Fluid Therapy in Sepsis

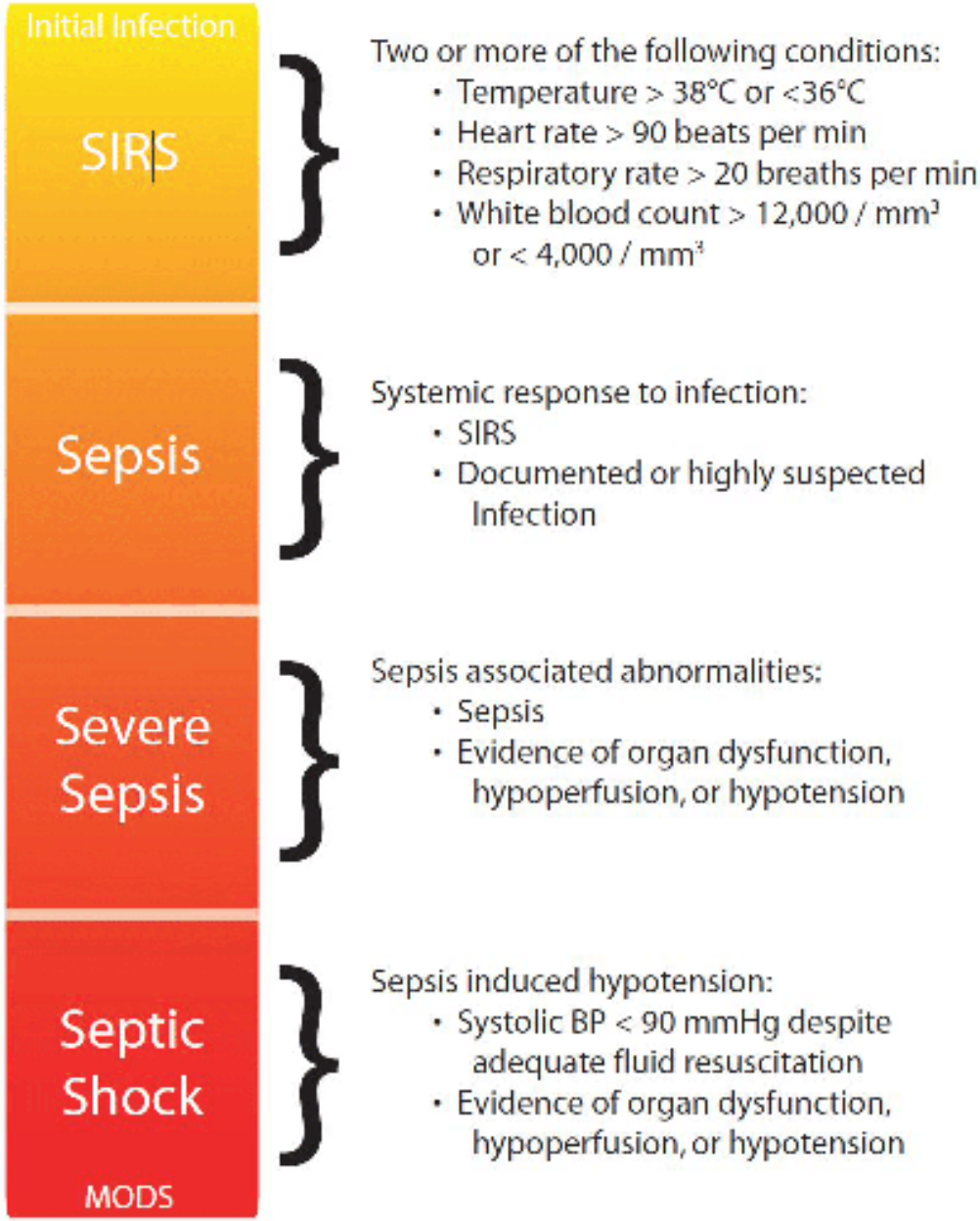
By Dr navid nooraei

What is Sepsis?

Sepsis is a life-threatening condition caused by an infection that spreads throughout the body. It can lead to organ dysfunction and failure if not treated promptly and effectively.

The Importance of Fluid Therapy

In sepsis, fluid therapy plays a crucial role in restoring haemodynamic stability by optimizing blood volume and improving tissue perfusion. It is an essential component of early management.


Initial Infection
SIRS
Two or more of the following conditions:
• Temperature > 38°C or <36°C
• Heart rate > 90 beats per min
• Respiratory rate > 20 breaths per min
• White blood count > 12,000 / mm³ or < 4,000 / mm³
Sepsis
Systemic response to infection:
• SIRS
• Documented or highly suspected Infection
Severe Sepsis
Sepsis associated abnormalities:
• Sepsis
• Evidence of organ dysfunction, hypoperfusion, or hypotension
Septic Shock
MODS
Sepsis induced hypotension:
• Systolic BP < 90 mmHg despite adequate fluid resuscitation
• Evidence of organ dysfunction, hypoperfusion, or hypotension

. The SSC suggests (but previously strongly recommended) treating septic subjects with at least 30 mL/kg of intravenous (IV) crystalloids within the first 3 h

Potential Complications and Challenges

1

Fluid Overload

Excessive fluid administration can lead to fluid overload, pulmonary edema, and worsen respiratory function.

2

Impaired Oxygen Delivery

Insufficient fluid replacement can compromise oxygen delivery to vital organs, leading to tissue hypoxia and worsening organ dysfunction.

FT can be expressed as the degree to which a patient can tolerate the administration of fluids without the onset of organ dysfunction [118]. FR is commonly defined as a stroke volume (SV) increase of at least 10% following a fluid bolus of 200–500 mL in 10–15 min

Optimal Fluid Resuscitation Strategies

1

Early Goal-Directed Therapy

Implementing a bundle of interventions, including early aggressive fluid administration, to achieve predefined haemodynamic targets.

2

Types and Amounts

Choosing the appropriate fluid type and carefully titrating the amount to prevent complications while maintaining tissue perfusion.

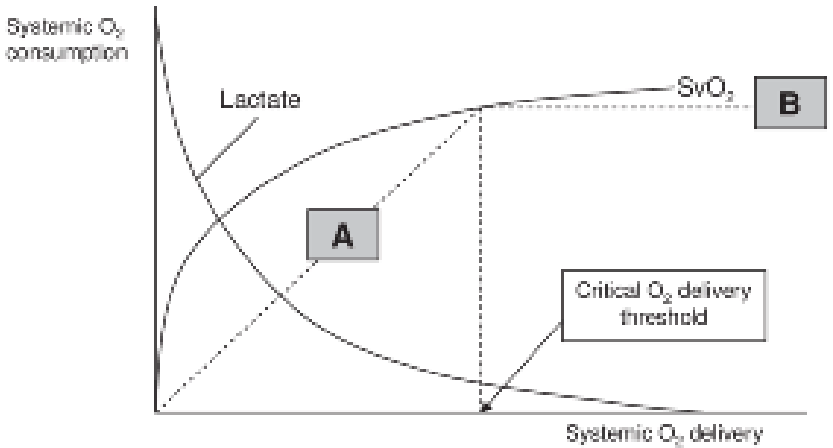
3

Individualized Approach

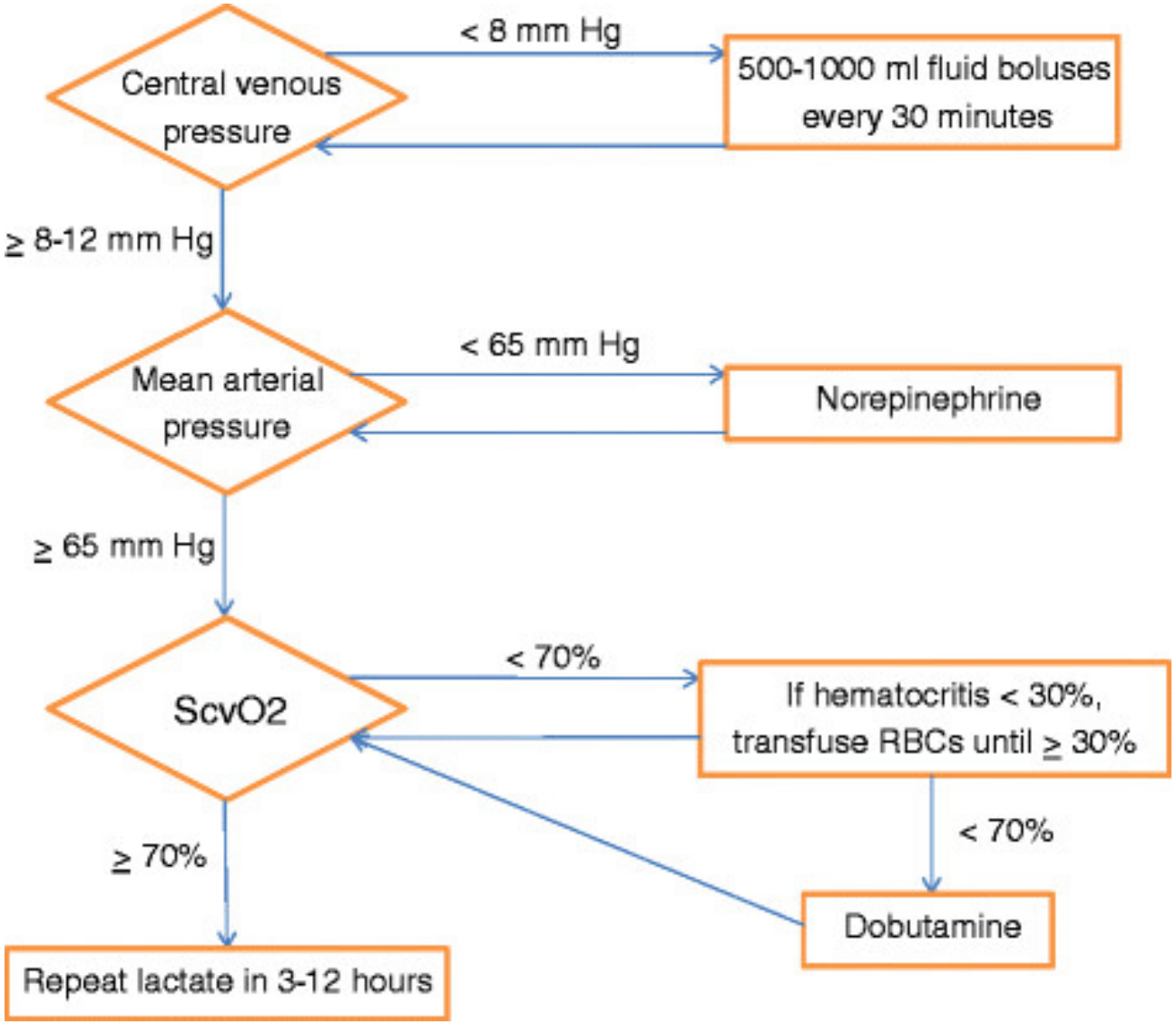
Tailoring fluid resuscitation plans to the specific needs and responses of each patient, considering comorbidities and cardiac function.

WHAT is sepsis early goal directed therapy?

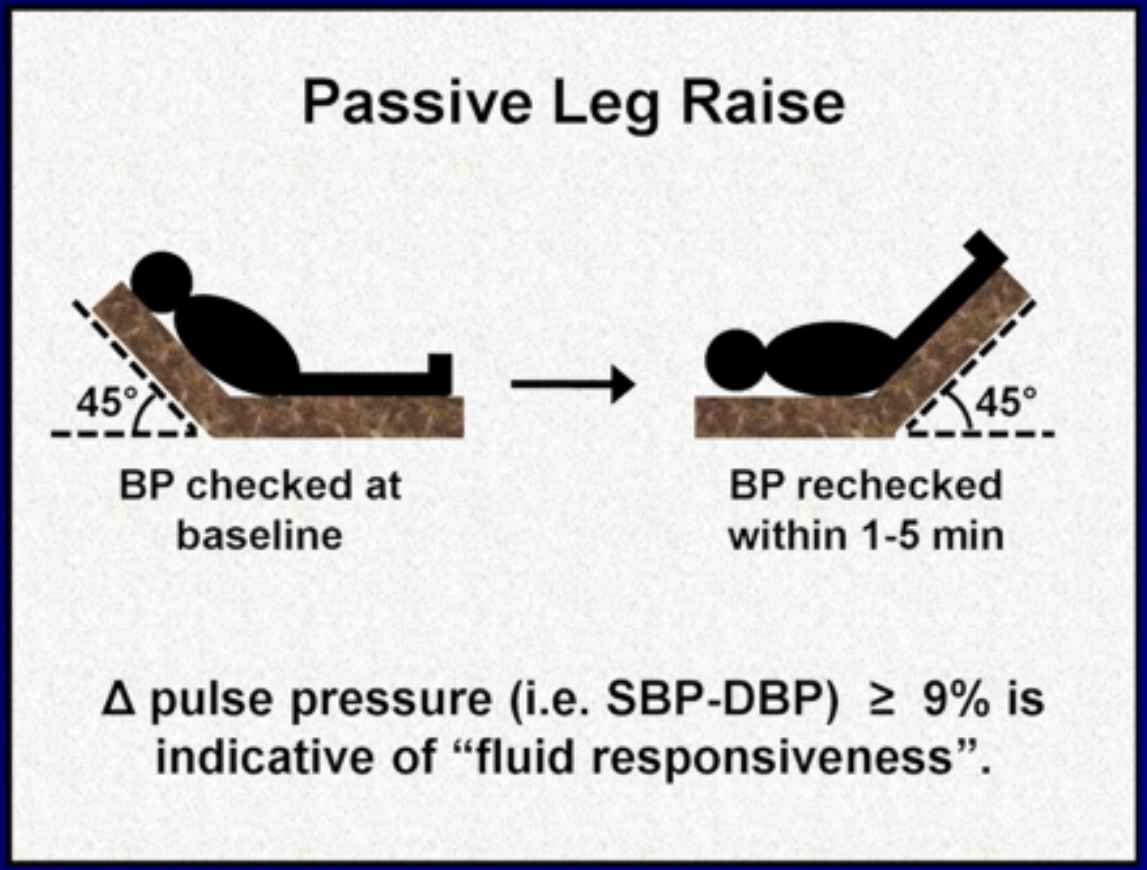
The EGDT protocol comprised infusion of colloids and crystalloid fluids to increase effective circulatory volume, vasopressor administration to raise MAP and, as needed, blood cell transfusion, inotropes, mechanical ventilation or curarization to ensure a correct balance between oxygen supply and consumption.



	MAP	CVP	SvO_2	Lactate	CI	SVR	Therapy
Hypovolemia	variable	↓	↓	↑	↓	↑	volume
Compensated and vasodilatory stage	normal or ↓	normal	↑	variable	↑	↓	vasopressors
Myocardial depression	variable	↑	↓	↑	normal or ↓	normal or ↑	inotropic therapy
Impaired tissue O_2 utilization	variable	normal	↑	↑	variable	variable	vasodilators, rAPC


Central venous pressure
< 8 mm Hg
500-1000 ml fluid boluses every 30 minutes
≥ 8-12 mm Hg
Mean arterial pressure
< 65 mm Hg
Norepinephrine
≥ 65 mm Hg
ScvO2
< 70%
If hematocritis < 30%, transfuse RBCs until ≥ 30%
< 70%
Dobutamine
≥ 70%
Repeat lactate in 3-12 hours

Passive Leg Raise as a Substitute for CVP



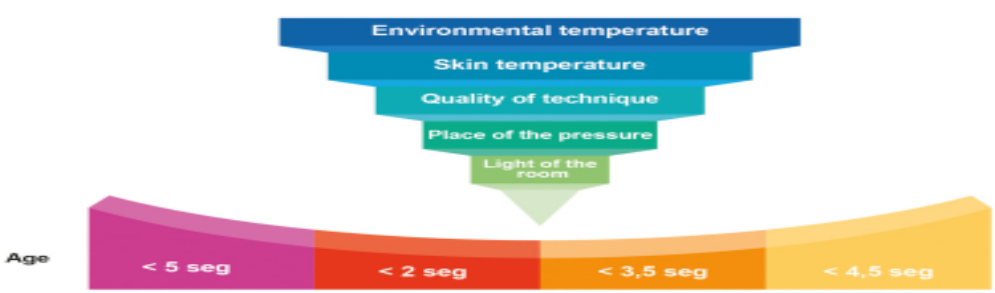
Passive leg raise as a predictor of fluid responsiveness:

Sensitivity = 79%

Specificity = 85%

Préau S, et al. Passive leg raising is predictive of fluid responsiveness in spontaneously breathing patients with severe sepsis or acute pancreatitis. Crit Care Med. 2010; 38 : 819-25.

Factors that affect the normal Capillary Refill Time (CRT)



Types of Fluids Used in Sepsis

Crystalloids

Comprising saline and balanced solutions, crystalloids are commonly used due to their ability to rapidly expand intravascular volume.

Colloids

Colloids, including albumin and synthetic solutions, provide oncotic pressure and may be beneficial in certain cases to maintain fluid balance.

Blood Products

In severe cases, blood transfusion may be necessary to restore oxygen-carrying capacity and correct coagulopathy.

Type of Fluids

The two main types of resuscitation fluids are isotonic crystalloids and colloids. The following paragraphs will describe the main features of these therapies.

Crystalloids

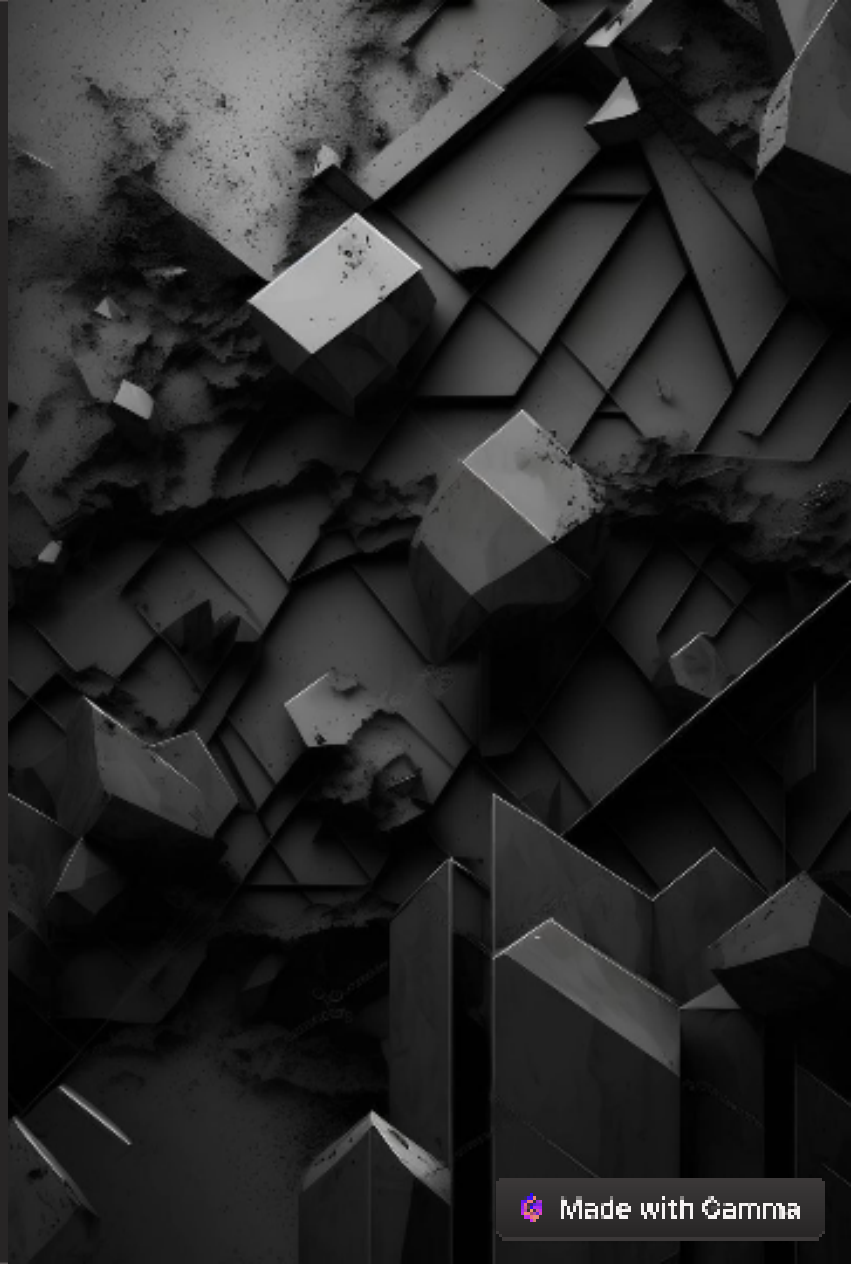
Crystalloids are divided into two main categories (i.e., chloride-rich solutions and balanced crystalloids); according to the previous guidelines, they should be considered the fluids of choice in patients with sepsis/septic shock [2,96]. The administration of balanced crystalloids for the fluid resuscitation of septic patients is preferable for two reasons: (i) they have an electrolytic composition closer to that of plasma, and (ii) chloride-rich solutions are associated with a high risk of hyperchloremic acidosis (especially in large volumes). To date, the volume of fluids to be infused in a septic patient in the early stages of treatment is largely debated and, therefore, remains incompletely defined [97]. Further discussion about the amount of fluid will be discussed in a separate section given below

Colloids are frequently used for fluid expansion in the intensive care unit, although its use on several clinical scenarios remains unproven of any relevant clinical benefit. The purpose of this article was to carry out a narrative review regarding the safety and efficacy of colloids in patients with sepsis and septic shock, with emphasis on the most commonly used colloids, albumin and starches. Colloids are effective fluid expanders and are able to restore the hemodynamic profile with less total volume than crystalloids. These properties appear to be preserved even in patients with sepsis with increased capillary permeability. However, some colloids are associated with renal impairment and coagulation abnormalities. Starch use was associated with increased mortality in two large clinical trials. Also, starches probably have significant renal adverse effects and may be related to more need for renal replacement therapy in severe sepsis. Albumin is the only colloid that has been shown safe in patients with sepsis and that may be associated with improved outcomes on specific subpopulations. No trial so far found any robust clinical end point favoring colloid use in patients with sepsis. Because there is no proven benefit of the use of most colloids in patients with sepsis, its use should not be encouraged outside clinical trials. Albumin is the only colloid solution that has proven to be safe, and its use may be considered on hypoalbuminemic patients with sepsis. BLOOD TRANSFUSION; in the absence of ongoing bleedund or active myocardial ischemia, it seems safer targeting HB BETWEEN 7 AND 9

Monitoring and Reassessment

Regular monitoring and reassessment of fluid therapy efficacy are crucial to maintain haemodynamic stability and identify any potential complications.

Blood pressure, urine output, and clinical signs should be closely monitored.



Conclusion

Sepsis is a life-threatening and time-dependent condition that is still accompanied by an overall poor prognosis. Several reasons may be advocated to explain why sepsis and septic shock challenge emergency physicians in daily practice, including (i) its insidious clinical onset; (ii) misdiagnosis leading to delayed treatment and subsequent worsening of clinical outcomes and quality of life; and finally (iii) multidisciplinary and challenging management with different therapeutic aspects that are still debated.

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Thank you!
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