

Septic Shock

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Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock 2021

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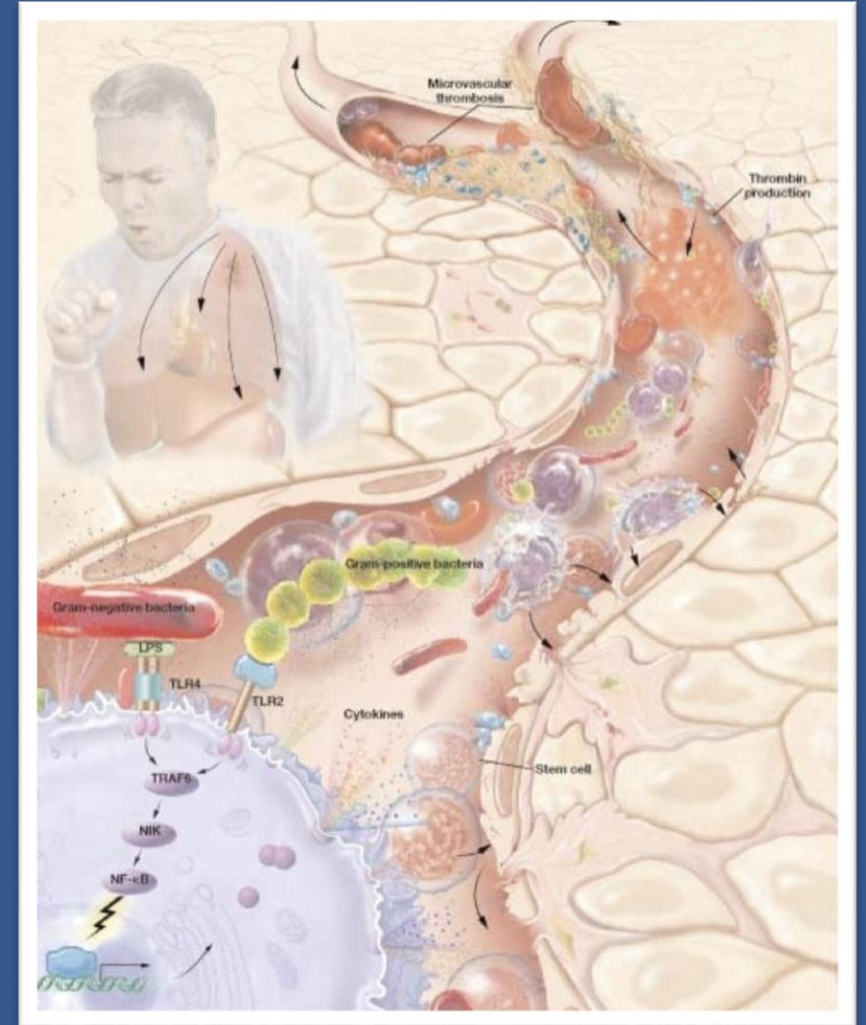
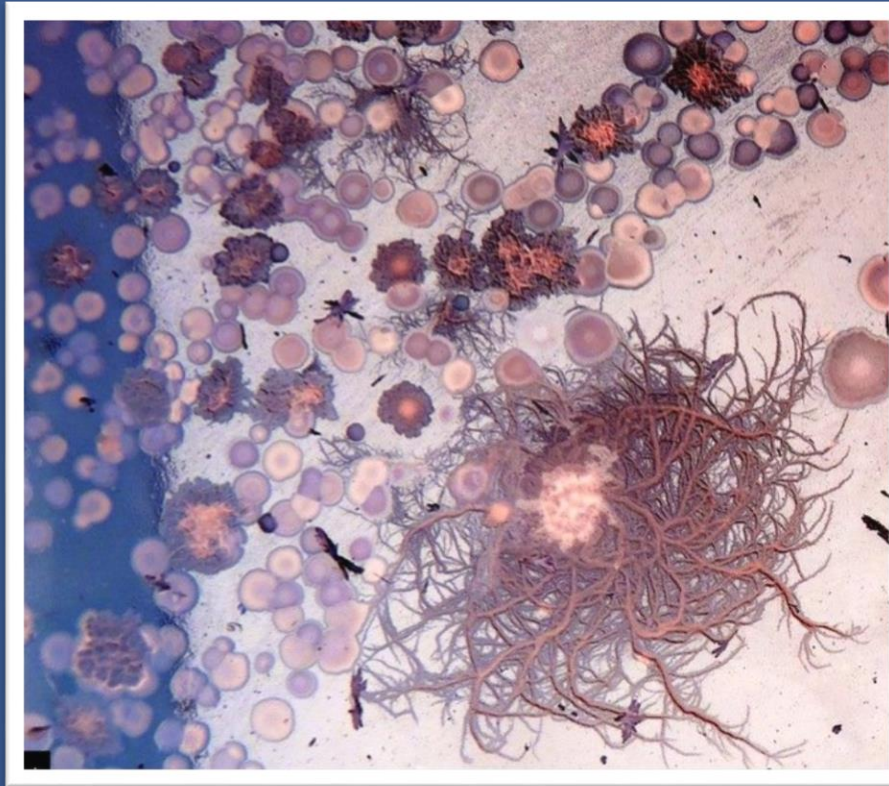
- ☐ Strong
- ☐ Weak
- ☐ Best Practice
- ☐ No Recommendation

Dysregulated Host Response to Infection

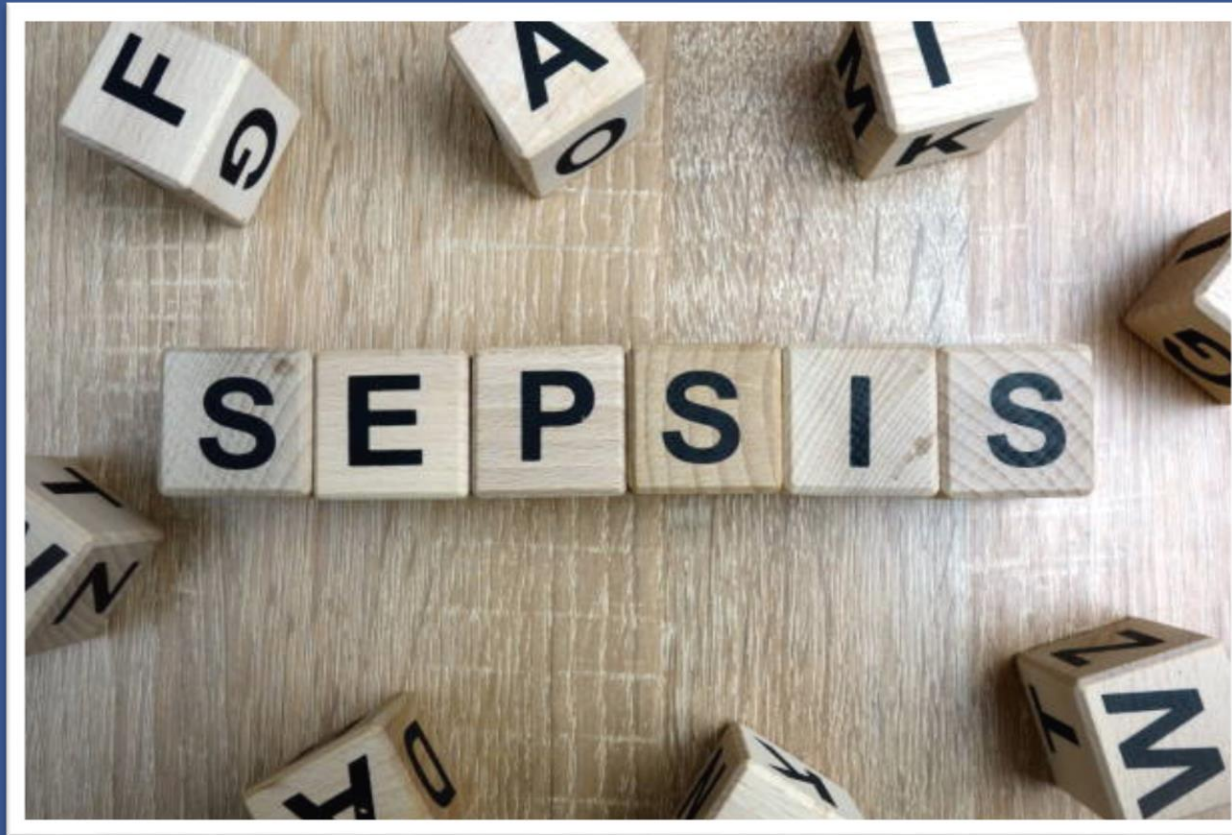
Gram Positive bacteria

Gram Negative bacteria

Fungi



Septic Shock



Nonspecific signs and symptoms

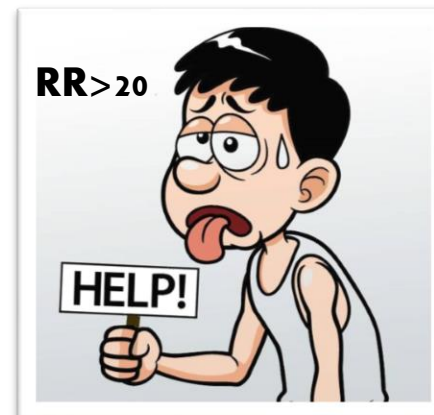
Signs and symptoms specific to an infectious source



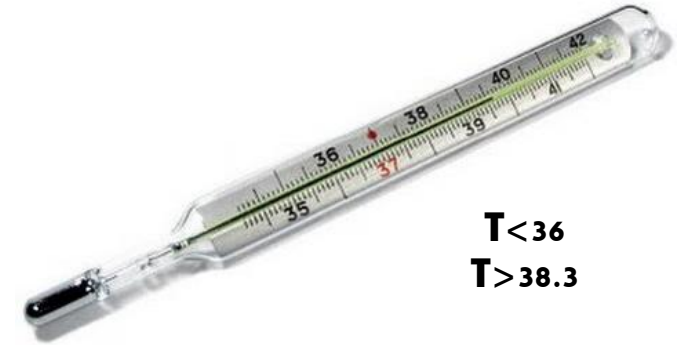
SBP < 90
MAP < 70
SBP decrease > 40



**Cold, cyanotic
and mottled skin**



RR > 20



T < 36
T > 38.3



HR > 90

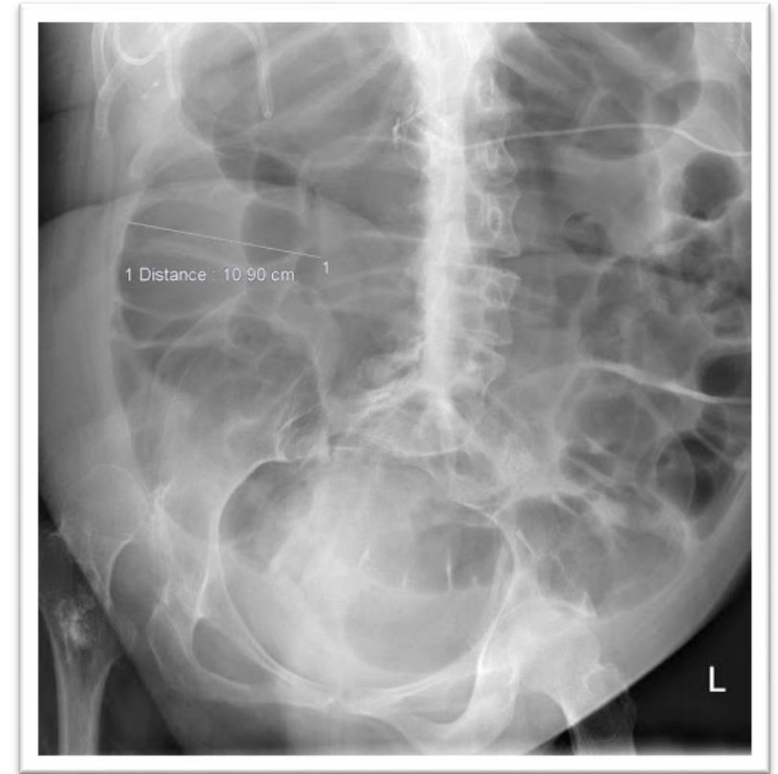
Signs of end-organ perfusion



Altered mental status



Oliguria



Ileus

For adults suspected of having sepsis, we suggest measuring blood lactate.

Quality of evidence: Low

Screening

Weak

Blood Lactate

Screening: Diagnostic Tools

SIRS Criteria?

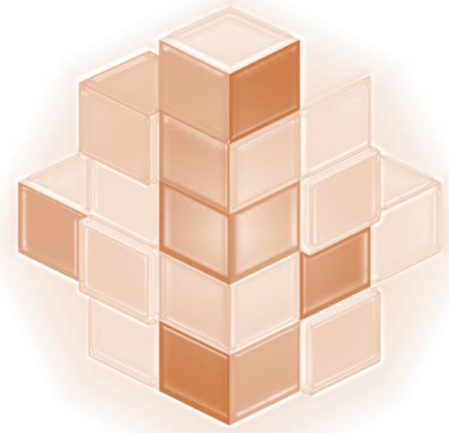
Systemic Inflammatory Response Syndrome

SOFA?

Sequential (Sepsis-Related) Organ Failure Assessment Score

NEWS?

The National Early Warning Score



SIRS



Body temperature: $>38^{\circ}\text{C}$ or $<36^{\circ}\text{C}$

Heart rate: >90 beats per minute

Tachypnea: manifested by a respiratory rate >20 breaths per minute or a PaCO_2 of <32 mmHg

White blood cell count: $>12,000/\text{mm}^3$ or $<4,000/\text{mm}^3$, or the presence of $>10\%$ immature neutrophils

NEWS



Calculator: National Early Warning Score (NEWS2) for acute illness in adults

Input

Respiratory rate breaths/min ▾

Hypercapneic
respiratory ☐ No (Scale 1)
failure

☐ Yes (Scale 2)

On
supplemental ☐ No
O₂

☐ Yes

O₂ saturation % ▾

Systolic BP mmHg ▾

Pulse beats/min ▾

Consciousness ☐ Alert

☐ CVPU

Temperature degC ▾

SOFA Score

Lung: Respiration

Coagulation: Platelets

Liver: Bilirubin

Cardiovascular: Blood Pressure

Brain: GCS

Kidney: Renal Function

Total Criteria Point Count:



SOFA Score



Calculator: Sequential Organ Failure Assessment: SOFA score in adults

Lung: Respiration

- ☐ $\text{PaO}_2/\text{FiO}_2 > 400$ (0 points)
- ☐ $\text{PaO}_2/\text{FiO}_2$ 301 to 400 (1 point)
- ☐ $\text{PaO}_2/\text{FiO}_2 \leq 300$ (2 points)
- ☐ $\text{PaO}_2/\text{FiO}_2$ 101 to 200 **with ventilatory support** (3 points)
- ☐ $\text{PaO}_2/\text{FiO}_2 \leq 100$ **with ventilatory support** (4 points)

Coagulation: Platelets

- ☐ $> 150 \times 10^3/\text{mm}^3$ (0 points)
- ☐ 101 to $150 \times 10^3/\text{mm}^3$ (1 point)
- ☐ 51 to $100 \times 10^3/\text{mm}^3$ (2 points)
- ☐ 21 to $50 \times 10^3/\text{mm}^3$ (3 points)
- ☐ $\leq 20 \times 10^3/\text{mm}^3$ (4 points)

Liver: Bilirubin

- ☐ $< 1.2 \text{ mg/dL}$ (20 mcmol/L) (0 points)
- ☐ 1.2 to 1.9 mg/dL (20 to 32 mcmol/L) (1 point)
- ☐ 2 to 5.9 mg/dL (33 to 101 mcmol/L) (2 points)
- ☐ 6 to 11.9 mg/dL (102 to 204 mcmol/L) (3 points)
- ☐ $> 12 \text{ mg/dL}$ ($> 204 \text{ mcmol/L}$) (4 points)

Cardiovascular: Blood pressure

- ☐ Hypotension absent (0 points)
- ☐ Mean arterial pressure $< 70 \text{ mmHg}$ (1 point)
- ☐ On dopamine $\leq 5 \text{ mcg/kg/min}$ or any dobutamine (2 points)
On dopamine $> 5 \text{ mcg/kg/min}$, epinephrine $\leq 0.1 \text{ mcg/kg/min}$, or norepinephrine $\leq 0.1 \text{ mcg/kg/min}$ (3 points)
- ☐ On dopamine $> 15 \text{ mcg/kg/min}$, epinephrine $> 0.1 \text{ mcg/kg/min}$, or norepinephrine $> 0.1 \text{ mcg/kg/min}$ (4 points)

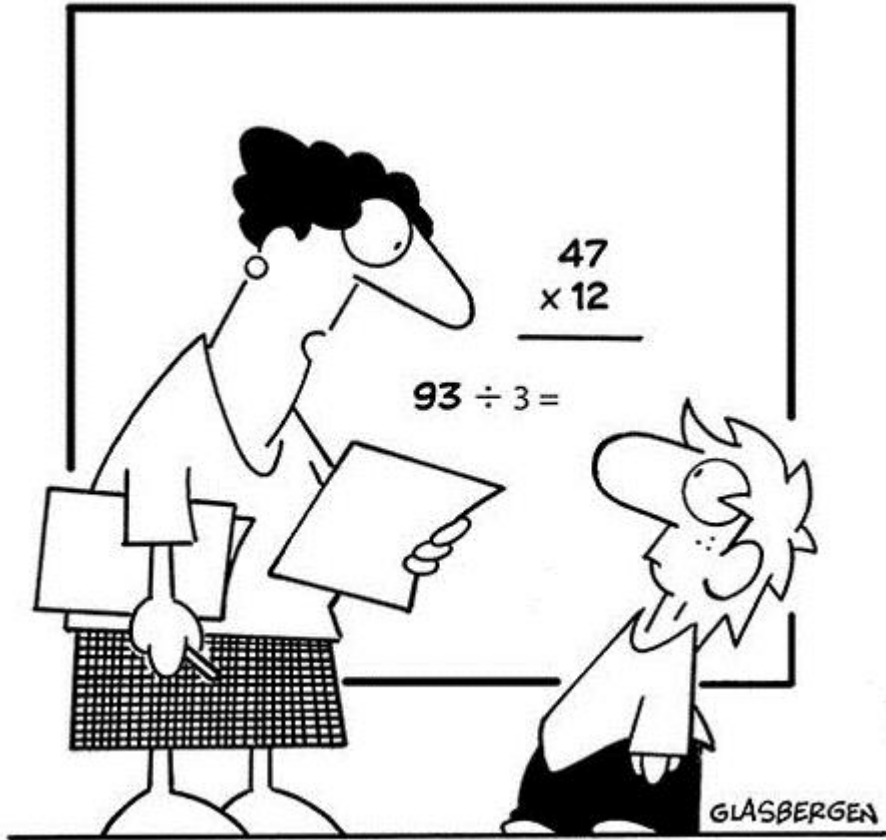
Brain: Glasgow coma score

- ☐ 15 (0 points)
- ☐ 13 to 14 (1 point)
- ☐ 10 to 12 (2 points)
- ☐ 6 to 9 (3 points)
- ☐ < 6 (4 points)

Kidney: Renal function

- ☐ Creatinine $< 1.2 \text{ mg/dL}$ (110 mcmol/L) (0 points)
- ☐ Creatinine 1.2 to 1.9 mg/dL (110 to 170 mcmol/L) (1 point)
- ☐ Creatinine 2 to 3.4 mg/dL (171 to 299 mcmol/L) (2 points)
- ☐ Creatinine 3.5 to 4.9 mg/dL (300 to 440 mcmol/L) or urine output 200 to 500 mL/day (3 points)
- ☐ Creatinine $> 5 \text{ mg/dL}$ (440 mcmol/L) or urine output $< 200 \text{ mL/day}$ (4 points)

qSOFA



Calculator: Sequential Organ Failure Assessment (Quick) qSOFA score in adults

Input:

Glasgow coma score derived points ☐ 15 (normal mental status*) (0)

☐ <15 (not normal) (1)

Systolic blood pressure mmHg ▼

Respiratory rate breaths/min ▼

Results:

qSOFA score points

Reset form

qSOFA interpretation

2 to 3 points: High risk

0 to 1 point: Not high risk

SIRS Criteria?

SOFA?

NEWS?

 SofaScore

We recommend against using qSOFA compared with SIRS, NEWS, or MEWS as a single screening tool for sepsis or septic shock.

Quality of evidence: Moderate

Screening

Strong

Screening Tools

For adults with suspected sepsis or septic shock, we suggest against using procalcitonin plus clinical evaluation to decide when to start antimicrobials, as compared to clinical evaluation alone.

Quality of evidence: Very low

Infection

Weak

Procalcitonin



Management of Sepsis

Sepsis and septic shock are medical emergencies, and we recommend that treatment and resuscitation begin immediately.

Initial Resuscitation

Best Practice

Treatment & Resuscitation (if time fits please use)



Secure Airway

Correct Hypoxemia

Establish Vascular Access

Fluids

Antibiotics

Routine Labs/Blood and other Cultures

Imaging of Suspected Sources

For patients with sepsis-induced hypoperfusion or septic shock, we suggest that at least 30 mL/kg of IV crystalloid fluid be given within the first 3 hours of resuscitation.

Quality of evidence: Low

Initial Resuscitation

Weak

Fluid Resuscitation

For adults with sepsis or septic shock, we suggest guiding resuscitation to decrease serum lactate in patients with elevated lactate levels over not using serum lactate.

Quality of evidence: Low

Initial Resuscitation Weak Serum Lactate

For adults with septic shock, we suggest using capillary refill time to guide resuscitation as an adjunct to other measures of perfusion.

Quality of evidence: Low

Initial Resuscitation Weak Perfusion



For adults with sepsis or septic shock, we recommend using **crystalloids** as first-line fluid for resuscitation.

Quality of evidence: Moderate

Hemodynamic Management

Strong

Fluid Resuscitation

For adults with sepsis or septic shock, we suggest using **balanced crystalloids** instead of normal saline for resuscitation.

Quality of evidence: Very low

Hemodynamic Management

Weak

Fluid Resuscitation

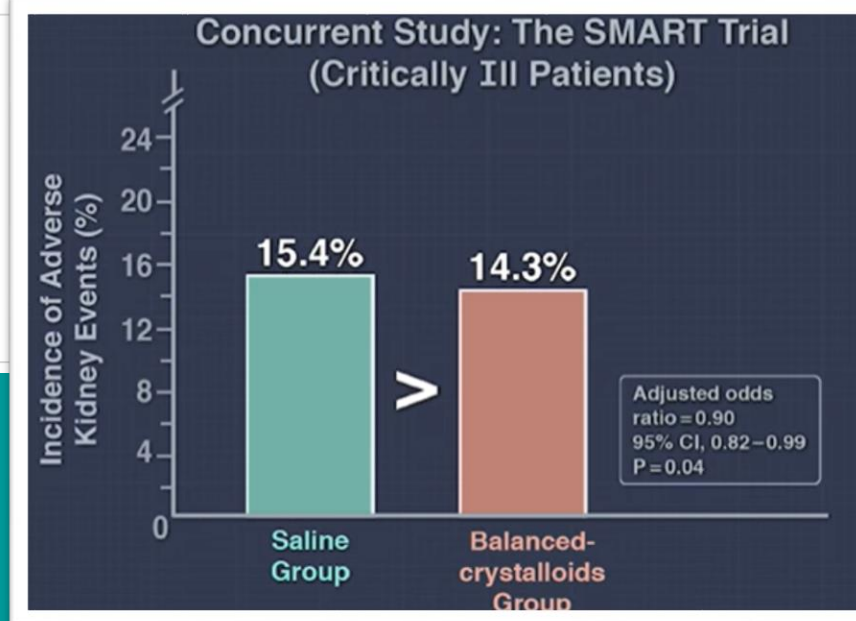
For adults with sepsis or septic shock, we suggest using **albumin** in patients who received large volumes of crystalloids.

Quality of evidence: Moderate







Hemodynamic Management

Weak

Fluid Resuscitation



Vasoactive Agent Management

	<div>  Use norepinephrine as first-line vasopressor. </div>
For patients with septic shock on vasopressors	<div>  Target a MAP of 65 mm Hg. </div> <div>  Consider invasive monitoring of arterial blood pressure. </div>
If central access is not yet available	<div>  Consider initiating vasopressors peripherally.* </div>
If MAP is inadequate despite low-to-moderate norepinephrine	<div>  Consider adding vasopressin. </div>
If cardiac dysfunction with persistent hypoperfusion is present despite adequate volume status and blood pressure	<div>  Consider adding dobutamine or switching to epinephrine. </div>

● Strong recommendations are displayed in green

● Weak recommendations are displayed in yellow.



There is insufficient evidence to make a recommendation on the use of restrictive versus liberal fluid strategies in the first 24 hours of resuscitation in patients with sepsis and septic shock who still have signs of hypoperfusion and volume depletion after the initial resuscitation.

Hemodynamic Management

No Recommendation

Fluid Resuscitation

LIBERAL

VERSUS

RESTRICTIVE

FLUID REGIMEN




For adults with septic shock and an ongoing requirement for vasopressor therapy, we suggest using IV corticosteroids.

Quality of evidence: Moderate

Additional Therapies Weak Corticosteroids



Antibiotic Timing

	 Shock is present	 Shock is absent
 Sepsis is definite or probable	<input checked="" type="checkbox"/> Administer antimicrobials immediately , ideally within 1 hour of recognition.	<input checked="" type="checkbox"/> Administer antimicrobials immediately , ideally within 1 hour of recognition.
Sepsis is possible	<input checked="" type="checkbox"/> Administer antimicrobials immediately , ideally within 1 hour of recognition.	<input checked="" type="checkbox"/> Rapid assessment* of infectious vs. noninfectious causes of acute illness. <input checked="" type="checkbox"/> Administer antimicrobials within 3 hours if concern for infection persists.

**Rapid assessment includes history and clinical examination, tests for both infectious and noninfectious causes of acute illness, and immediate treatment of acute conditions that can mimic sepsis. Whenever possible, this should be completed within 3 hours of presentation so that a decision can be made as to the likelihood of an infectious cause of the patient's presentation and timely antimicrobial therapy provided if the likelihood is thought to be high.*

Broad-spectrum combination treatment

Community- or hospital-acquired

Recent antibiotics received

Previous organisms

Comorbidities

Immune defects

Suspected site of infection

Presence of invasive devices

For adults with sepsis or septic shock, we suggest using prolonged infusion of beta-lactams for maintenance (after an initial bolus) over conventional bolus infusion.

Quality of evidence: Moderate

Infection Weak Beta-lactams

For adults with sepsis or septic shock, we recommend optimizing dosing strategies of antimicrobials based on accepted pharmacokinetic/pharmacodynamic principles and specific drug properties.

Infection Best Practice Optimizing Antimicrobials

TABLE 73.6 Surviving Sepsis Campaign Recommendations on Antimicrobial Therapy and Source Control

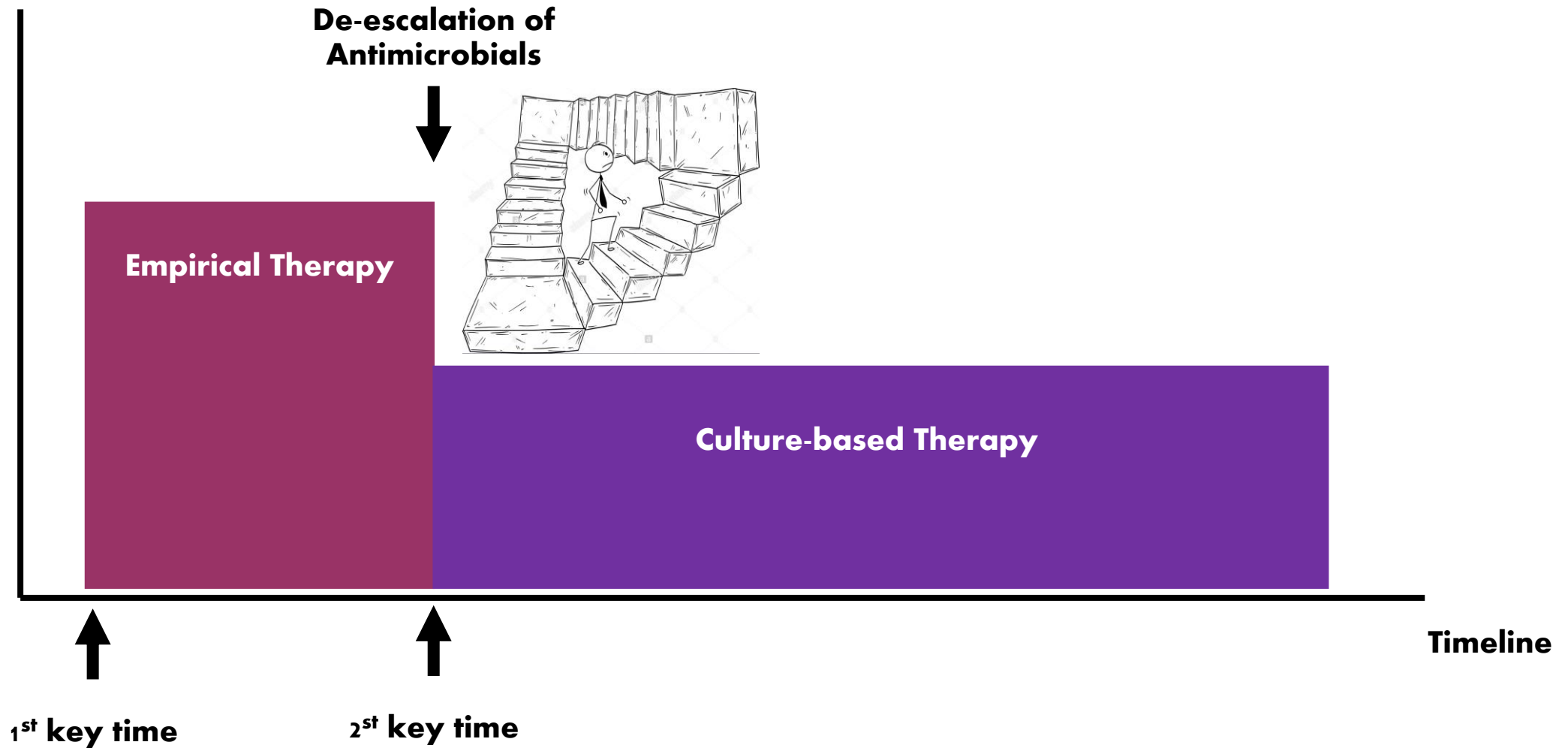
RECOMMENDATION

GRADE

Source Control

- | | | |
|---|--|-------------------------|
| 1 | A specific anatomic diagnosis of infection requiring emergent source control should be identified or excluded as rapidly as possible in any patient with sepsis. Required source control interventions should be implemented as soon as medically and logistically possible. | Best practice statement |
| 2 | Prompt removal of intravascular access devices that are a possible source of sepsis or septic shock is recommended after other vascular access has been established. | Best practice statement |

Antimicrobial De-escalation



For adults with sepsis or septic shock, we suggest daily assessment for de-escalation of antimicrobials over using fixed durations of therapy without daily reassessment for de-escalation.

Quality of evidence: Very low

Infection

Weak

De-escalation of Antibiotics

For adults with an initial diagnosis of sepsis or septic shock and adequate source control, we suggest using shorter over longer duration of antimicrobial therapy.

Quality of evidence: Very low

Infection

Weak

Duration of Antibiotics

For adults with suspected sepsis or septic shock but unconfirmed infection, we recommend continuously reevaluating and searching for alternative diagnoses and discontinuing empiric antimicrobials if an alternative cause of illness is demonstrated or strongly suspected.

Infection

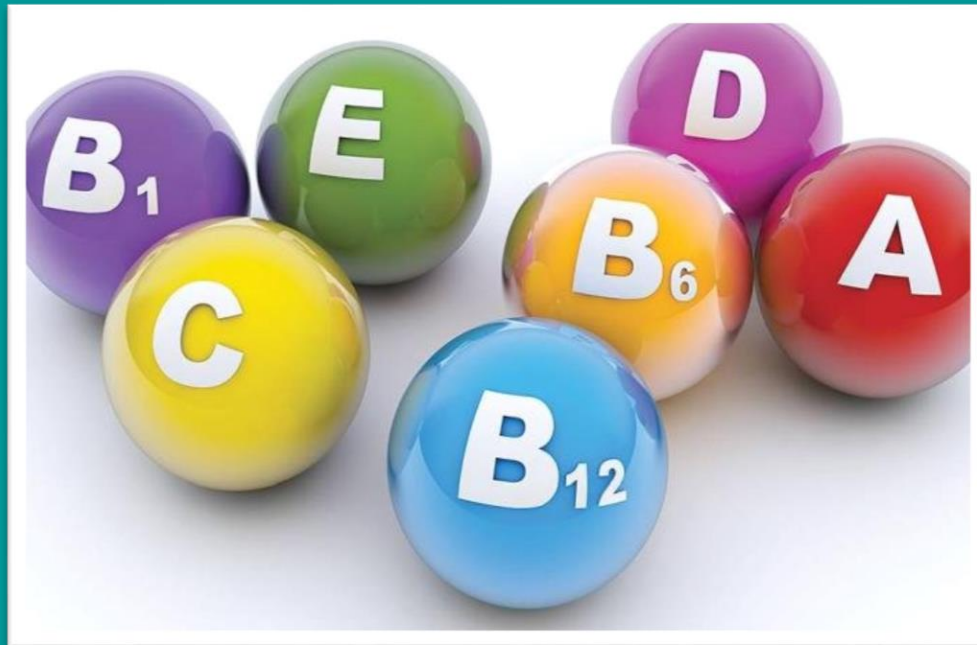
Best Practice

Dx Infection



For adults with sepsis or septic shock, we suggest against using IV vitamin C.
Quality of evidence: Low

Additional Therapies Weak Vitamin C



Thanks for Your Kind Attentions!

