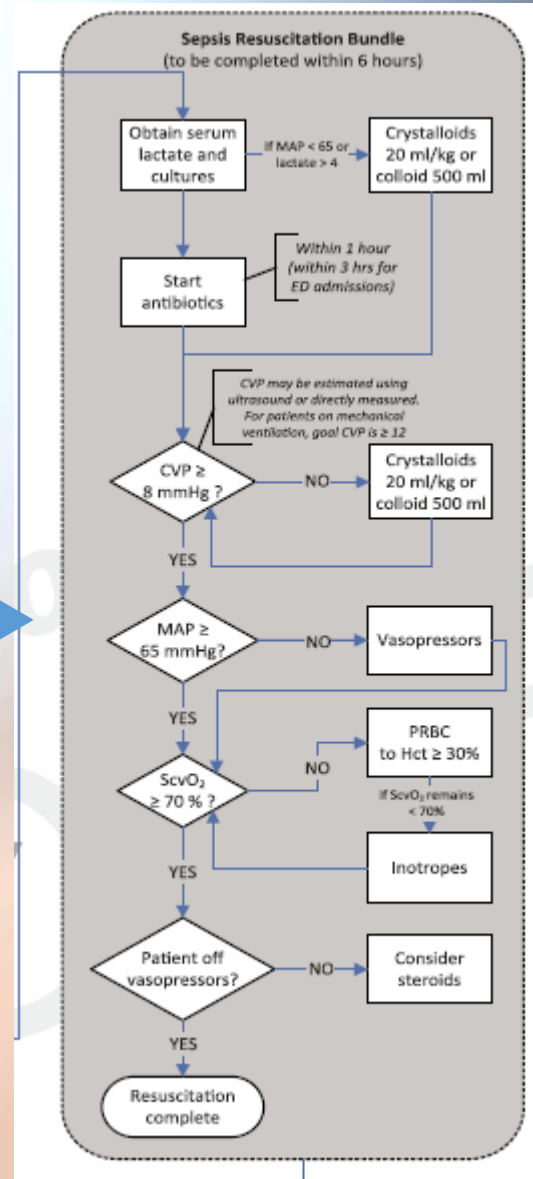
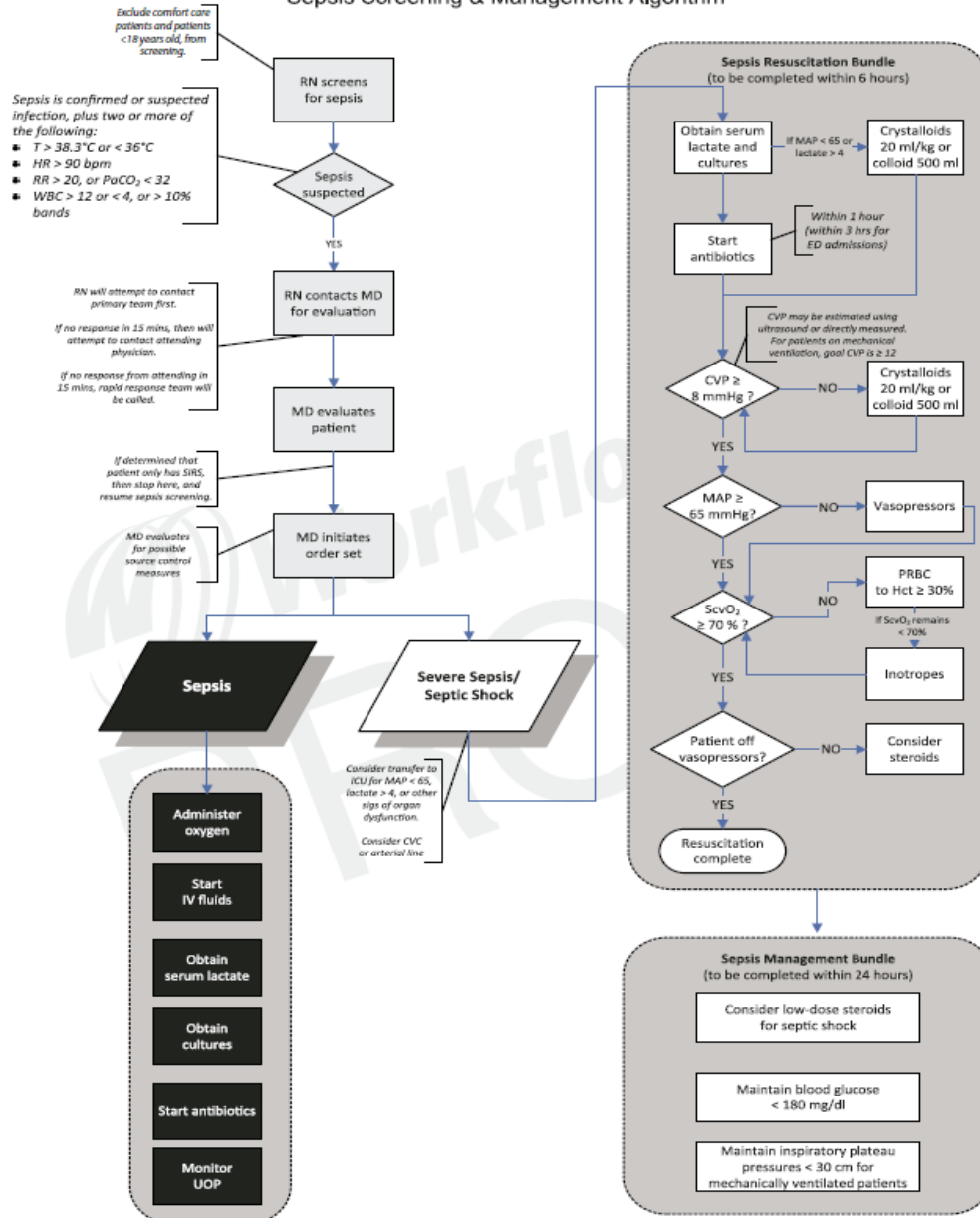
- **Antibiotics**—should be started within the first hour
    - Vancomycin PLUS Zosyn
  - **Vasopressors**—norepinephrine is the drug of choice to restore hemodynamic stability
  - **Corticosteroids**—indicated in adult patients with hypotension not responding to fluids or vasopressors
- \*\*\*\* Drotrecogin alfa (Xigris)**— no longer approved for treatment of severe sepsis (Lily, 2011)

# Source Control: Break the Chain of Infection

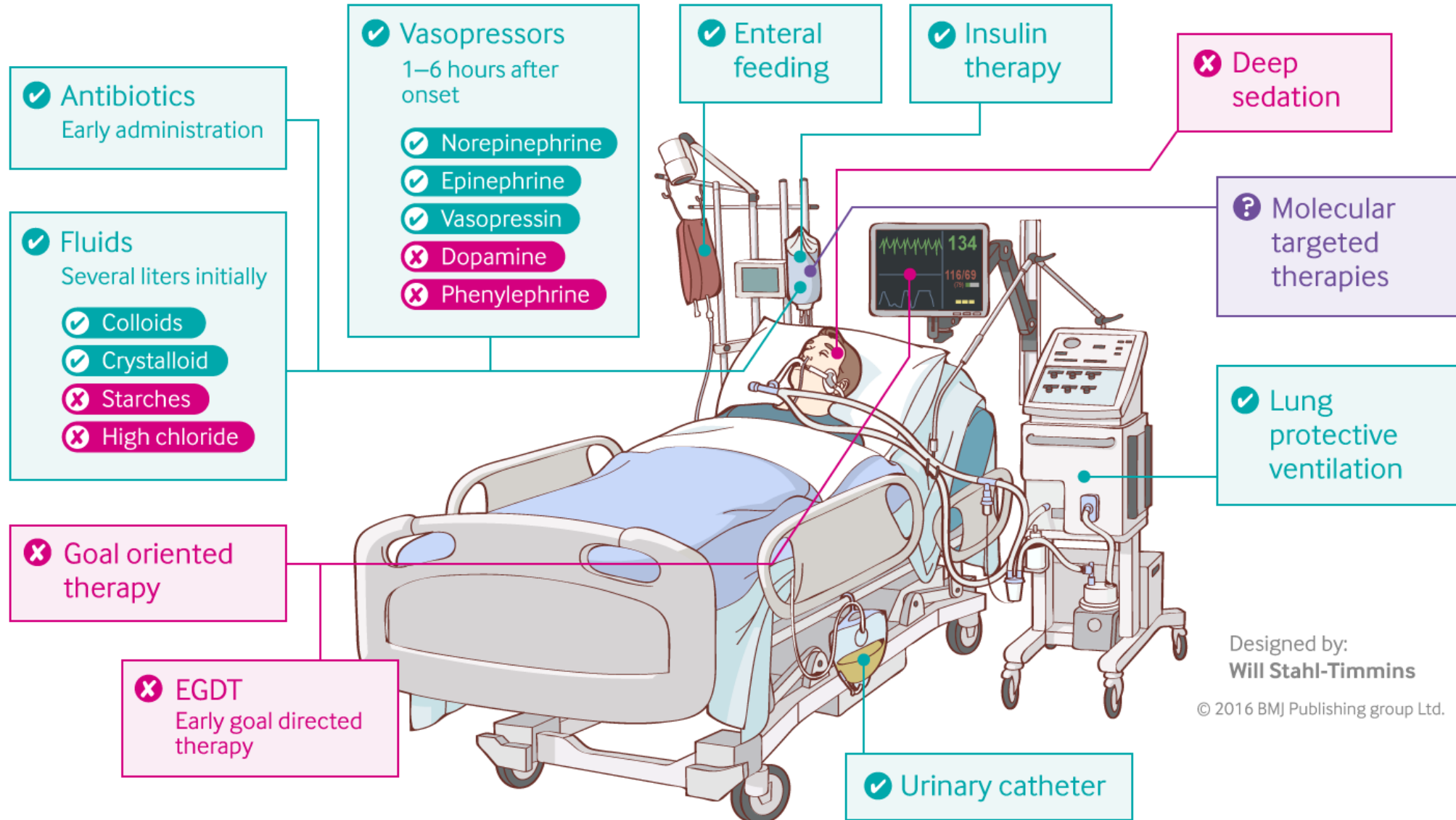
- Drainage of abscess
- Removal of infected catheters
- Debridement infected wounds
- Amputation of limbs with osteomyelitis



Sepsis Screening & Management Algorithm



# Treating sepsis: the latest evidence



# Nursing Interventions

- Infection control measures: hand hygiene, to control the spread of infection
- Assessment and monitoring: vital signs, neurologic checks, signs of DIC, bleeding from invasive devices; to identify signs and symptoms of sepsis; to initiate prompt intervention
- Documentation of vital signs, subtly changes in the client's condition
- Report suspicions and assessment to provided promptly.
- Advocacy: Advocate for the admission of the client. Don' wait until its too late!
- Communication with patient's family

# Summary

- Sepsis is a serious disorder that effects widespread patients in the population
- There is a high mortality and morbidity associated with the disorder
- S/S of Sepsis may be obvious or subtle early
- Prompt intervention is necessary to increase survival rates.
- Nurses should have a high index of suspicion for vulnerable populations
- Identify sources of infection
- Take appropriate cultures
- Report findings, advocate for prompt provider intervention
- Monitor carefully for potential complications

# Case Study : Jose Guerrero

Jose Guerrero is a 36 year old developmentally disabled male who is recovering from a recent case of the flu. He lives at home with his sister Loretta.

Jose is obese due to a sedentary lifestyle and poor dietary preferences. Jose had a wound on his forearm after he had a slight fall in his home. The area on his arm around the wound has progressively gotten red, tender, hot to the touch, and has some drainage.

Today it caused aching pain and he was feeling weak and had a temperature.

His medical history includes diabetes, hypertension and a mild case of asthma for which he occasionally uses an inhaler.





# Case Study: Jose Guerrero

- Heart Rate (HR) 98
- Respiratory Rate (RR) 26
- Temperature (T) 38.2° C (98.2 °)
- O2 Sat (room air) 95%
- Blood Pressure 138/88
- Level of Consciousness Alert & oriented to time, place and person, but seems forgetful
- Weight 201 lbs.

# Physical Examination

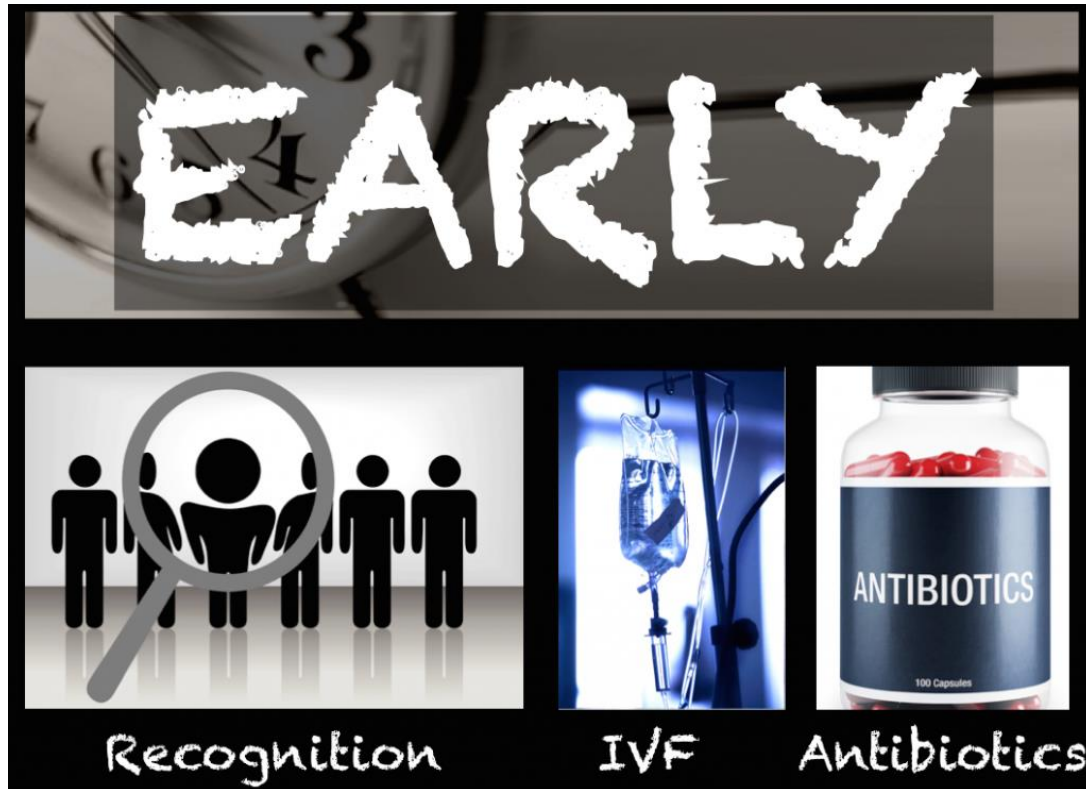


- **Neuro:** PERRLA, generalized weakness, cannot focus in conversation
- **Cardio/Respiratory:** BP is decreased from normal baseline, regular but weak pulses in all extremities, shallow/rapid breathing, lung sounds crackles bases bilaterally
- **GI/GU:** Abdomen firm/distended, pt moans with RUQ palpation, BS decreased, decreased urine output (20cc/hr; amber in color, cloudy with sediment)

# **Case Study: Jose Guerrero**

- 1. What are the key factors in his history and physical that can signal the presence of sepsis?**
- 2. What are our priorities in care?**
- 3. What are your next steps as the nurse caring for Jose?**

# Effective Care of the Septic Patient Includes...



## Step 1

- Investigate early and aggressively

## Step 2

- Refer early and aggressively

## Step 3

- Treat early and aggressively

# Sepsis Post-Test

What age group is the most susceptible to sepsis?

- A**    **Infants.**
- B**    **Adolescents.**
- C**    **Elderly.**
- D**    **Young adults.**

# Sepsis Post-Test

Physiologic responses to all types of shock include the following EXCEPT:

- A Activation of the inflammatory system.
- B Activation of the coagulation system.
- C Hypoperfusion of tissues.
- D **Vasoconstriction.**

# Sepsis Post-Test

Patients receiving fluid replacement therapy should be frequently monitored for:

- A Adequate urinary output.
- B Changes in mental status.
- C Vital sign stability.
- D All of the above.**

# Sepsis Pre-Test

Medical management of septic shock includes all of the following EXCEPT:

- A Administration of colloids.
- B Administration of Drotrecogin alfa.**
- C Aggressive fluid resuscitation.
- D Aggressive nutritional supplementation.



# Sepsis Post-Test

The ultimate goal in treating septic shock is:

- A Preserving the myocardium.
- B Restoring adequate fluid status.
- C Identification and elimination of the cause of infection.**
- D Identification and elimination of the cause of allergy.



**Questions ??**