### 1. The estimated 1.6 million to 3.8 million traumatic brain injuries (TBIs) that occur nationally each year occur during:

a. motor vehicle accidents.
b. falls.
c. sports competitions.
d. combat operations.

### 2. The annual mild TBI rate among U.S. soldiers has climbed an average of ______ % annually between 1997 and 2007.

a. 8.5  
b. 15  
c. 19.5  
d. 38

### 3. Boys aged ______ years have the highest sex-specific rates for TBI hospitalizations and deaths.

a. 0 to 4  
b. 5 to 9  
c. 10 to 14  
d. 15 to 19

### 4. The U.S. Centers for Disease Control and Prevention (CDC) noted a 62% increase in ______-related TBI visits to emergency departments between 2002 and 2006.

a. motor vehicle accident  
b. fall  
c. sports competition  
d. combat operation

### 5. According to a CDC study, male prisoners had ______ history of TBI when compared to female inmates, including injuries sustained during incarceration and those occurring prior to incarceration.

a. no  
b. a lower  
c. the same  
d. a higher

---

**To earn continuing education credit:**

- Take this Directed Reading quiz online at www.asrt.org/drquiz.
- Or, transfer your responses to the answer sheet on Page 296CT and mail to ASRT, PO Box 51870, Albuquerque, NM 87181-1870.

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*Your answer sheet for this Directed Reading must be received in the ASRT office on or before this date.

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Read the preceding Directed Reading and choose the answer that is **most correct** based on the article.

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*continued on next page*
6. Evidence suggests that people who experienced a TBI have more than 4.6-times the risk of developing _______ than people with no recent history of TBI.
   a. brain cancer
   b. post-traumatic stress disorder
   c. excitotoxicity
   d. clinical depression

7. It is unclear whether _______ may initially result from early, undiagnosed TBIs, or whether these predispose some people to accidents resulting in TBI or both.
   a. aneurysms
   b. strokes
   c. seizures
   d. cluster headaches

8. More than _______ % of adult TBI patients had alcohol in their bloodstream at the time of diagnosis, according to a 1989 study.
   a. 10
   b. 30
   c. 50
   d. 70

9. The anterior of the brain is composed of the frontal and _______ lobes.
   a. occipital
   b. temporal
   c. parietal
   d. cerebellar

10. Neuron cell bodies and dendrites make up the brain’s:
    a. glial scaffolding.
    b. myelin insulation.
    c. gray matter.
    d. white matter.

11. Focal TBI results from:
    1. skull fractures.
    2. contusions.
    3. lacerations.
    a. 1 and 2
    b. 1 and 3
    c. 2 and 3
    d. 1, 2, and 3

12. Forces on brain tissue may be exerted as _______ strain.
    1. compressive
    2. tensile
    3. shearing
    a. 1 and 2
    b. 1 and 3
    c. 2 and 3
    d. 1, 2, and 3

13. Primary _______ may occur at both the point of impact or opposite the point of impact, representing a “counter-coup” injury.
    a. depressed skull fractures
    b. linear skull fractures
    c. contusions
    d. axonal shearing

14. Widespread _______ can cause separation of white and gray matter, profoundly disrupting brain function.
    a. skull fractures
    b. deceleration injury
    c. contusions
    d. axonal shearing
15. Uncontrolled release of ______ damaged neurons causes excitotoxicity, or damage to neurons caused by overactivation.
   a. sodium
   b. glutamate
   c. dopamine
   d. serotonin

16. ______ affects up to 33% of patients, according to a recent meta-analysis, though the molecular mechanisms underlying its occurrence in TBI patients is not well understood.
   a. Aneurysm
   b. Hemorrhage
   c. Coagulopathy
   d. Herniation

17. ______ is a secondary TBI that can lead to cardiac arrhythmias, paralysis, coma, or death.
   a. Aneurysm
   b. Hemorrhage
   c. Coagulopathy
   d. Herniation

18. According to the article, 96% of patients with ______ TBI and 84% of patients with ______ TBI suffer persistent symptoms, such as headache or memory impairment, 3 months after injury.
   a. moderate; mild
   b. moderate; severe
   c. severe; mild
   d. severe; moderate

19. Extracranial injury roughly ______ the risk of death in TBI patients.
   a. equates
   b. doubles
   c. triples
   d. quadruples

20. ______ is the preferred imaging modality for initial TBI assessment.
   a. Computed tomography (CT)
   b. CT angiography (CTA)
   c. CT perfusion (CTP)
   d. Magnetic resonance (MR)

21. Advances have made ______ a viable alternative modality for nonemergent assessment of diffuse axonal injury.
   a. CT
   b. CTA
   c. CTP
   d. MR

22. CT sensitively visualizes acute hemorrhage and subdural hematomas as hypodense foci, and edema and ischemia as hyperdense foci.
   a. true
   b. false

23. Under the Trauma Coma Databank assessment scheme, brain swelling with midline ventricles compressed or absent, but without high- or mixed-density lesions larger than 25 cc, represents which class of TBI?
   a. diffuse injury I
   b. diffuse injury II
   c. diffuse injury III
   d. diffuse injury IV

24. The correlation of Glasgow Coma Scale (GCS) and Trauma Coma Databank scores is strongest during the first ______ hours after TBI.
   a. 6
   b. 24
   c. 48
   d. 72

directed reading quiz continued on next page
25. ______ are a red flag for the possible damage to the brain’s dural membrane, which can increase the patient’s risk of infection.
   a. Depressed skull fractures
   b. Linear skull fractures
   c. Contusions
   d. Concussions
Thank you for taking the time to complete this evaluation. Your opinion helps us serve you better. Your comments will remain confidential and will not affect the scoring of your Directed Reading (DR) test. **Choose only ONE response for each question.** Use a blue or black ink pen. Do not use felt tip markers. Completely fill in the circles.

1. **Why did you choose to complete this DR?**
   - O Interested in the topic
   - O Topic pertained to my area of practice
   - O Needed CE credits immediately
   - O Other

2. **How relevant is this DR to your practice?**
   - O Very relevant
   - O Relevant
   - O Somewhat relevant
   - O Not relevant

3. **How beneficial is this DR to your professional or personal development?**
   - O Very beneficial
   - O Beneficial
   - O Somewhat beneficial
   - O Not beneficial

4. **How would you rate the level of difficulty of this DR?**
   - O Too difficult
   - O Somewhat difficult
   - O Just the right level
   - O Somewhat easy
   - O Too easy

5. **How would you rate the length of this DR?**
   - O Too long
   - O Somewhat long
   - O Just the right length
   - O Somewhat short
   - O Too short

6. **Did this DR meet your expectations?**
   - O Yes
   - O Partially
   - O No

7. **Would you recommend this DR to a colleague?**
   - O Yes
   - O No

8. **Overall, how valuable are the DRs to you?**
   - O Very valuable
   - O Valuable
   - O Somewhat valuable
   - O Not very valuable

If you have comments or questions about this Directed Reading, please write them below or send them separately to Ellen Lipman, Director of Professional Development, ASRT, 15000 Central Ave SE, Albuquerque, NM 87123-3909 or elipman@asrt.org.
Computed Tomography Imaging of Traumatic Brain Injury

-- A passing score is 75% or better.
-- Take the quiz online at www.asrt.org/drquiz for immediate results and your CE certificate.
-- Or, mail the original answer sheet to ASRT, PO Box 51870, Albuquerque, NM 87181-1870.
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USE A BLUE OR BLACK INK PEN. Completely fill in the circles.

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Note: For true/false questions, A=true, B=false.

1 O O O O O
2 O O O O O
3 O O O O O
4 O O O O O
5 O O O O O
6 O O O O O
7 O O O O O
8 O O O O O
9 O O O O O
10 O O O O O

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1. In most cases, the blood clots that result in pulmonary embolism (PE) originate in:
   a. the lungs.
   b. local tumors.
   c. the heart.
   d. leg and pelvic arteries.

2. Up to ______ % of hospital deaths are PE-associated, making PE the leading preventable cause of hospital deaths.
   a. 5
   b. 10
   c. 15
   d. 20

3. Which of the following conditions can cause PE?
   1. atherosclerotic plaque
   2. gas
   3. talc used in street narcotics
   a. 1 and 2
   b. 1 and 3
   c. 2 and 3
   d. 1, 2, and 3

4. Computed tomography pulmonary angiography (CTPA) is an appropriate screening tool for patients at low risk of PE.
   a. true
   b. false

5. Estimated PE incidence rates increase with age, climbing from ______ cases per 100 000 children to up to ______ cases per 100 000 adults aged 75 years or older.
   a. 5; 300
   b. 5; 600
   c. 10; 300
   d. 10; 600

6. Among young adults, the risk of venous thromboembolism is higher for ______ because of their ______.
   a. men; higher likelihood of traumatic injury
   b. women; higher prevalence of autoimmune disorders
   c. men; higher smoking rates
   d. women; oral contraceptive use and risks during and soon after pregnancy

continued on next page
7. Up to ______ % of patients who die of PE were previously undiagnosed with the condition.
   a. 20
   b. 40
   c. 60
   d. 80

8. ______ patients face up to 700% the risk of symptomatic venous thromboembolism as other adults.
   a. Diabetes
   b. Cancer
   c. Stroke
   d. Asthma

9. Risk factors for PE include:
   1. certain autoimmune diseases.
   2. long-distance air travel.
   3. central venous catheters.
   a. 1 and 2
   b. 1 and 3
   c. 2 and 3
   d. 1, 2, and 3

10. The segmental pulmonary arteries represent the ______ order of the pulmonary arterial network.
    a. first
    b. second
    c. fourth
    d. fifth

11. Virchow’s triad of PE, named after 19th century German pathologist Rudolf Virchow, consists of which biological components?
    1. altered blood flow
    2. vessel wall damage
    3. right ventricular strain
    a. 1 and 2
    b. 1 and 3
    c. 2 and 3
    d. 1, 2, and 3

12. The clinical and prognostic importance of ______-order emboli remains unclear and controversial.
    a. first
    b. second
    c. fourth
    d. fifth

13. PE-associated pulmonary infarction is associated with pre-existing:
    a. heart disease.
    b. diabetes.
    c. myeloproliferative disorders.
    d. genetic disorders.

14. Most patients who die of PE are killed by ______ failure of the heart.
    a. right atrial
    b. left atrial
    c. right ventricular
    d. left ventricular

15. Chronic thromboembolic pulmonary hypertension involves pulmonary artery blood pressures of ______mm Hg.
    a. 25
    b. 30
    c. 35
    d. 40

16. ______ is the most common clinical symptom of PE but is frequently absent, even in life-threatening cases.
    a. Dyspnea
    b. Hypoxia
    c. Tachycardia
    d. Hemoptysis

continued on next page
17. Massive PE can result in right ventricular dysfunction, which may be accompanied by:
   1. peripheral edema.
   2. a distended jugular vein.
   3. abnormal heartbeat sounds.
   a. 1 and 2
   b. 1 and 3
   c. 2 and 3
   d. 1, 2, and 3

18. Of the widely used clinical probability assessment tests for PE, studies suggest the ______ test offers lower specificity than the others, possibly contributing to overdiagnosis.
   a. Wells
   b. traditional Geneva
   c. simplified Wells
   d. revised Geneva

19. Which clinical probability assessment test for PE requires a current chest radiograph?
   a. Wells
   b. Geneva
   c. simplified Wells
   d. revised Geneva

20. Patients with a _______ clinical probability of PE should undergo diagnostic imaging regardless of D-dimer test results because of a 10% false-negative D-dimer test rate.
   a. low
   b. intermediate
   c. high
   d. undetermined

21. Thrombolytic drugs such as _______ frequently are prescribed for patients with massive PE and cardiac shock.
   a. heparin
   b. warfarin
   c. fondaparinux
   d. urokinase

22. Ventilation-perfusion (V/Q) scintigraphy can neither confirm nor exclude PE in up to ______ % of patients.
   a. 20
   b. 40
   c. 60
   d. 80

23. A recent multihospital study found magnetic resonance angiography (MRA) image quality to be inadequate for PE diagnosis in up to ______ % of exams.
   a. 32
   b. 42
   c. 52
   d. 62

24. In patients with suspected PE, the medical justification for the additional irradiation associated with ______ is unclear and controversial as a follow-up to negative PE results from multidetector CTPA.
   a. CT venography
   b. MRA
   c. compression ultrasonography
   d. V/Q scintigraphy

25. Compression ultrasonography specificity for deep vein thrombosis in symptomatic patients exceeds ______ %.
   a. 25
   b. 53
   c. 75
   d. 93

continued on next page
26. Several recent studies found that PE is diagnosed in fewer than 10% of the patients who undergo _______ for suspected PE.
   a. CT venography
   b. CTPA
   c. compression ultrasonography
   d. V/Q scintigraphy

27. As many as 1 in 2000 patients tested for PE with CTPA may eventually experience malignancies attributable to the CTPA exam.
   a. true
   b. false

28. With 16-detector CTPA, collimation should be 0.625 mm to 1 mm, with a rotation time of _______ seconds.
   a. 0.37 to 0.42
   b. 0.47 to 0.52
   c. 0.57 to 0.62
   d. 0.67 to 0.72

29. Select the option that lists the materials in order from lowest to highest Hounsfield units.
   a. air, fat, water, muscle, iodinated contrast material
   b. air, water, iodinated contrast material, fat, muscle
   c. water, air, fat, muscle, iodinated contrast material
   d. iodinated contrast material, muscle, fat, water, air

30. Acute PE frequently is associated with _______ on CTPA images.
   a. high attenuation filling defects
   b. wedge-shaped lucencies
   c. ancillary linear bands
   d. internal lucencies
Directed Reading Evaluation
CT of Pulmonary Embolism

1. Why did you choose to complete this DR?
   ○ Interested in the topic  ○ Topic pertained to my area of practice
   ○ Needed CE credits immediately  ○ Other

2. How relevant is this DR to your practice?
   ○ Very relevant  ○ Relevant  ○ Somewhat relevant  ○ Not relevant

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4. How would you rate the level of difficulty of this DR?
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Computed Tomography of Pulmonary Embolism

Expires: December 31, 2014
Approved for 2.0 Category A+ CE Credits

--- A passing score is 75% or better.
--- Take the quiz online at www.asrt.org/drquiz for immediate results and your CE certificate.
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Note: For true/false questions, A=true, B=false.

1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20
21 22 23 24 25 26 27 28 29 30

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