Sepsis & Septic Shock: A Comprehensive Overview

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Sepsis is defined as LIFE-THREATENING ORGAN DYSFUNCTION caused by a dysregulated host response to infection.

This dysregulation means the body's immune system, instead of fighting the infection, turns on itself, leading to

Understanding Septic Shock: A Critical Subset

Septic shock is characterized by persisting hypotension requiring vasopressors to maintain a mean arterial pressure (MAP) of 65 mmHg or higher, and a serum lactate level greater than 2 mmol/L (18 mg/dL), despite adequate volume resuscitation.

septic shock represents a severe progression of sepsis, indicating profound circulatory and cellular/metabolic dysfunction, which is associated with a significantly higher risk of mortality.

Recognizing the Signs & Symptoms

The clinical presentation of sepsis often involves **nonspecific signs and symptoms**, which can make early diagnosis challenging. Key indicators include:

- **Systemic Manifestations:** Fever, chills, or rigors.
- **Neurological Changes:** Confusion, anxiety, disorientation.
- **Respiratory Distress:** Difficulty breathing, increased respiratory rate.
- **General Malaise:** Fatigue, weakness, profound malaise.
- **Gastrointestinal Issues:** Nausea and vomiting.

Early recognition is crucial for improving patient outcomes.

Diagnosis of Sepsis: Clinical Assessment

The **qSOFA (quick Sequential Organ Failure Assessment) score** is a rapid bedside tool used to identify patients at higher risk for poor outcomes due to sepsis.

Altered Mental Status

Glasgow Coma Scale (GCS) score less than 15.

Systolic Blood Pressure

Systolic blood pressure (SBP) less than or equal to 100 mmHg.

Respiratory Rate

Respiratory rate greater than or equal to 22 breaths per minute.

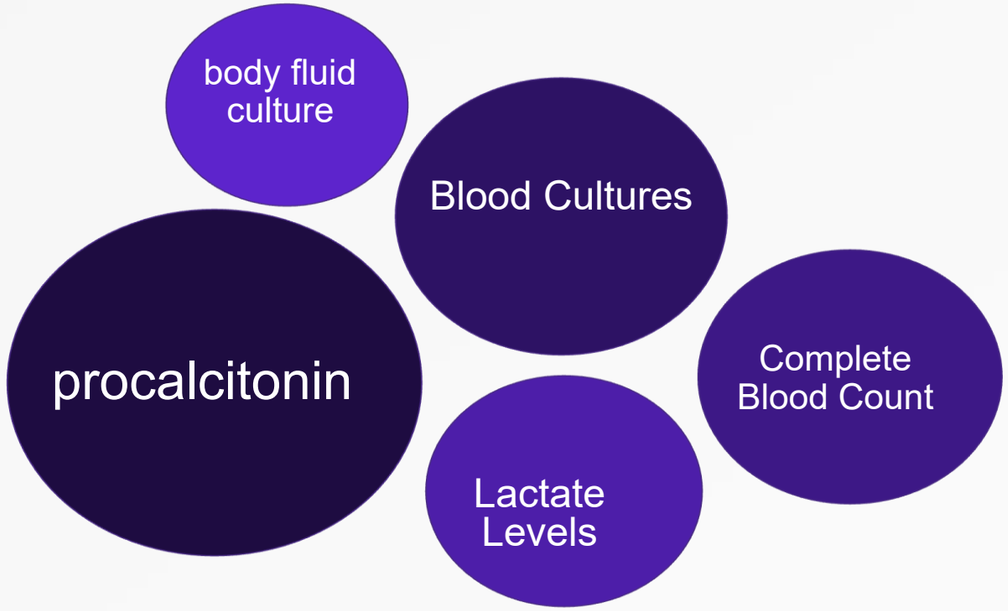
Patients with suspected infection and a qSOFA score of 2 or more should be promptly evaluated for sepsis.

Key Investigations for Sepsis

Laboratory Tests

Including blood cultures, complete blood count (looking for leukocytosis or leukopenia), and lactate levels

- Two or more sets (aerobic and anaerobic) of blood cultures are recommended before initiation of any new antimicrobial in all patients with suspected sepsis Other sites and bodily fluids may be Cultured as clinically appropriate.



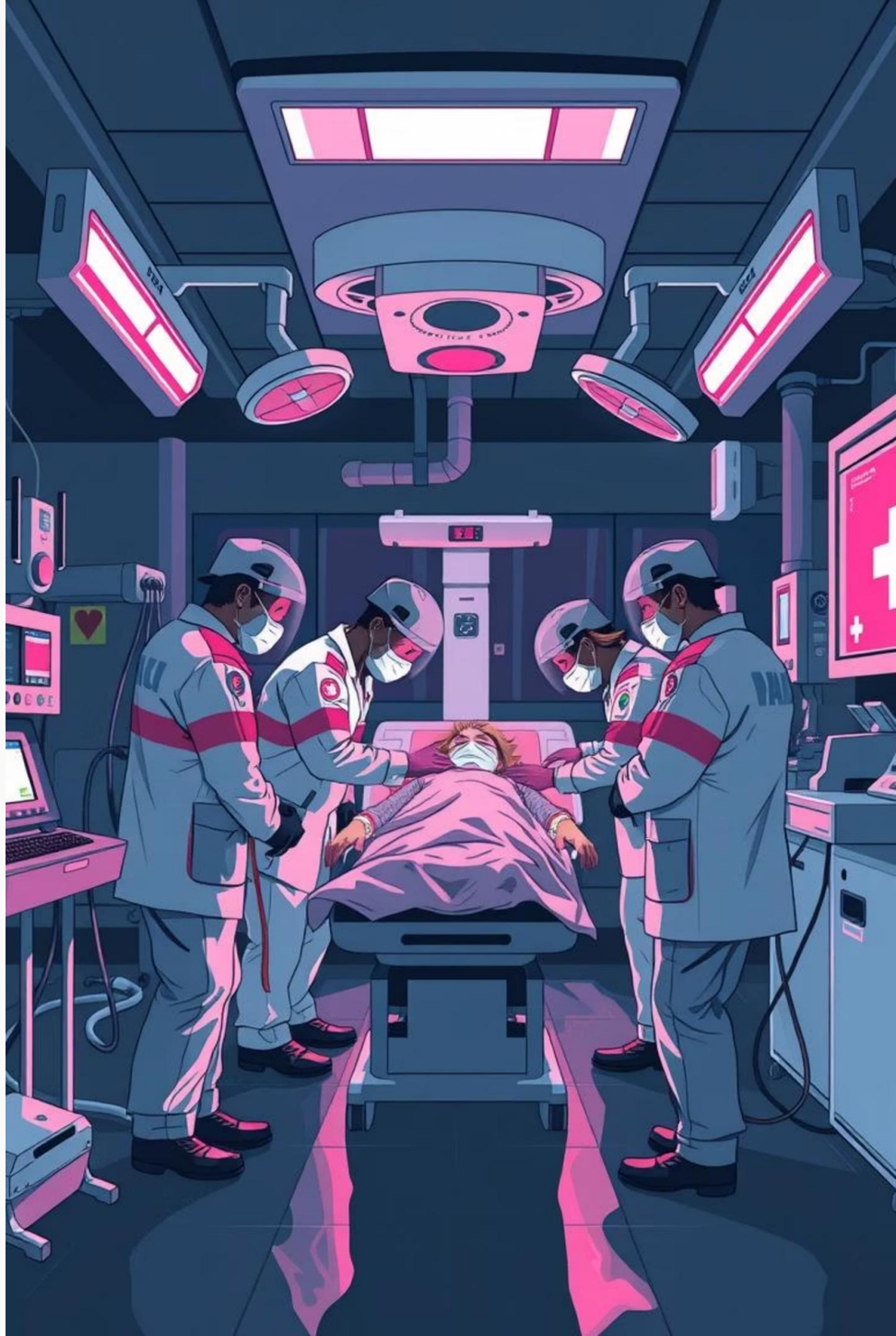
Prompt collection of cultures within 45 minutes is vital for guiding appropriate antimicrobial therapy.

Imaging Studies

- Chest radiography: To identify pulmonary sources of infection (e.g., pneumonia).
- Abdominal ultrasonography: For abdominal source control (e.g., abscess).
- Computed Tomography (CT): Detailed imaging of suspected infection sites (e.g., abdomen, extremiti

Sepsis Management: A Timely Response

Effective management of sepsis requires a rapid and coordinated approach to stabilize the patient, identify the source of infection, and initiate targeted therapies.



The Sepsis Six: Immediate Actions

The Sepsis Six are critical interventions to be delivered within the first hour of suspicion of sepsis, with a target completion within 6 hours. These actions significantly improve patient outcomes:

High-Flow Oxygen

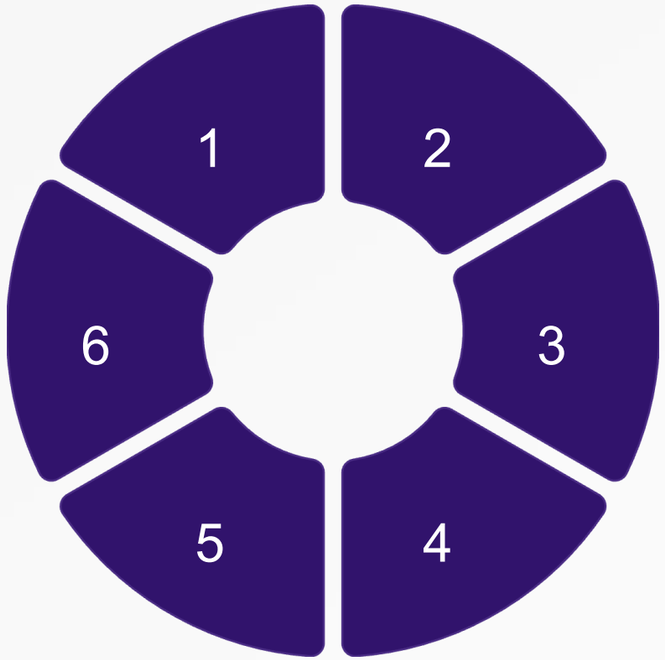
To optimize tissue oxygenation and combat hypoxia.

Accurate Urine Output

Commence continuous monitoring of urine output as a marker of renal perfusion.

IV Fluid Resuscitation

Initiate intravenous fluid bolus to restore circulating volume and improve perfusion.



Blood Cultures

Obtain two or more sets before initiating antibiotics to guide therapy.

Empiric IV Antibiotics

Administer broad-spectrum antibiotics within one hour of diagnosis.

Serum Lactate & FBC

Measure serum lactate and full blood count (FBC) to assess severity and guide resuscitation.

Core Goals of Sepsis Management

The primary objectives of sepsis management focus on reversing the critical physiological disruptions caused by the infection:

Core Goal

Effective sepsis management focus.

Oxygenation & Ventilation

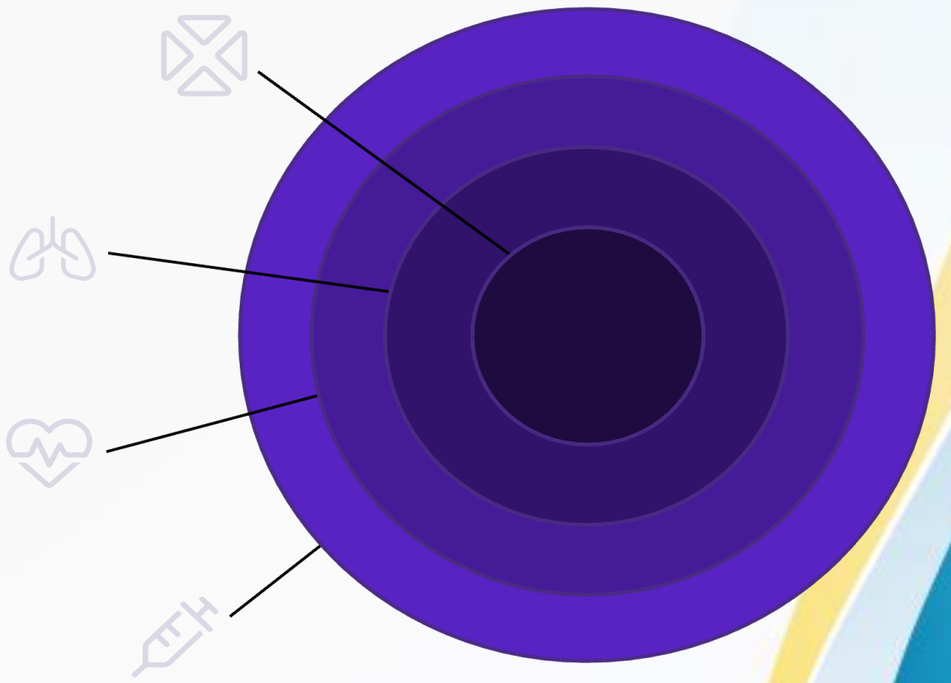
Maintaining adequate respiratory support.

Circulation

Ensuring proper blood flow and pressure.

Antibiotics & Source Control

Start antibiotics and control infection.



Achieving these goals swiftly is paramount to preventing irreversible organ damage and reducing mo

Airway (A) & Breathing (B) Management

Oxygenation

- **Maintain SpO2 > 90% in sepsis patients.**

Endotracheal Intubation (Indications)

- **Unsecured airway or inadequate respirations.**
- **Hypotension unresponsive to fluid resuscitation, to prevent respiratory muscle fatigue from hypoperfusion.**

Ventilation Goals

- **Target tidal volume of 6ml/Kg of ideal body weight.**
- **Limiting tidal volume has shown to decrease mortality (from 40% to 31%), reduce organ dysfunction, and lower cytokine levels.**

Effective respiratory support is vital for maintaining tissue oxygen delivery and mitigating lung injury in septic patients.

CIRCULATORY SUPPORT

Immediate Hemodynamic Stabilization

Fluid Resuscitation

Initiate 1 or more large-bore IVs or a central venous line. Administer 0.5L NS every 5-10 min, up to 4-6L total (30ml/kg). Crystalloids are preferred over colloids.

Hemodynamic Monitoring

Utilize early invasive monitoring with Central Venous Catheter (CVC) and Arterial Line placement per EGDT guidelines.

Target Parameters

Maintain CVP 8-12 mm Hg, MAP >65 mm Hg, Venous Oxygen Saturation >70%, and Urine Output ≥ 0.5ml/kg/hr.

CIRCULATORY SUPPORT

Inotropic Therapy

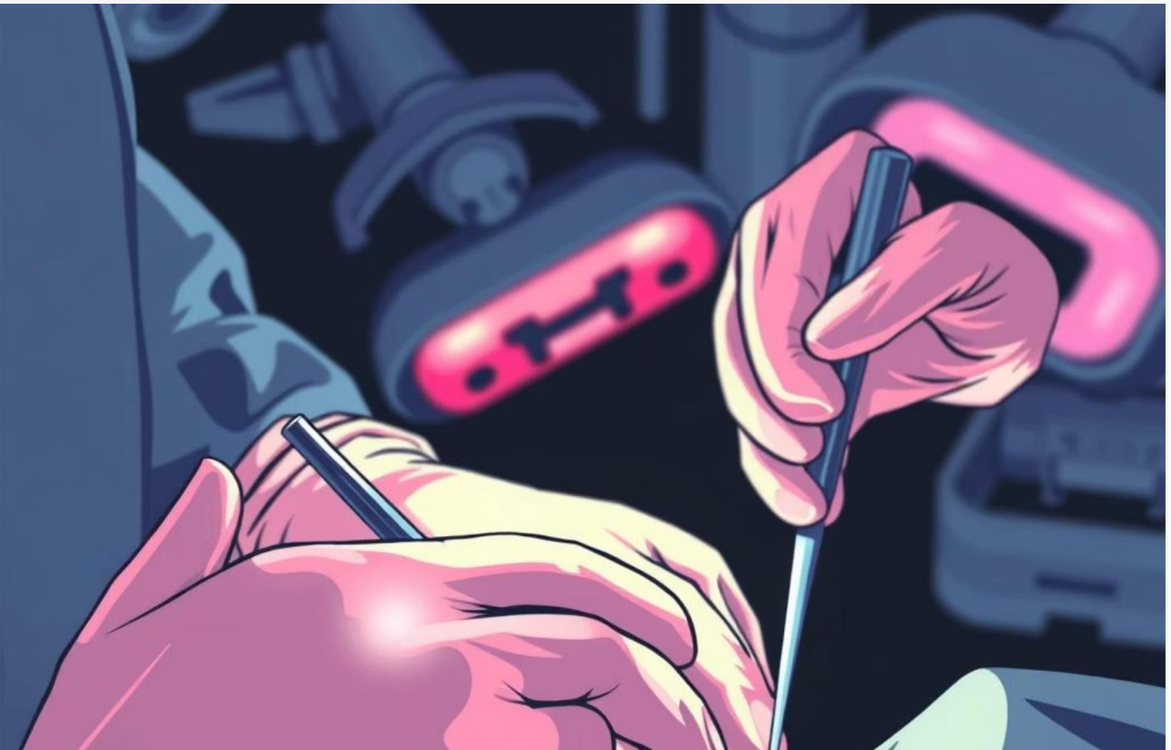
1	2	3
Indications	**First-Line**	**Refractory Shock**
Consider inotropes if no hemodynamic response after 3-4L of fluid, or with signs of fluid overload (e.g., pulmonary edema, raised CVP).	**Norepinephrine is the vasopressor of choice (2.5-20 mcg/min). Dopamine (5-20 mcg/kg/min) is an alternative.**	**If unresponsive, consider epinephrine infusion. Dobutamine can be used for low cardiac output with high filling pressure (often ICU setting).**

Note: Individual patient response and underlying cardiac function should guide inotrope selection and titration. Close monitoring is essential to prevent adverse effects like arrhythmias or myocardial ischemia.

Source Control & Early Antibiotics

Prompt identification and elimination of the infection source are vital for sepsis resolution and preventing relapse.

- **Remove indwelling catheters (IV, urinary).**
- **Drain abscesses (intra-abdominal, sinus, soft tissue).**



- **Administer empiric IV therapy targeting common Gram-positive (Streptococcus, Staphylococcus) and Gram-negative organisms.**

Timely antibiotic administration significantly improves survival

- **Aim for initiation within 30 minutes of hypotension.**

- **Utilize maximum recommended antibiotic dose**

Empiric Antibiotic Regimens

Key: Prompt initiation of broad-spectrum antibiotics,
followed by de-escalation once culture results and sensitivities are available.

Empirical Antibiotic Therapy – ICU Sepsis (2025 SSC & MEDSCAPE)

Initiation

Start IV broad-spectrum antibiotics within 1 hour of recognizing sepsis or septic shock, regardless of shock p

Empirical Coverage Strategy

Gram-negative (incl. Pseudomonas): Piperacillin-tazobactam OR Meropenem ± Amikacin

MRSA (if risk present): Add Vancomycin or Linezolid

Anaerobes (abdomen, aspiration): Add Metronidazole (unless using Meropenem)

Fungal (if high risk): Add Echinocandin (e.g. Caspofungin) or Fluconazole

📌 Source-Based Empiric Regimen

Lung (HAP/VAP)

Piperacillin-tazobactam or Meropenem + Vancomycin ± Amikacin

Urinary Tract

Cefepime or Piperacillin-tazobactam ± Vancomycin

Intra-abdominal

Meropenem or Piperacillin-tazobactam ± Metronidazole

Skin/Soft Tissue

Vancomycin + Piperacillin-tazobactam

CNS (Meningitis)

Ceftriaxone + Vancomycin ± Ampicillin (Meropenem if nosocomial)

🧪 Key Guidelines

Use **2 agents for septic shock** with MDR risk (e.g., Meropenem + Amikacin).

Prefer **extended/prolonged infusion of β-lactams**.

Adjust for renal/hepatic function.

De-escalate within 48–72 hrs based on culture/clinical response.

Use **Procalcitonin + clinical judgment** to shorten duration if needed.

Goal: Early, appropriate, targeted therapy with daily reassessment for de-escalation.🧭 **Follow local antibiogram** + patient-specific risk factors.

ADJUNCTIVE THERAPIES

Glycemic Control & Steroid Use

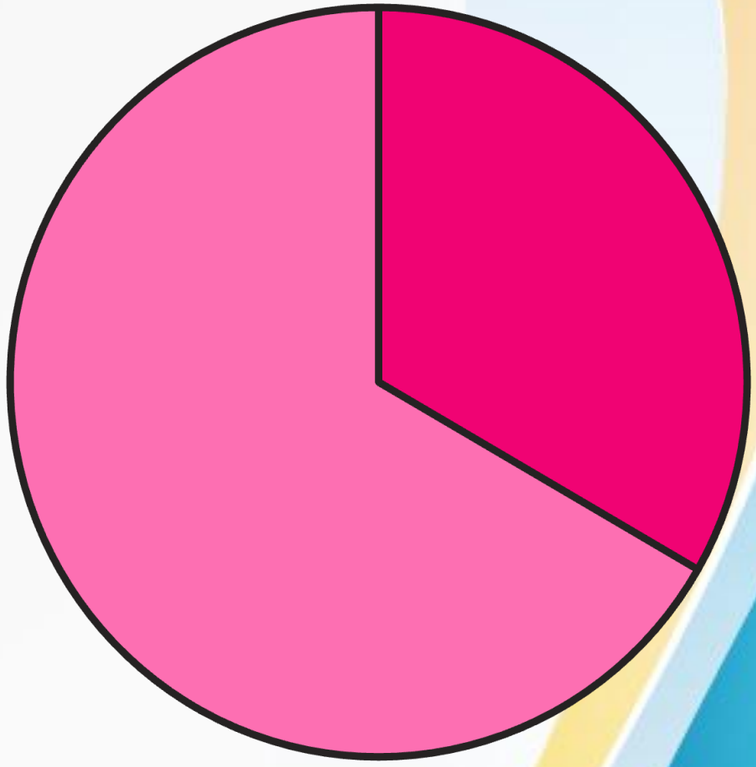
Glycemic Management

Hyperglycemia exacerbates sepsis by promoting inflammation, impairing immune function, and affecting fluid balance. It adversely affects granulocyte adherence, chemotaxis, phagocytosis, and intracellular killing. Aim for judicious glycemic control with blood glucose levels <150mg/dl.

Corticosteroid Role

Hydrocortisone (<=300mg/day) is indicated in adult septic shock patients who remain hypotensive despite adequate fluid resuscitation and vasopressor therapy. This helps to restore vascular tone and improve responsiveness to catecholamines.

ADJUNCTIVE THERAPIES



Anemia Management in Sepsis

Hb > 9 g/L Hb 7-9 g/L Hb < 7 g/L

Hb > 9 g/L: Generally, no packed Red Blood Cell (RBC) transfusion required unless specific clinical indications arise.

Hb 7-9 g/L: Transfuse if suspected ongoing hemorrhage or signs of tissue hypoperfusion attributable to anemia.

Hb < 7 g/L: Blood transfusion is typically required to maintain oxygen delivery to tissues and p further organ dysfunction.

1st HOUR SEPSIS BUNDLE

1. Measure serum lactate level. If the initial lactate is >2 mmol/L, remeasure within 2-4 hours
2. Obtain blood cultures. These should be drawn prior to administering antibiotics.
3. Administer broad-spectrum antibiotics. Antibiotics should be started within 1 hour of non-E within 3 hours of ED admission.
4. Begin rapid administration of 30ml/kg crystalloid. This is for patients with hypotension (syst mmHg or MAP <65 mmHg) or elevated lactate >4 mmol/L.
5. * Apply vasopressors. If hypotension persists despite fluid resuscitation, vasopressors sho maintain a MAP >65 mmHg.

6. The rationale behind the 1-hour bundle is to ensure prompt intervention, as delays in treatr significantly increase mortality risk. While some elements of the bundle may take longer th complete, the goal is to initiate all aspects of the treatment plan within the first hour
7. ***SSC aimed in general to : Target (a) MAP ≥ 65 mmHg; (b) urine output > 0.5 mL/kg/h; ScvO2 ≥ 70%, when available; (d) normalization of lactate levels or decreasing of 20% lactate levels.***
8. ******Each hour of delay in the first antibiotic dose in septic shock has been shown to risk of mortality by 7%.***

LONG-TERM IMPACT

Understanding Sepsis Complications

Once sepsis sets in, if left untreated, it can rapidly progress to septic shock and death. Globally, approximately one-third of individuals who develop sepsis succumb to the condition.

Survivors often face profound, life-altering sequelae, including:

Post-Traumatic Stress Disorder (PTSD)

Psychological impact requiring ongoing support.

Chronic Pain & Fatigue

Persistent physical discomfort and debilitating exhaustion.

Persistent Organ Dysfunction

Long-term impairment of kidney, lung, or other vital organ functions.

Amputations

In severe cases due to tissue necrosis and severe infection.

KEY PRINCIPLES

Sepsis Management: Core Message

Early Recognition

Prompt identification is the cornerstone of effective management, crucial for improving patient outcomes.

Immediate Resuscitation

Aggressive initial therapy with source control, IV fluids, and antibiotics is paramount.

Frequent Assessment

continuous monitoring of volume status and response to therapy is critical throughout resuscitation.

Multidisciplinary Care

Sepsis management is a complex clinical challenge requiring a coordinated team approach.

Sepsis, defined as life-threatening organ dysfunction caused by a dysregulated host response to infection, demands a highly coordinated and rapid clinical response.

FINAL THOUGHTS

The Urgency of Sepsis

1 Early Diagnosis

Obtain appropriate routine microbiologic cultures (including blood) before starting antimicrobial therapy.

2 Septic Shock Defined

A subset of sepsis characterized by tissue hypoperfusion, requiring vasopressors to maintain MAP >65 mmHg, and often presenting with elevated lactate levels.

3 Global Impact

Sepsis kills and disables millions worldwide, underscoring the critical need for early suspicion and aggressive treatment for survival.

QUESTION ANSWER SESSION

PATIENCE AND PARTICIPATIONS

- DR.MOSTAFIZUR RAHMAN KHAN