CE TEST QUESTIONS

AJN0320

Brain Death: History, Updates, and Implications for Nurses

GENERAL PURPOSE:
To provide information about the history of the development of brain death criteria, including recent controversies and criteria updates.

LEARNING OBJECTIVES/OUTCOMES:
After completing this continuing education activity, you should be able to

- explain the history of brain death, including some important controversies and position statements that have guided health care professionals in understanding this concept.
- discuss the applicable nursing considerations when caring for patients declared brain dead and their families.

1. The 1968 Harvard Ad Hoc Committee proposed that death could be defined when a brain no longer functions and cannot regain function in a patient who exhibits
a. complete unresponsiveness to stimuli.
b. cessation of circulatory function.
c. diminished elicitable reflexes.

2. Electroencephalography (EEG) can confirm that brain damage is irreversible provided that 2 conditions have been ruled out, one of which is
a. hyporeflexia.
b. hypothermia.
c. cerebral hypoxia.

3. The Uniform Determination of Death Act defined death as occurring in the presence of one or both of 2 criteria, one of which is classified as
a. hemodynamic criteria.
b. cardiopulmonary criteria.
c. multiorgan failure criteria.

4. Which of the following states allows for religious exemptions to the declaration of brain death if family members object?
a. New Hampshire
b. New Mexico
c. New Jersey

5. Confusion can arise when the physical appearance of a patient who has been declared dead by neurologic clinical criteria is identical to that of a patient who is
a. comatose.
b. hypoxic.
c. acidotic.

6. Bernat argued that, while some human tissues and organs can be kept alive outside the body of a deceased person and transplanted to a living person, the survival of these components doesn't
a. rule out intermittent responsiveness.
b. guarantee that the donor will survive.
c. alter the fact that the donor "as a whole" is dead.

7. Shewmon pointed out that, in rare cases, even when all diagnostic criteria for brain death are met, patients who receive ongoing physiological support
a. would most certainly perish without such support.
b. may continue important integrative functions, such as digestion.
c. may undergo rapid deterioration of the gross structure of the brain.

8. The 2008 white paper from the President's Council on Bioethics on "Controversies in the Determination of Death" argued that the preservation of some bodily functions via mechanical ventilation in patients declared dead by neurologic criteria
a. enables them to act upon their environment.
b. can, in some cases, signify self-consciousness.
c. isn't sufficient to define these patients as living.

9. In 2019, the American Academy of Neurology released a position statement that encouraged the development of institutional policies across U.S. medical facilities that reflect uniformity in which of the following areas?
a. the use of EEG to confirm the irreversibility of brain damage
b. the appointment of specialized committees to resolve ethically complex dilemmas
c. the training and credentialing for all physicians involved in brain death declarations

10. A 2016 data analysis of policies pertaining to brain death determination in use at the majority of U.S. hospitals between June 26, 2012, and July 1, 2015, found significant variability among the policies in all 5 categories studied, one of which was
a. risk management consultation.
b. prerequisites for clinical testing.
c. age-related differences in pediatric patients.

11. When brain death is suspected, a clinical assessment is performed, which typically involves testing to establish
a. the absence of brain stem reflexes.
b. the presence of any form of sedation.
c. a lack of fluctuation in any vital signs.

12. A study by Tawil and colleagues found that, compared with family members who did not observe brain death evaluation, those who did had significantly higher postevaluation scores on scales measuring
a. their ability to cope with the loss of their loved one.
b. their appreciation for the staff's diligence.
c. their understanding of brain death.

13. If family members choose to observe brain death testing, nurses should arrange for which of the following to be present to reduce any confusion and distress?
a. a specialist from donor services
b. a behavioral health counselor
c. a spiritual support person

14. As cited by Bosek, which of the following religious traditions accepts cardiopulmonary death but may not accept death by neurologic criteria?
a. Sikhism
b. Orthodox Judaism
c. Seventh-Day Adventist

15. The 2012 "Guidelines for the Determination of Brain Death in Infants and Children" recommends
a. 2 neurologic examinations and 2 apnea tests.
b. examinations of neonates after 48 hours of observation.
c. examinations of older children after 24 hours of observation.

16. If a patient declared brain dead has viable organs or tissue, who should initiate organ donation conversations?
a. a member of the spiritual support staff
b. the nursing or medical staff caring for the patient
c. trained personnel from an organ procurement organization ▼

CE TEST QUESTIONS

AJN1019A

Infection in Acute Care: Evidence for Practice

GENERAL PURPOSE:
To provide information about the evidence on infection in acute care settings, with recommendations for integrating this evidence into current nursing practice.

LEARNING OBJECTIVES/OUTCOMES:
After completing this continuing education activity, you should be able to

- summarize the risk factors for, diagnosis of, and prevention and treatment measures for pneumonia.
- describe the risk factors for, manifestations of, and prevention and treatment measures for surgical site infections.
- outline the risk factors for, diagnosis of, and prevention and treatment measures for *Clostridioides difficile* infection.

1. As a result of a 2015 survey, the Centers for Disease Control and Prevention identified which of the following as the most common health care–associated infection?
a. pneumonia
b. surgical site infection
c. gastrointestinal (GI) tract infection

2. One risk factor for community-acquired pneumonia (CAP) is treatment with which of the following types of drugs?
a. antihistamines
b. gastric acid–suppressing agents
c. angiotensin-converting enzyme inhibitors

3. Which of the following methods of diagnosing CAP has the highest diagnostic sensitivity?
a. chest radiography
b. assessment of clinical symptoms
c. chest computed tomography

4. Current guidelines for patients with CAP hospitalized in a non-ICU setting include treatment with either a respiratory fluoroquinolone or a combination of a β-lactam and a
a. macrolide. b. sulfonamide.
c. cephalosporin.

5. In cases of community-acquired methicillin-resistant *Staphylococcus aureus*, the patient should also receive vancomycin or
a. azithromycin. b. clindamycin.
c. linezolid.

6. Even though the evidence isn't compelling, the Infectious Diseases Society of America (IDSA)/American Thoracic Society guidelines for hospital-acquired pneumonia strongly recommend antibiotic therapy for how many days?
a. 7
b. 10
c. 14

7. For diagnosing ventilator-associated pneumonia, culturing which of the following specimen types is recommended?
a. bronchoscopic
b. endotracheal suction tube
c. mini-bronchoalveolar lavage

8. Modifiable risk factors for surgical site infections (SSIs) include
a. a recent skin infection.
b. a history of radiotherapy.
c. preoperative hypoalbuminemia.

9. Which of the following strategies is recommended for preventing SSIs?
a. achieving glucose control
b. shaving the surgical site
c. maintaining mild hypothermia perioperatively

10. Further recommendations for preventing SSIs include implementing
a. the use of silver-containing dressings.
b. topical wound antibiotic treatment.
c. preoperative chlorhexidine bathing.

11. Once an SSI is diagnosed, treatment recommendations include
a. initiating wound vacuum therapy.
b. opening the wound to allow drainage.
c. replacing sutures or staples with antibiotic sutures.

12. According to Stevens and Bryant, surgical patients at greatest risk for necrotizing fasciitis include those who have
a. a family history of chronic disease.
b. had a previous wound infection.
c. sustained traumatic wounds.

13. Clinical manifestations of necrotizing fasciitis include
a. numbness.
b. skin bullae.
c. evisceration.

14. One of the top 3 risk factors for *Clostridioides difficile* infection (CDI) is
a. antibiotic use.
b. GI manipulation.
c. longer lengths of stay.

15. Risk factors for recurrence of CDI include
a. male sex.
b. chronic kidney disease.
c. the use of statins within 90 days of diagnosis.

16. Current guidelines for diagnosing CDI include testing patients who haven't used laxatives but have had
a. 2 or more unformed stools in 24 hours.
b. 3 or more unformed stools in 24 hours.
c. 3 or more unformed stools in 48 hours.

17. Screening for CDI often begins by collecting a specimen for which of the following tests?
a. glutamate dehydrogenase
b. polymerase chain reaction
c. erythrocyte sedimentation rate

18. As soon as CDI is suspected, clinicians should institute which of the following types of transmission-based precautions?
a. airborne
b. droplet
c. contact

19. Newer data support treating CDI with oral vancomycin or
a. fidaxomicin.
b. aztreonam.
c. fosamil.

20. The IDSA/Society for Healthcare Epidemiology of America guidelines recommend treating recurrences of CDI in patients who initially received metronidazole with a
a. 7-day course of clarithromycin.
b. 10-day course of doxycycline.
c. 10-day course of vancomycin. ▼

CE Test

More Snakebites and Less Antivenom: Prescribing Burdens for Venomous Envenoming

Instructions:
- Read the article. The test for this CE activity can only be taken online at http://www.nursingcenter.com/ce/CNS. Tests can no longer be mailed or faxed.
- You will need to create (its free!) and login to your personal CE Planner account before taking online tests. Your planner will keep track of all your Lippincott Professional Development online CE activities for you.
- There is only one correct answer for each question. A passing score for this test is 14 correct answers. If you pass, you can print your certificate of earned contact hours and access the answer key. If you fail, you have the option of taking the test again at no additional cost.
- For questions, contact Lippincott Professional Development: 1-800-787-8985.

Registration Deadline: December 3, 2021

Disclosure Statement:
The author and planners have disclosed no potential conflicts of interest, financial or otherwise.

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Lippincott Professional Development will award 1.5 contact hours for this continuing nursing education activity. This activity has been assigned 0.5 pharmacology credit.

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Payment:
- The registration fee for this test is $17.95.

CE TEST QUESTIONS

CNS1119

PURPOSE: To provide information on venomous snakes and snake envenoming.

LEARNING OBJECTIVES/OUTCOMES: After completing this continuing education activity, you should be able to:

1. Identify the epidemiology and signs and symptoms of venomous snake envenoming.
2. Summarize the management of a patient who has had a snake bite envenomation.

1. Who are the most likely to be bitten, become disabled, or die of snake envenoming?
   a. children
   b. young adults, aged 18 to 25 years
   c. the elderly

2. Which statement is true about snake antivenom?
   a. It is always necessary for snake bite treatment.
   b. It can reverse damage to organs and tissues.
   c. It cannot reach toxins that are inside cells.

3. Snakes are found in every state of the United States except Alaska, Hawaii, and
   a. Maine.
   b. Massachusetts.
   c. Rhode Island.

4. Venomous snakes of the subfamily Crotalidae in North America include
   a. black rat snakes.
   b. copperhead snakes.
   c. bull snakes.

5. As noted in the article, the amount, composition, and strength of venom are a function of all of the following *except* the
   a. time of year.
   b. snake's age.
   c. snake's gender.

6. Neurotoxic effects from snake venom include
   a. bradycardia.
   b. a metallic taste.
   c. tissue necrosis.

7. Rattlesnake envenomation may result in which hematological effect?
   a. thrombocythemia
   b. increased prothrombin time
   c. hyperfibrinogenemia

8. Nursing care following envenomation includes
   a. administering prophylactic antibiotics.
   b. completing serial, circumferential measurements of the affected limb.
   c. marking the leading edges of the swelling and tenderness.

9. Additional treatment of patients after snake envenomation includes
   a. carefully administering intravenous fluid therapy.
   b. applying ice to the bite area.
   c. rapidly administering nonsteroidal anti-inflammatory drugs.

10. Clinical indications for antivenom treatment following rattlesnake envenomation include
    a. malignant hypertension.
    b. increasing pain.
    c. muscle fasciculations.

11. Most symptoms of envenomation will begin to develop within a maximum of how much time after envenoming?
    a. 20 minutes
    b. 60 minutes
    c. 120 minutes

12. As noted in the article, what vaccination should be administered, if indicated, after envenoming?
    a. hepatitis A
    b. hepatitis B
    c. tetanus

13. What electrolyte abnormality may be precipitated by snake envenoming?
    a. hyponatremia
    b. hypokalemia
    c. hypocalcemia

14. Evidence-based first aid interventions after envenoming include
    a. applying a tourniquet.
    b. making small cuts above and below the wound.
    c. providing hemodynamic support.

15. Patients who receive antivenom are at risk of serum sickness that may manifest as
    a. blurred vision.
    b. joint pain.
    c. intractable vomiting.

16. Patients are at risk of an allergic reaction to CROFAB if they have a known hypersensitivity to
    a. soy.
    b. papaya.
    c. tree nuts.

17. Coral snake bites are associated with
    a. respiratory failure and paralysis.
    b. severe pain and swelling.
    c. life-threatening coagulopathy.

18. The author suggests that if a patient develops life-threatening signs or symptoms after coral snake envenomation and antivenom is not available, possible treatment options include a trial dose of
    a. neostigmine.
    b. leucovorin.
    c. protamine sulfate.

19. Which of the following drugs was designed based on the structure of a peptide from snake venom?
    a. indomethacin
    b. heparin
    c. captopril

20. As noted in the article, contact between humans and snakes is increasing because of
    a. exotic pet stores.
    b. global warming.
    c. habitat encroachment.

Sepsis: Diagnosis and Management

Self-Assessment Questions

1 . In the Sepsis 3 report, sepsis is defined as

A) temperature of 36.5°C (97.7°F).
B) a severe infection caused by specific pathogens.
C) leukocyte count between 5,000 and 11,000 cells/mm³.
D) life-threatening organ dysfunction caused by a dysregulated host response to infection.

INTRODUCTION AND DEFINITIONS

The Sepsis 3 report defines sepsis as life-threatening organ dysfunction caused by a dysregulated host response to infection. This new definition emphasizes the loss of adaptive homeostasis in response to infection, the potential lethality of infection when any degree of organ dysfunction is present, and the importance of urgent assessment and prompt treatment. Because even modest organ dysfunction has been found to confer a mortality risk in excess of 10%, sepsis is inherently a serious condition and the term "severe sepsis" is no longer considered useful [6].

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2 . All of the following are manifestations of organ dysfunction, EXCEPT:

A) Oliguria ✓
B) Metabolic acidosis ✓
C) Altered mental status ✓
D) A ratio of arterial oxygen tension to fraction of inspired oxygen of 380 or more

INTRODUCTION AND DEFINITIONS

The presence and extent of organ dysfunction can be assessed with various scoring systems that rely on clinical and laboratory parameters, such as the following [6,7,62]:

- Acute lung injury: A ratio of arterial oxygen tension to fraction of inspired oxygen of 280 or less
- The presence of a metabolic acidosis (e.g., lactate >2 mmol/L)
- Oliguria: Urinary output of less than 0.5 mL/kg body weight/hour for at least two hours in a patient with a urinary catheter in place
- Coagulation abnormalities: International normalized ratio (INR) >1.5
- Thrombocytopenia: Platelet count <100,000 cells/mcL
- Elevated bilirubin: >2 mg/dL
- Acute alteration in mental status

3 . Which of the following is NOT one of the elements in the quick Sequential Organ Failure Assessment (qSOFA) tool?

A) Altered mentation ✓
B) Elevated bilirubin (>2 mg/dL)
C) Systolic blood pressure 100 mm Hg or less ✓
D) Respiratory rate of at least 22 breaths per minute ✓

INTRODUCTION AND DEFINITIONS

Working from a model derived from a large data base, the task force was able to identify and validate a simple "bedside" clinical measure that can be used to identify which patients with suspected infection are at risk for developing sepsis, referred to as the quick SOFA (qSOFA). This measure consists of three elements:

- Respiratory rate ≥22 per minute
- Altered mentation
- Systolic blood pressure ≤100 mm Hg

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4 . Severe insults, including infection and shock, can lead to a reaction involving

A) hyperoxemia.
B) widespread endothelial damage.
C) decreased vascular permeability.
D) All of the above

EPIDEMIOLOGY AND BURDEN OF SEPSIS

The first description of multiple organ failure appeared in 1973 in a discussion of three patients who died of distal organ failure that followed ruptured aortic aneurysms. Multiple organ failure was subsequently described as multiple, progressive, or sequential systems organ failure. It was noted that shock or infection alone did not cause the distal organ dysfunction. Other severe insults could set in motion an underlying reaction that would lead to widespread endothelial damage, edema resulting from increased vascular permeability, and impaired availability of oxygen [8,9,10].

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5 . The majority of sepsis cases occur in

A) women.

B) patients 25 to 44 years of age.
C) patients 65 years of age or older.
D) patients younger than 5 years of age.

EPIDEMIOLOGY AND BURDEN OF SEPSIS

The reported incidence rates of sepsis increase with advanced age. Two-thirds of all sepsis cases occur in people 65 years of age and older, with case fatality rates as high as 40% [16]. Age-adjusted rates for sepsis hospitalization and mortality increased annually by 8.2% and 5.6%, respectively, between 1993 and 2003, whereas the fatality rate decreased by 1.4% [15]. Sepsis is more common among men than women, and the fatality rate is greater in men and nonwhite populations [22].

---

6 . All of the following factors are considered important in the development of sepsis, EXCEPT:

A) Fungal organisms ✓
B) Burns or other trauma ✓
C) Appropriate narrow-spectrum antibiotic therapy
D) Progressive clinical conditions, such as diabetes ✓

RISK FACTORS AND PREVENTION

Factors considered important in the development of sepsis include: inappropriate broad-spectrum antibiotic therapy; immunosuppressive treatments, such as cancer chemotherapy; invasive procedures; transplantations; fungal organisms; burns or other trauma; anatomic obstruction; intestinal ulceration; age (the very young and the very old); and progressive clinical conditions, such as malignancy, diabetes, or AIDS [24].

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7 . A major cause of sepsis among hospitalized, severely ill patients is

A) malignancy.
B) hyperglycemia.
C) intestinal ulceration.
D) healthcare-associated infection.

RISK FACTORS AND PREVENTION

Healthcare-associated infections are a major cause of sepsis among severely ill patients. Increased risk of nosocomial infection is associated with the presence of underlying chronic disease, alteration in host defenses, prolonged hospital stay, and the presence of invasive catheters or monitoring devices [27]. Pulmonary, urinary tract, gastrointestinal, and wound infections predominate [28,29]. In hospitalized adult patients, the etiology of sepsis has shifted from being predominantly gram-negative nosocomial infections (*Escherichia coli*, *Klebsiella* spp., *Enterobacter* spp., and *Pseudomonas aeruginosa*) to gram-positive infections (*Staphylococcus aureus*, *Streptococcus pneumoniae*, and *Streptococcus pyogenes*). The incidence of sepsis caused by gram-positive infections has increased by 26.3% per year over the last three decades [17]. Multidrug-resistant pathogens, such as *S. aureus*, now account for more than half of all sepsis cases. *S. aureus* is singly responsible for 40% of ventilator-associated pneumonia episodes and most cases of nosocomial pneumonia [17,25]. Group B streptococcus is a leading cause of neonatal sepsis in the United States [30].

---

8 . The natural defense against infection includes

A) macrophages. ✓
B) T and B lymphocytes. ✓
C) platelets and coagulation factors. ✓
D) All of the above

PATHOGENESIS OF SIRS

The natural defense of the body to an infection, or other assault, involves a number of cellular and humoral factors. They include B and T lymphocytes, macrophages, neutrophils, platelets, tumor necrosis factor (TNF), interleukins, the coagulation factors, and probably several other products [26,37,38]. There are five rather distinct phases that describe how these biologic products work together to overcome the assault and, paradoxically, how they can interact to cause SIRS and potentially lead to critical organ failure [26,39].

---

9 . In the United States, the etiology of sepsis is characterized by a predominance of

A) viruses.
B) fungal organisms.
C) gram-negative bacteria.
D) gram-positive, drug-resistant bacteria.

PATHOPHYSIOLOGY OF SEPSIS

As noted, in the United States, the etiology of sepsis has shifted from a predominance of gram-negative bacteria to a predominance of gram-positive, drug-resistant bacteria [25]. This shift has led to a re-evaluation of basic assumptions about the pathogenesis of sepsis (e.g., there may or may not be differences in the host response to gram-negative organisms compared with the

B) patients 25 to 44 years of age.
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PATHOPHYSIOLOGY OF SEPSIS

As noted, in the United States, the etiology of sepsis has shifted from a predominance of gram-negative bacteria to a predominance of gram-positive, drug-resistant bacteria [25]. This shift has led to a re-evaluation of basic assumptions about the pathogenesis of sepsis (e.g., there may or may not be differences in the host response to gram-negative organisms compared with the

response to gram-positive organisms) [44,45]. It is important to note that discrimination between gram-negative and gram-positive organisms is based on the recovery of specific pathogens from blood or the presumed site of infection rather than from any specific immunologic criterion. In 30% to 50% of sepsis cases, the inciting organism is not identified [18,25].

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10 . The role of the coagulation system in the sepsis-induced inflammatory cascade includes

A) up-regulating fibrinolysis.
B) blocking further inflammation.
C) down-regulating the anticoagulant system.√
D) All of the above

PATHOPHYSIOLOGY OF SEPSIS

The coagulation system plays an important role in the sepsis-induced inflammatory cascade. Coagulation is the inflammatory reaction to tissue injury and is activated independent of the type of microbe (e.g., gram-positive and gram-negative bacteria, viruses, fungi, or parasites). Coagulation contributes to the outcome in sepsis by down-regulating fibrinolysis and the anticoagulant systems. The collaboration between clotting and inflammation, which works to wall off damaged and infected tissues, is an important host survival strategy. Coagulation induced by inflammation can in turn contribute to further inflammation. A key to determining survival in sepsis is to limit the damage while retaining the benefits of localized clotting and controlled clearance of pathogens [5,14,47].

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11 . The common manifestations of sepsis are seen in all of the following organ systems, EXCEPT:

A) Skeletal
B) Pulmonary
C) Cardiovascular
D) Central nervous system

MANIFESTATIONS OF SEPSIS

Any patient with sepsis who has evidence of dysfunction in one organ in the absence of an obvious cause such as traumatic injury may have incipient dysfunction of other organs. The manifestations of sepsis may be seen in the cardiovascular, pulmonary, central nervous, renal, gastrointestinal, and hematologic systems of the body (most frequently in the lungs and circulatory system) [20].

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12 . Before the onset of shock, patients with sepsis

A) are hypodynamic.
B) have decreased pulse volume.
C) display narrowed pulse pressure.
D) have decreased systemic vascular resistance.

MANIFESTATIONS OF SEPSIS

Before the onset of shock, the patient's condition is usually hyperdynamic. The skin is warm and flushed, pulse volume is increased, and pulse pressure is wide. Cardiac output is typically elevated, and systemic vascular resistance (SVR) is usually decreased. Despite the increase in cardiac output, serum lactate levels are often elevated. Anaerobic metabolism occurs because of inadequate nutrient blood flow [24].

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13 . Altered mental status is a common manifestation of sepsis. An early sign of this change may be

A) irritability or confusion.
B) hallucinations.
C) polyneuropathy.
D) nonfocal manifestations.

MANIFESTATIONS OF SEPSIS

Altered mental status may be the most common and most overlooked manifestation of sepsis. This causes elderly patients to be at particularly high risk. Early changes include withdrawal, confusion, irritability, or agitation. In patients with severe infection, one may see disorientation, lethargy, seizures, or frank obtundation [21,50].

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14 . Which of the following is among the principal recommendations for fluid resuscitation in patients with sepsis?

A) Albumin should be added when patients require substantial amounts of crystalloids.
B) Administration of intravenous fluid should be delayed until the results of cultures are received.
C) Fluid resuscitation should initially target a mean arterial pressure (MAP) of 100 mm Hg in patients requiring vasopressors.
D) In patients with sepsis-induced hypoperfusion, no more than 15 mL/kg of intravenous crystalloid fluid should be given in the first three hours.

DIAGNOSIS AND MANAGEMENT

The principal recommendations for fluid resuscitation are [72].

- Intravenous fluid resuscitation should be started immediately, beginning with crystalloids (grade strong, B).
- In the setting of sepsis-induced hypoperfusion, at least 30 mL/kg of intravenous crystalloid fluid should be given within the first three hours (grade strong, B).
- It is suggested that albumin be added when patients require substantial amounts of crystalloids (grade weak, C).
- Fluid resuscitation should initially target a MAP of 65 mm Hg in patients with septic shock requiring vasopressors (grade strong, B).

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15 . Which of the following statements regarding antibiotic therapy in patients with sepsis is TRUE?

A) Cultures should be obtained after antibiotic therapy is initiated, if possible.
B) The empirical antimicrobial regimen should not be changed based on culture results.
C) Generally, a 7- to 10-day course is considered adequate for most serious infections.
D) One should confirm the diagnosis by culture results before starting antibiotic treatment.

DIAGNOSIS AND MANAGEMENT

The SCCM recommends obtaining appropriate cultures before beginning antimicrobial therapy, but the process of doing so should not delay antibiotic administration. At least two sets (aerobic and anaerobic) of blood cultures should be obtained, including one drawn through any indwelling vascular catheter or device in place prior to onset of infection. Cultures from other suspected sites should be obtained as well. The guideline committee also recommends that imaging studies be performed to confirm the source of infection, assuming the patient's condition allows it [62,65,72].

Intravenous antimicrobial therapy should be started as early as possible, ideally within the first hour of recognition of sepsis or septic shock (grade strong, B). Clinical studies have shown that delay in antimicrobial therapy for serious infection and sepsis prolongs morbidity, lengthens hospital stay, and increases mortality [68]. A retrospective cohort study involving 2,731 patients with sepsis showed that initiation of antimicrobial therapy within the first hour of documented hypotension was associated with increased survival to discharge. Moreover, each hour of delay conferred an approximately 12% decreased probability of survival [69].

The initial choice of antibiotics will depend on the most likely pathogens associated with the source of infection as well as the prevalent micro-organisms in the local community and hospitals. The clinician should assess risk factors for multidrug-resistant pathogens, including prior hospitalization, health facility residence, recent antimicrobial use, and evidence of prior infection with resistant organism. The anticipated susceptibility profile of prevalent local pathogens and the ability of the antibiotic to penetrate to the source of the infection must also be

considered. A combination of drugs with activity against all likely pathogens should be administered initially, but the regimen should be reassessed in light of culture results, the goal being to identify a single, narrow-spectrum antibiotic that will best control the infection [53,57]. It has been found that combining an extended-spectrum beta-lactam antibiotic (e.g., penicillins, cephalosporins) with an aminoglycoside (e.g., gentamicin) was no more effective in reducing mortality than using the beta-lactam agent alone. In addition, the combination carries an increased risk of renal damage [53,57]. A common approach is to initiate empiric therapy with a carbapenem or extended-spectrum penicillin/beta-lactamase inhibitor (e.g., ticarcillin/tazobactam) to cover gram-negative enteric bacilli and *Pseudomonas*, often in combination with vancomycin to cover *S. aureus* pending culture results.

The empirical antimicrobial regimen should be narrowed as soon as the pathogen has been identified and sensitivities are known. The duration of therapy will depend on the nature of the infection and other considerations specific to a given case. As a general rule, a 7- to 10-day course of bactericidal antimicrobial therapy is considered adequate for most serious infections associated with sepsis [72]. In the event that the syndrome is due to something other than an infectious cause, such as trauma, antibiotics should be discontinued as soon as possible.

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16 . Which drug is the first choice vasopressor to restore blood pressure and perfusion in the patient with septic shock?

A) Dobutamine
B) Phenylephrine
C) Norepinephrine
D) Chlorpromazine

DIAGNOSIS AND MANAGEMENT

Historically, norepinephrine, dopamine, and epinephrine were three inotrope-vasopressor used to correct hypotension in septic shock [53]. Based on comparison studies and a meta-analysis of six randomized trials, norepinephrine is considered superior to dopamine and is now the recommended first choice for vasopressor therapy in septic shock (grade strong, B) [65,70,72]. If a second agent is needed to maintain blood pressure, epinephrine is preferred (grade 2B). Dopamine is not recommended, as there are concerns that side effects (e.g., tachyarrhythmia) may be detrimental to patients in septic shock. Low-dose dopamine should not be used for renal protection [72]. For patient safety and effectiveness, intravenous vasopressor therapy should be administered via a central venous catheter.

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17 . If corticosteroids are used in the management of sepsis, the recommended regimen in adults is

A) oral deflazacort 0.9 mg/kg once daily.
B) oral dexamethasone 2 mg/kg to a maximum dose of 80 mg.
C) IV methylprednisolone 400 mg per day by continuous infusion.
D) IV hydrocortisone 200 mg per day, in divided doses or by continuous infusion.

DIAGNOSIS AND MANAGEMENT

The patient with persistent hypotension despite fluids and vasopressors should be assessed for adrenal responsiveness and may benefit from corticosteroid therapy. If corticosteroids are to be given, the 2016 SCCM guideline suggests IV hydrocortisone at a dose of 200 mg per day, in divided doses or by continuous infusion (grade weak, D) [72]. In 2017, a multispecialty task force of 16 international experts in critical care medicine, endocrinology, and guideline methods, all members of the SCCM and/or the European Society of Intensive Care Medicine, published a guideline for the management of corticosteroid insufficiency in critically ill patients. This group suggests using IV hydrocortisone <400 mg/day for three or more days at full dose in patients with septic shock that is not responsive to fluid and moderate- to high-dose vasopressor therapy. They suggest not using corticosteroids in adult patients with sepsis without shock [73].

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18 . Red blood cell transfusion is recommended for patients with sepsis when the hemoglobin level falls below

A) 7.0 g/L.
B) 7.5 g/L.
C) 10 g/L.
D) 11.5 g/L.

DIAGNOSIS AND MANAGEMENT

In some cases, blood product administration may be required. The 2016 guideline recommends RBC transfusion if the hemoglobin level falls below 7.0 g/L [72]. The routine use of erythropoietin is not recommended for treatment of anemia in patients with sepsis unless other conditions are present, such as the compromise of red blood cell production induced by renal failure. Prophylactic platelet transfusion is suggested when the platelet count is <10,000/mm^3 (10 × 10^9/L) in the absence of apparent bleeding and when counts are <20,000/mm^3 (20 × 10^9/L) if the patient has a significant risk of bleeding [72].

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19 . Diagnostic criteria for SIRS in children include

A) temperature of 36.5°C.
B) leukocyte count that is either elevated or depressed for the child's age.
C) tachycardia greater than one standard deviation above normal for the child's age.
D) mean respiratory rate greater than one standard deviation above normal for the child's age.

PEDIATRIC CONSIDERATIONS

The panel's definition of SIRS for children includes the presence of at least two of the following criteria (one of which must be abnormal temperature or leukocyte count) [51]:

- Core temperature greater than 38.5°C or less than 36°C (measured by rectal, bladder, oral, or central catheter probe). Hypothermia may indicate serious infection (especially in infants).
- Tachycardia greater than two standard deviations above normal for the child's age in the absence of external stimulus; or unexplained persistent elevation over a four-hour time period; or, for children younger than 1 year of age, bradycardia (as defined by the panel); or unexplained persistent depression over a 30-minute time period. Bradycardia is not a sign of SIRS in older children but may be a sign in the newborn.
- Mean respiratory rate greater than two standard deviations above normal for the child's age or mechanical ventilation
- Leukocyte count that is either elevated or depressed for the child's age; or greater than 10% immature neutrophils

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20 . In hyperdynamic pediatric septic shock, the child has

A) bounding pulses.
B) delayed capillary refill. Hypo
C) mottled, cool extremities. Hypo
D) no need for fluid replacement. both need

PEDIATRIC CONSIDERATIONS

Clinically, pediatric septic shock takes two forms. In hyperdynamic shock, the child has rapid capillary refill and bounding pulses. In hypodynamic shock, there is prolonged capillary refill, mottled cool extremities, and diminished pulses. In both types, immediate resuscitation involves maintaining necessary circulation with fluid replacement, assuring proper ventilation, and maintaining threshold heart rates. Suggested therapeutic end points include a capillary refill of less than two seconds, warm extremities, urine output greater than 1 mL/kg/hr, normal blood pressure, normal mental status, and normal pulses with no differential between peripheral and central pulses. Frequent monitoring is required as rapid changes may occur in the status of a child with sepsis [52,53].
