# critical care nursing
# lecture 3
# Sepsis

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## Learning Objectives:

- Define sepsis and recognize signs / symptoms of sepsis.
- Identify causes  and risk factors for sepsis.
- Compare sepsis screening tools.
- Discuss and review sepsis bundles and Evidence-Based sepsis care.
- Relate best practices to sepsis care.
- Describe best Nursing care plane for patients.

Definition:

Sepsis: is an infection, usually bacterial in nature, enters the bloodstream causing a systemic infection with an extreme immune response. Sepsis is life-threatening and requires early intervention to prevent septic shock which can lead to organ failure and death.

Sepsis often develops very quickly and has a high mortality rate if not recognized and aggressively treated. Infants and adults over age 65 are at the highest risk for developing sepsis along with those who have weakened immune systems or chronic conditions.

## Clinical Manifestation:

The following are general sepsis symptoms:

- Increased or decreased temperature
- Chills
- Changes in mentation
- Rapid breathing
- Flushed or cool skin
- Hypotension

## Causes of  Sepsis:

Any infection from viruses, bacteria, and fungi can lead to sepsis.

Sepsis is commonly due to infection of the following:

- Lung (pneumonia)
- Kidney, bladder, and urinary system
- Gastrointestinal system
- Blood
- Invasive devices
- Burns or wounds

## Risk Factors:

The following factors increase the risk of sepsis:

- Age over 65
- Infancy
- Compromised immune system
- Comorbidities (such as diabetes or kidney disease)
- Longer hospital stays
- Invasive lines like central venous catheters or urinary catheters
- Prolonged and unsupervised antibiotic therapy within the last 90 days
- Use of corticosteroids and other immunosuppressants

- Existing infection
- Undiagnosed infection
- Untreated infection
- Compromised immune system (such as cancer or HIV)
- Chronic diseases (such as diabetes or COPD)
- Recent surgical procedures
- Implanted devices like pacemakers or ports
- Organ transplant complications

- Discontinuation of antibiotics without provider instruction
- Unnecessary antibiotic use
- Frequent antibiotic use
- No access to medications
- Poor quality medications
- Incorrect drug prescribing

## Physical Assessment

### 1. Assess the vital signs.

Patients with sepsis initially display the following changes in their vital signs:

- Hyperthermia (>100.4 F) or hypothermia (<96.5 F)
- Tachycardia
- Tachypnea

## 2. Perform a systemic assessment.

Sepsis can worsen to severe sepsis and septic shock with organ dysfunction without intervention. Monitor closely for the following changes:

- **CNS:** altered mental status
- **Respiratory:** hypoxia, cough, chest pain, dyspnea
- **Cardiovascular:** decreased capillary refill
- **Gastrointestinal:** ileus, perforation, abscess, abdominal tenderness
- **Genitourinary:** decreased (oliguria) or absent (anuria) urine production
- **Integumentary:** flushed skin, cyanosis, pallor, skin mottling

## 3. Assess for progression to shock.

As septic shock progresses, hypotension and decreased organ perfusion occur, and patients may exhibit symptoms like:

- Cool extremities
- Delayed capillary refill (>3 seconds)
- Thready pulses
- Pale skin
- Diaphoresis
- Confusion
- Decreased level of consciousness

**4. Observe intravenous lines.**

Observe any signs of infection and thrombophlebitis at the IV site, such as swelling, redness, or drainage. Central venous lines are frequently linked to sepsis or bacteremia.

**5. Note any signs of infection in wounds or incisions.**

The presence of an abscess, cellulitis, or wound infection often causes pain, purulent discharge, erythema, or swelling. Closely monitor and document changes in wounds and incisions.

# Diagnostic Procedures

## 1. Collect samples for the following laboratory studies.

The following laboratory tests can diagnose sepsis and identify the causative agent:

- **Complete blood count (CBC)** reveals high or low WBC, neutropenia, and thrombocytopenia.
- **Kidney function tests** can indicate poor kidney perfusion.
- **Blood and site-specific cultures** from wounds, sputum, blood, or urine can determine the cause of sepsis.
- **Urinalysis & culture** further investigate the cause of infection.
- **Biomarkers** (such as procalcitonin and presepsin) help diagnose sepsis early.
- **Lactate levels** >2 mmol/L correlate with poor organ perfusion. Levels over 4 mmol/L indicate septic shock.
- **C-reactive protein** is expected to be elevated.
- **INR and PTT** results that are elevated signal abnormalities in coagulation.

## 2. Prepare the patient for imaging scans.

Imaging scans can further investigate the cause of infection. These may include the following:

- Chest x-ray
- Chest CT scan
- Abdominal ultrasonography
- Abdominal CT scan or MRI
- Site-specific soft tissue imaging, including ultrasound, CT scan, or MRI
- Contrast-enhanced CT scan or MRI of the brain/neck

## 3. Anticipate the possibility of invasive diagnostic procedures.

The following invasive procedures may be considered when sepsis is suspected:

- Thoracentesis
- Paracentesis
- Fluid accumulations and abscess drainage
- Bronchoscopy with lavage, washing, or other invasive samples

## Nursing Interventions

Nursing interventions and care are essential for the patients recovery. In the following section, you will learn more about possible nursing interventions for a patient with sepsis.

### 1. Prepare the patient for hospital admission.

Patients with sepsis require close observation and care in a hospital intensive care unit. Sepsis can quickly worsen and requires aggressive medical treatment.

## 2. Initiate antibiotic therapy as ordered.

Initiate treatment with antibiotics as soon as possible. Broad-spectrum antibiotics are used first. When blood test results show which pathogen is causing the infection, the antibiotic may be switched to a narrow-spectrum antibiotic to target the causative agent.

## 3. Start fluid volume resuscitation.

In the acute phase of sepsis, volume resuscitation is advised to be at least 30 ml/kg of crystalloid fluids given within the first three hours. The goal is to maintain appropriate perfusion pressure.

**4. Administer vasopressors as prescribed.**

Vasopressors raise blood pressure by constricting arteries. A vasopressor drug may be prescribed if blood pressure is too low despite receiving fluids.

**5. Position as advised.**

Semi- or high-Fowler's positioning is advised to reduce the risk of pneumonia. Prone positioning is recommended in sepsis-induced ARDS.

**6. Begin invasive monitoring.**

Invasive arterial monitoring allows the nurse to monitor hemodynamics and blood pressure accurately.

**7. Apply oxygen or prepare for mechanical ventilation.**

Patients who are hypoxic require supplemental oxygen, while patients who display respiratory failure will require intubation and ventilation.

**8. Administer insulin.**

Sepsis causes a rise in glucose levels despite the absence of diabetes.

Administer insulin for glucose levels above 180 mg/dL.

**9. Prepare the patient for possible surgery.**

Infected or necrotic tissue are possible sources of infection that must be removed through surgery.

**10. Remove intravascular devices.**

Prompt removal of intravascular access devices that may be the source of sepsis is advised.

**11. Implement hygiene practices.**

The best way to prevent infection is through standard hand hygiene. The patient with sepsis requires strict hygiene practices to prevent the growth of bacteria. Administer bed baths and perform aseptic cleaning of catheters and IV hubs per facility guidelines. All equipment must be disinfected regularly.

## 12. Implement the appropriate precautions.

To reduce the chance of cross-transmission between an infected patient and a non-infected patient, caregiver, or visitor, septic isolation/transmission-based precautions are implemented. Protective isolation involves keeping a patient with a compromised immune system from coming into contact with potentially infectious microorganisms. Visitors are not allowed.

## 13. Use appropriate PPE.

PPE protects the healthcare workers and the patient. Don gowns and gloves before entering the room. Don face masks and safety goggles to protect against droplets and airborne microorganisms.

## 14. Initiate enteral feedings.

Enteral or parenteral nutrition should be implemented early to correct micronutrient deficiencies and deliver protein to patients who are not expected to consume an oral diet within three days.

## Nursing Care Plans

Once the nurse identifies nursing diagnosesfor sepsis, nursing care plans help prioritize assessments and interventions for both short and long-term goals of care. In the following section, you will find nursing care plan examples for sepsis.

Decreased Cardiac Output

Severe sepsis and hypoperfusion affect circulation.

# Nursing Care Plans

Once the nurse identifies nursing diagnosesfor sepsis, nursing care plans help prioritize assessments and interventions for both short and long-term goals of care. In the following section, you will find nursing care plan examples for sepsis.

## 1. Nursing Diagnosis: Decreased Cardiac Output

**Related to:**

- Altered hemodynamic parameters
- Impaired cardiac contractility
- Impaired myocardial circulation
- Loss of vascular tone
- Hypovolemia

## As evidenced by:

- Tachycardia
- Central venous pressure < 8 mmHg
- Mean arterial pressure < 65 mmHg
- Cyanosis
- Pallor
- Prolonged capillary refill time
- Blood pressure <90/60 mmHg
- Oliguria
- Alteration in the level of consciousness
- Cold, clammy skin
- Decreased peripheral pulses
- Cardiac dysrhythmias
- Presence of murmurs

## Expected outcomes:

- Patient will manifest adequate cardiac output as evidenced by the following:
  - Vital signs within normal limits:
    - Blood pressure: 90/60 mmHg to 120/80 mmHg
    - Pulse rate: 60 to 100 beats per minute
    - Central venous pressure 8-12 mmHg
    - Mean arterial pressure 65-90 mmHg
  - Urine output: 0.5 to 1.5 cc/kg/hour
  - Unremarkable cardiac findings:
    - Adynamic precordium
    - Absence of cardiac dysrhythmias
    - Absence of murmurs

## Assessment:

**1. Assess for signs and symptoms of cardiac and circulatory compromise.**

*Hypotension, tachycardia, tachypnea, and thready peripheral pulses are signs of severe sepsis with decreased cardiac output.*

**2. Monitor hemodynamic parameters (i.e., Central Venous Pressure (CVP), Pulmonary Artery Diastolic Pressure (PADP), and Pulmonary Capillary Wedge Pressure (PCWP).**

- *CVP provides information on the filling pressures of the right side of the heart.*
- *PADP and PCWP provide information on left-sided fluid volumes.*

## 3. Monitor laboratory data.

Sepsis-induced cardiomyopathy may reveal the following laboratory findings:

- Elevated cardiac markers:
  - An increase in plasma troponins I or T in patients with sepsis may be associated with left ventricular systolic dysfunction and myocardial injury.
  - Elevated BNP and NT-proBNP in septic patients may also be positively correlated with the severity of the disease.
- Decreased ejection fraction:
  - Left ventricular ejection fraction is one of the initial indicators used to describe septic cardiomyopathy.

## Interventions:

### 1. Administer fluid resuscitation as prescribed.

Adequate volume therapy remains essential in treating sepsis-induced tissue hypoperfusion and counteracting absolute and relative hypovolemia caused by vasodilatation, external fluid loss, and capillary leakage. Based on Frank-Starling law, increasing preload will increase stroke volume and cardiac output. But this must be done cautiously because cardiomyopathy will shift the Frank-Starling curve, and excessive fluid management can lead to complications.

**2. Administer medications as prescribed.**

- Antibiotics: Broad-spectrum antibiotics are the first choice and should be administered immediately after obtaining blood cultures.
- Vasopressors cause vasoconstriction to counteract the systemic arterial vasodilation caused by the pathogen to increase blood pressure and perfusion.

**3. Anticipate the need for adjunctive therapies as indicated.**

Mechanical support is widely used in septic cardiomyopathy. Intra-aortic balloon pump (IABP), percutaneous ventricular assist devices, or extracorporeal membrane oxygenation (ECMO) may be indicated to support cardiac output when primary therapies fail.

**4. Meet oxygen demands.**
Ensure adequate oxygenation to support cardiac function and perfusion via high-flow mask or ventilation as necessary.

## Hyperthermia

**An elevated body temperature is a normal and protective process in response to inflammation and infection. When body temperature is extremely elevated and prolonged it can cause serious damage and increase the risk of mortality.**

## Nursing Diagnosis: Hyperthermia

Related to:

- Dehydration
- Increased metabolic rate
- Inflammatory process

## As evidenced by:

- Tachycardia
- Central venous pressure < 8 mmHg
- Mean arterial pressure < 65 mmHg
- Cyanosis
- Pallor
- Prolonged capillary refill time
- Blood pressure <90/60 mmHg
- Oliguria
- Alteration in the level of consciousness
- Cold, clammy skin
- Decreased peripheral pulses
- Cardiac dysrhythmias
- Presence of murmurs

## Expected outcomes:

- Patient will maintain body temperature within normal limits.
- Underlying causes (infection) will be treated to prevent worsening hyperthermia.

## Assessment:

### 1. Assess temperature rectally.

Rectal thermometers are most accurate for monitoring core temperature.

### 2. Assess neurological status.

Hyperthermia that is not controlled can cause brain damage. An altered LOC, confusion, and seizures are symptoms of deterioration.

## Interventions:

### 1. Provide a cool environment.

Keep the room temperature cooler, remove extra linens, and remove heavy or restrictive clothing.

### 2. Apply a cooling blanket.

A cooling blanket will reduce surface temperature. These should be monitored closely so as not to induce shivering, which will have an inverse effect.

**3. Administer antipyretics.**

Administer acetaminophen or other antipyretics to reduce fever.

**4. Provide cool rags or a tepid bath.**

Place cool rags around the groin or axillae which are areas of high blood flow, and provide tepid baths to increase heat loss by evaporation.

**Ineffective Protection**

The patient may have a decreased ability to protect themselves from an infectious etiology, increasing the risk of a systemic inflammatory response.

**Nursing Diagnosis: Ineffective Protection**

## Related to:

- Infectious process
- Immunosuppression
- Abnormal blood profiles
- Poor nutrition
- Medication regimen
- Older age

## As evidenced by:

- Change in level of consciousness
- Insomnia
- Immobility
- Poor ability to handle stress
- Open wound/pressure ulcer

## Expected outcomes:

- Patient will remain free from infection.
- Patient will verbalize food choices to meet nutrition needs.
- Patient will demonstrate measures to protect or increase immune system protection.

## Assessment:

**1. Monitor for signs of sepsis.**

*Changes in mental status, hypotension, fever, tachycardia, chills, and flushed skin are some signs of sepsis that must be reported promptly.*

**2. Monitor WBC and differential count.**

Leukocytosis is observed in patients with infection. However, in sepsis, patients may either have leukocytosis or leukopenia, depending on the severity of the condition. There are also cases when the WBC count is in the normal range, but an increase in immature band forms is present. Assessing the differential count components may also hint at the type of organism causing the infection (i.e., neutrophil: bacteria; lymphocyte: viral; eosinophil: parasite).

**3. Monitor risk factors against protection.**

Assess the patient's risk factors that correlate to ineffective protection and a greater risk of sepsis, such as immunosuppression caused by illnesses like cancer, autoimmune diseases, or HIV and their treatments, i.e., chemotherapy, immunosuppressants. Patients who are immobile, lack proper nutrition, or have wounds are at risk for infection and sepsis.

**Interventions:**

1. Encourage rest.
Sleep is vital to cellular repair and allows the release of growth hormone to heal the body. When sleep is disrupted or inadequate, growth hormone is suppressed.

2. Avoid invasive procedures as much as possible.
Catheterization, injections, and rectal or vaginal procedures must be avoided or kept at a minimum. These procedures increase the risk of introducing harmful pathogens. If the patient must have an invasive line, clean using aseptic techniques.

**3. Encourage high protein, nutrient-rich diets.**

Protein helps the body repair tissues and fight against infection. If the patient lacks an appetite, consider appetite stimulants or dietician consultation.

**4. Educate the patient and family about infection control measures.**

Hand hygiene is the simplest way to prevent infection transmission. Instruct the patient and family/caregivers on proper handwashing techniques.

## Risk for Deficient Fluid Volume

Sepsis worsening into septic shock causes a shift of fluids out of the intravascular space leading to hypotension requiring fluid resuscitation.

Nursing Diagnosis: Risk for Deficient Fluid Volume

**Related to:**

- Vasodilation
- Membrane permeability

**As evidenced by:**

A risk diagnosis is not evidenced by signs and symptoms as the problem has not yet occurred. Nursing interventions are aimed at prevention.

## Expected Outcome:

- Patient will maintain an adequate circulatory volume as evidenced by vital signs and urinary output within normal limits.

## Assessment:

**1. Monitor for signs of fluid loss.**

Septic shock will result in a rapid drop in blood pressure as the fluid shifts out of the intravascular space. The patient will display tachycardia, fever, and signs of dehydration such as poor skin turgor and dry mucous membranes.

**2. Assess intake and output and weight.**

Closely monitor intake (PO, IV) against urine output to check for imbalances.

**3. Monitor for edema.**

Fluid shifting into the interstitial space will cause edema in the tissues. The nurse can also monitor for general weight gain as this may also indicate third spacing.

**4. Review lab values.**

Changes in hemoglobin and hematocrit can point to a low fluid volume. Kidney failure will result in abnormal BUN and creatinine levels. Urine testing with a high specific gravity indicates dehydration and kidney damage.

# Interventions:

## 1. Administer IV fluids.

Crystalloids (normal saline, lactated Ringers) are the initial choice for fluid resuscitation as they are readily available and cost-effective. Colloids (albumin, fresh frozen plasma) may also be necessary to administer as they will remain in the intravascular space better than crystalloids due to their larger molecule size.

## 2. Administer vasopressors.

Vasopressors (dopamine, norepinephrine) should also be used with fluids or when septic shock is persistent despite fluid resuscitation. Vasopressors restore and maintain blood pressure.

**3. Monitor circulatory function.**

Monitoring the heart rate and rhythm is essential to ensure organ function. The mean arterial pressure (MAP) is an important indication of perfusion. Respiratory function should be monitored through pulse oximetry and kidney function should be monitored through output measurement and lab values.

## Risk for Infection

Sepsis is a systemic infection and requires close monitoring of vital signs with prompt intervention. Nurses must recognize patients at risk for developing sepsis and prevent a worsening of their condition.

Nursing Diagnosis: Risk for Infection

**Related to:**

- Immunosuppression
- Multiple chronic comorbidities
- Compromised skin or tissue integrity
- Malnutrition
- Untreated/worsening infections (UTIs, cellulitis, pneumonia)

**As evidenced by:**

A risk diagnosis is not evidenced by signs and symptoms as the problem has not yet occurred. Nursing interventions are aimed at prevention.

## Expected Outcomes:

- Patient will remain free of infection with vital signs and white blood count within normal limits.
- Patient will display improvement in wound healing with no signs of infection such as redness, drainage, or odor.
- Patient will identify interventions they can apply to prevent or reduce their risk of infection.

## Assessment:

### 1. Note signs and symptoms of sepsis.

Signs of sepsis are fever, tachycardia, tachypnea, chills, and an altered mental status. The nurse should monitor for abnormal vital signs and intervene to prevent sepsis.

**2. Monitor lab work.**

Lab tests indicative of sepsis include an elevated white blood count, C-reactive protein, and lactate levels.

**3. Obtain specimens for culture.**

To determine the source of the infection, the nurse may need to obtain blood for culture, urine specimens, and sputum samples.

## Interventions:

### 1. Administer antiinfectives.

Prophylactic IV antibiotics may be administered to prevent infection. Broad-spectrum antibiotics may be used to kill the most common types of pathogens until a specific type of organism is identified through culture and sensitivity testing.

### 2. Hand hygiene.

Proper hand hygiene is the best intervention to prevent infection. Nurses must be vigilant about handwashing and patients should also be instructed when to perform hand hygiene and use hand sanitizer.

**3. Discontinue unnecessary invasive lines.**

IV lines, urinary catheters, vascular access devices, NG tubes, PEG tubes, drains, and mechanical ventilation are all possible sources that can lead to bloodstream infections. Lines should be assessed regularly for necessity and discontinued when they are no longer needed.

**4. Promote skin integrity.**

Patients often have decreased mobility while in the hospital which places them at risk for skin breakdown. Incontinence, poor nutrition and hydration, and any open wounds increase the risk of infection. Promote skin integrity by turning the patient every 2 hours, assisting with ambulation, and inspecting the skin every shift to monitor for impending or worsening skin breakdown.

# Thank you for listening