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THE JOURNAL OF BONE & JOINT SURGERY  
CONTINUING MEDICAL EDUCATION

CME

REVIEW QUESTIONS

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JULY, AUGUST, SEPTEMBER  
2004

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THE DEADLINE TO SUBMIT YOUR ANSWERS FOR GRADING THIS SET OF QUESTIONS IS JANUARY 15, 2005.

## PURPOSE

The purposes of this CME program are:

- To provide the general orthopaedic surgeon with an ability to assess his or her continuing competence in orthopaedics through the acquisition of contemporary scientific information.
- To provide a broad-based review and update of the major subspecialty areas in orthopaedics.
- To make *The Journal* reader aware of new advances in orthopaedic surgical techniques and technology.

## INSTRUCTIONS

In order to benefit most from this educational experience and qualify for Continuing Medical Education credit, please observe the following instructions:

1. Read the learning objectives listed on the Response Form and be certain that they meet your individual learning needs.
2. These CME questions have been derived from the information presented in the July, August, and September issues of the American volume of *The Journal of Bone and Joint Surgery* (Volume 86-A, Numbers 7, 8, and 9). A careful study of each article should yield the best response to each question.
3. Read each question carefully, identify the best answer, and record that answer on the CME Response Form in the back of this document.
4. To receive CME credit, it is absolutely essential that you complete all portions of the attached Response Form and answer each question.
5. In order for the American Academy of Orthopaedic Surgeons to document your participation in the CME activity, Academy Fellows must provide their AAOS membership number in the designated area on the Response Form.
6. In addition to providing the answers to the CME questions, you must complete the examination evaluation questions. These questions are found on the Response Form. The way you answer these evaluation questions will not in any way affect the score that you achieve.
7. All completed answer sheets will be graded, and you will be advised of the results of this examination within four weeks after it is received. In order to qualify for CME credit, a score of more than 50% correct must be achieved on the examination. A charge of \$30 per quarter, or \$110 per year, must be paid at the time that the answer sheet is submitted. **The deadline to submit your answers for grading this set of questions is January 15, 2005.**

1. **Which of the following is independently predictive of nonunion after a fracture of the midpart of the shaft of the clavicle?**
  - A. a history of excess alcohol consumption
  - B. patient compliance
  - C. magnitude of fracture displacement
  - D. high-energy mechanism of injury
  - E. more than two medical comorbidities
2. **A fifty-three-year-old woman with rheumatoid arthritis presents with shoulder pain. She has had a previous rotator cuff repair. On examination, her shoulder is stiff, weak, and painful. Radiographs indicate medial glenoid erosion. Expert cuff sonography shows the absence of the supraspinatus tendon. Which of the following factors would be least likely to influence the result of a prosthetic humeral hemiarthroplasty?**
  - A. history of shoulder surgery
  - B. cuff integrity
  - C. diagnosis of rheumatoid arthritis
  - D. gender
  - E. erosion of glenoid bone
3. **The carpometacarpal joint of the thumb is a common site of osteoarthritis. Which of the following has been shown to be a strong determinant of thumb carpometacarpal osteoarthritis?**
  - A. alcohol intake
  - B. workload
  - C. smoking
  - D. educational level
  - E. body mass index
4. **The primary difference between a stem cell and a progenitor cell is the capacity of the stem cell to:**
  - A. proliferate and be expanded in culture
  - B. differentiate into more than one type of cell
  - C. "self-renew," or regenerate cells like itself
  - D. proliferate rapidly in response to an injury
  - E. generate new tissue
5. **Which of the following statements is correct concerning a clinical prediction rule that was developed to differentiate between septic arthritis and transient synovitis of the hip in children?**
  - A. clinical prediction rules usually demonstrate identical diagnostic performance in a new patient group compared with the original group from which the rule was derived
  - B. clinical prediction rules are meant as rigid guidelines to replace clinical judgment
  - C. clinical prediction rules can be validated within the original patient group through sampling methods such as bootstrapping but are best validated in a new patient group

- D. clinical prediction rules should be modified by anecdotal experience
- E. treatment should be strictly based on the clinical prediction rule without regard to atypical patients or unusual presentations
- 6. Factors that were significant predictors of a poor self-reported functional outcome following below-the-knee, through-the-knee, and above-the-knee amputations for traumatic injuries were:**
- A. timing of the amputation
- B. type of soft-tissue coverage and muscle anchorage
- C. technological sophistication of the prosthesis
- D. non-white race, less than a college education, preexisting medical conditions, smoking, and ipsilateral injury
- E. self-selected walking speeds
- 7. A promising use of preoperative tumor-marking guided by magnetic resonance imaging is to facilitate the surgical excision of:**
- A. clinically visible, well-defined, and sharply demarcated tumors
- B. tumors with characteristic radiographic features (e.g., a simple bone cyst)
- C. tumors well seen on fluoroscopy, sonography, or computer tomography
- D. clinically occult or insufficiently depicted tumors
- E. clinically occult tumors in patients with ferromagnetic fragments or clips near large vessels
- 8. Historically, flatback syndrome has been most commonly associated with the use of Harrington distraction instrumentation. Which factor associated with Harrington-type spinal fusion most significantly affects the loss of lumbar lordosis and the risk of subsequent flatback syndrome?**
- A. failure to utilize compression instrumentation on the convex side of the curve
- B. the distal extent of the instrumentation and fusion
- C. inadequate rod-contouring
- D. failure to use a squared-end rod to prevent rotation following contouring
- E. the magnitude of the distraction force or forces
- 9. It is a common practice to perform aspiration of the knee prior to proceeding with revision total knee arthroplasty. A recent study showed that the minimum threshold that is highly suggestive of infection was:**
- A. a white blood-cell count of  $>2500$  cell/mm<sup>3</sup> ( $>2.5 \times 10^9$ /L) with  $>60\%$  polymorphonuclear cells
- B. a white blood-cell count of  $>12,000$  cell/mm<sup>3</sup> ( $>12.0 \times 10^9$ /L) with  $>60\%$  polymorphonuclear cells
- C. a white blood-cell count of  $>25,000$  cell/mm<sup>3</sup> ( $>25.0 \times 10^9$ /L) with  $>70\%$  polymorphonuclear cells
- D. a white blood-cell count of  $>50,000$  cell/mm<sup>3</sup> ( $>50.0 \times 10^9$ /L) with  $>80\%$  polymorphonuclear cells
- E. a white blood-cell count of  $>80,000$  cell/mm<sup>3</sup> ( $>80.0 \times 10^9$ /L) with  $>90\%$  polymorphonuclear cells
- 10. A seventy-five-year-old woman is planning to have a total knee replacement for advanced osteoarthritis. She asks about the risk of dying from the procedure. You should tell her that, while the risk of death varies depending on patient and hospital factors, in the Medicare population the average mortality in the first ninety days following primary total knee replacement is about:**
- A. one in 100,000 to 200,000
- B. one in 10,000 to 20,000
- C. one in 1000 to 2000
- D. one in 100 to 200
- E. one in ten to twenty
- 11. The risk of death during the first thirty days following a hip arthroplasty performed for fracture is higher in:**
- A. patients with intertrochanteric fracture
- B. patients over seventy years of age
- C. patients with prior cardiorespiratory illnesses
- D. arthroplasty performed with cement
- E. all of the above
- 12. When impaction bone-grafting is used in revision total joint arthroplasty, which of the following was found to be most important in optimizing the mechanical performance of morselized bone graft?**
- A. the addition of biological induction agents (e.g., OP-1)
- B. increasing the porosity of the compacted graft
- C. avoiding the use of frozen bone graft
- D. the degree of graft compaction achieved
- E. the use of commercially available bone mills
- 13. Increased levels of molecular crosslinking of polyethylene are associated with:**
- A. increased wear rates
- B. increased fracture toughness
- C. increased tensile strength
- D. increased oxidative resistance
- E. decreased resistance to crack propagation
- 14. In a comparison of the short-term results of patients who underwent a mini-incision total hip arthroplasty (incision length  $\leq 10$  cm) and those who underwent a total hip arthroplasty with a standard incision, the mini-incision technique was found to:**
- A. be less invasive

- B. result in more frequent discharge to the patient's home rather than transfer to a rehabilitation center or skilled nursing facility
- C. result in a smaller scar
- D. be associated with a shorter hospital stay
- E. be associated with the need for less postoperative pain medication
- 15. When patients with arm pain of uncertain cause (idiopathic arm pain) were compared with patients with arm pain with a discrete, known cause, the DASH scores were:**
- A. higher and more variable for patients with discrete pain
- B. higher and more variable for patients with idiopathic pain
- C. similar but less variable for patients with idiopathic pain
- D. widely variable for patients with both types of pain
- E. indicative of the need for psychologic counseling
- 16. In a recent study, the prevalence of cervical instability great enough to be associated with neurologic compromise in patients with rheumatoid arthritis who undergo total joint arthroplasty was found to be:**
- A. 5% to 10%
- B. 11% to 15%
- C. 16% to 20%
- D. 26% to 30%
- E. 31% to 35%
- 17. Radiographic thumb carpometacarpal osteoarthritis is underdiagnosed in clinical practice because:**
- A. it is difficult to diagnose
- B. it is rare
- C. it seldom causes disability
- D. it is seldom symptomatic
- E. it is not worth treating
- 18. In the perioperative period, transfusion is generally indicated for signs of tachycardia, hypotension, or low urinary output only after:**
- A. the circulating blood volume has been normalized
- B. the hemoglobin level drops below 10 g/dL
- C. the drain output reaches 150 mL
- D. the patient is unable to comply with physical therapy secondary to fatigue
- E. a history of cardiac problems has been confirmed
- 19. The use of thoracic pedicle screws for treatment of idiopathic adolescent scoliosis has been shown to be associated with:**
- A. the need to fuse more segments
- B. a lower prevalence of perioperative neurologic deficits
- C. more room for decortication and bone-grafting
- D. improved segmental purchase
- E. higher infection rates
- 20. When medial knee motion in female athletes in the late postpubertal stage was compared with medial knee motion in male athletes in the same stage, the female athletes were found to have:**
- A. greater dynamic valgus of the knee
- B. greater neuromuscular control
- C. greater dynamic knee stability
- D. greater relative hamstrings strength
- E. decreased medial knee motion at landing
- 21. Following fracture of the neck of the talus, which of the following is least likely to be associated with subsequent osteonecrosis?**
- A. an open fracture
- B. comminution of the talar neck
- C. a delay before operative treatment of seventy-two to ninety-six hours
- D. a Hawkins type-III fracture
- E. a history of alcohol abuse
- 22. In comparison with a low-stiffness construct for anterior cruciate ligament reconstruction, an advantage of a high-stiffness graft construct is that:**
- A. there is less morbidity associated with the harvest of the graft
- B. there is a lower possibility of infection
- C. postoperative rehabilitation is accelerated
- D. the risk of recurrent anterior-posterior instability is decreased
- E. the duration of surgery is decreased
- 23. When patients with an isolated congenital hemivertebra were assessed with magnetic resonance imaging, the prevalence of associated intraspinal anomalies was found to be:**
- A. <1%
- B. 10%
- C. 25%
- D. 50%
- E. >80%
- 24. In a kinematic study of the intact knee, the magnitude of posterior femoral translation in high flexion was most influenced by:**
- A. anterior cruciate ligament tension
- B. posterior cruciate ligament tension
- C. posterior soft-tissue compression
- D. internal rotation of the tibia
- E. tibiofemoral articular geometry
- 25. In a cadaver study, which of the following treatment options most closely restored elbow kinematics following a combined comminuted radial head fracture and ligament injury?**

- A. radial head excision  
 B. radial head excision combined with ligament repair  
 C. ligament repair alone  
 D. radial head arthroplasty combined with ligament repair  
 E. radial head arthroplasty alone
- 26. Which of the following nonoperative treatment modalities has been shown to be no better than a placebo in a controlled trial?**
- A. physical therapy  
 B. chiropractic manipulation  
 C. nonsteroidal anti-inflammatory drugs  
 D. selective steroid injections  
 E. transcutaneous electrical nerve stimulation (TENS)
- 27. The primary dorsal blood supply to the cuboid is supplied by a branch of which of the following arteries?**
- A. anterior lateral malleolar artery  
 B. proximal lateral tarsal artery  
 C. proximal medial tarsal artery  
 D. distal lateral tarsal artery  
 E. distal medial tarsal artery
- 28. Which of the following is the earliest abnormal magnetic resonance imaging finding of osteonecrosis of the femoral head?**
- A. bone-marrow-edema pattern  
 B. abnormal signal-intensity band  
 C. magnetic resonance crescent sign  
 D. joint effusion  
 E. signal change on the acetabular side
- 29. After reconstruction of the anterior cruciate ligament with autologous gracilis and semitendinosus muscles, the postoperative muscle volume in patients returning to full activities was found to be:**
- A. strongly related to postoperative tendon length  
 B. strongly related to total postoperative muscle-tendon length  
 C. not related to total postoperative muscle-tendon length  
 D. unaffected by the use of the tendons as graft material  
 E. none of the above
- 30. In an animal model, infraspinatus tendon release and delayed repair was associated with which of the following muscle changes:**
- A. increased elasticity of the musculotendinous unit  
 B. permanent degeneration of the muscle fibers within the respective musculotendinous unit  
 C. accumulation of intracellular fat  
 D. accumulation of intercellular fat  
 E. an irreversible decrease of muscle fiber diameter within the respective musculotendinous unit
- 31. In comparison with the results of operative correction of adolescent idiopathic scoliosis in female patients, the operation in male patients was found to result in:**
- A. greater coronal plane correction, greater blood loss, less operative time, and a lower prevalence of complications  
 B. less coronal plane correction, greater blood loss, shorter operative time, and a higher prevalence of complications  
 C. greater coronal plane correction, greater blood loss, longer operative time, and a lower prevalence of complications  
 D. greater coronal plane correction, greater blood loss, longer operative time, and a similar prevalence of complications  
 E. less coronal plane correction, greater blood loss, longer operative time, and a similar prevalence of complications
- 32. All stem cells:**
- A. have a limited capacity for self-renewal  
 B. have the ability to fuse to other cells  
 C. are multipotent (can differentiate into several cell types) or totipotent (can differentiate into all cell types)  
 D. express the cell surface marker CD34  
 E. are derived from bone marrow
- 33. A histologic and immunohistochemical analysis of the subsynovial connective tissue from patients with carpal tunnel syndrome showed:**
- A. type-I collagen  
 B. type-III collagen  
 C. type-VI collagen  
 D. TGF- $\beta$  receptor  
 E. B and D
- 34. Which of the following modalities is considered the gold standard for diagnosing and staging intra-articular etiologies of ulnar-sided wrist pain?**
- A. magnetic resonance imaging with gadolinium arthrography  
 B. three-phase or triple-phase arthrography  
 C. diagnostic anesthetic injections  
 D. wrist arthroscopy  
 E. three-phase bone scan
- 35. When compared with the general population, obese patients treated with total knee arthroplasty are likely to have:**
- A. more perioperative complications  
 B. more late patellofemoral complications  
 C. poorer outcomes at two years postoperatively

- D. poorer outcomes at more than six years post-operatively  
E. no differences in outcomes
- 36. Which of the following statements most accurately describes the anatomic relationships of the peroneal nerve at the level of the proximal part of the tibia?**
- A. as the nerve passes around the head of the fibula and enters the lateral compartment of the leg, all of its branches describe a circular trajectory with a radius of 4.5 cm  
B. as the nerve passes around the head of the fibula and enters the lateral compartment of the leg, only its proximal branches describe a circular trajectory with a radius of 4.5 cm  
C. the nerve and its branches describe a circular trajectory around Gerdy's tubercle with a constant radius of 4.5 cm  
D. the nerve and its branches describe a circular trajectory around Gerdy's tubercle. The radius of this circle is proportional to the distance from Gerdy's tubercle to the posterior aspect of the head of the fibula  
E. the peroneal nerve and its branches are located within a 4.5 cm circle around Gerdy's tubercle
- 37. In patients who underwent hip arthroplasty for metastatic disease of the hip, improved patient survival was most closely associated with which of the following?**
- A. male gender  
B. a lack of postoperative complications  
C. a diagnosis of metastatic cancer of the lung  
D. a metastasis confined to the acetabulum  
E. a short time-interval between the diagnosis of the primary tumor and impending prosthetic fracture
- 38. A seven-year-old girl presents with posterior neck pain of two weeks' duration. She can point to a specific location of maximal pain. She reports that she has no upper-extremity weakness or clumsiness. The neck range of motion is limited by pain in extension but is otherwise normal. She has no other musculoskeletal symptoms, and the remainder of findings of the physical examination are normal. Radiographs show a grade-IIB collapsed C5 vertebral body with preservation of the disc space and spinal alignment. What would be the next appropriate step in your clinical evaluation of this patient?**
- A. computed tomography scan  
B. magnetic resonance imaging scan  
C. technetium bone scan  
D. biopsy  
E. no further evaluation is needed
- 39. Low-back pain is the leading cause of disability in those under forty-five years of age.**
- The reported chance of a patient returning to work after two years of disability is:**
- A. <50%  
B. <25%  
C. <10%  
D. <5%  
E. <1%
- 40. Magnetic resonance imaging after total hip arthroplasty:**
- A. is of limited value because of metal-induced artifact  
B. can be used to assess intraosseous osteolysis but not soft-tissue extension  
C. has no advantages over computerized tomography in the evaluation of periprosthetic osteolysis  
D. can be used to assess soft-tissue extension of osteolysis but not intraosseous destruction  
E. can be used to assess osteolysis associated with both cobalt-chromium and titanium metal implants, with less artifact about titanium implants
- 41. How do cartilage matrix degradation products such as fragments of fibronectin or denatured type-II collagen induce chondrocyte-mediated cartilage destruction (chondrolysis)?**
- A. by stabilizing the chondrocyte phenotype  
B. by preventing normal chondrocyte cell turnover  
C. by integrin-mediated activation of matrix metalloproteinases (MMPs)  
D. by induction of tissue inhibitors of matrix metalloproteinases (TIMPs)  
E. by increasing cartilage stiffness
- 42. In a vascularized proximal fibular epiphyseal transfer for distal radial reconstruction in skeletally immature patients, which of the following arteries was found to be the best feeding pedicle of the proximal fibular epiphysis?**
- A. the peroneal artery  
B. the anterior tibial artery  
C. the deep femoral artery  
D. the posterior tibial artery  
E. the saphenous artery
- 43. Although ulnar-sided wrist pain can constitute a diagnostic and treatment dilemma, an anatomically based examination can often elucidate the etiology of the pain. Which of the following symptoms or signs may be a normal variant?**
- A. pain with volar-to-dorsal compression of the pisiform on the triquetrum  
B. pain at the ulnocarpal joint with compression of the dorsal aspect of the ulnar shaft  
C. a click or clunk of the wrist while the patient voluntarily deviates the wrist radially and ulnarly

- D. pain with pushing off a chair handle  
E. atrophy of the intrinsic musculature of the hand
- 44. An open anterior elbow release is one of several ways to address an elbow flexion contracture. Which of the following, when combined with an anterior elbow release, has been shown to improve significantly the postoperative elbow arc of motion?**
- A. release of brachialis fascia  
B. capsulectomy rather than capsulotomy  
C. anterior and posterior incisions  
D. use of a continuous-passive-motion machine postoperatively  
E. extension splinting with adjunctive
- 45. Postoperative dislocation is one of the most common complications following a two-stage revision hip arthroplasty for infection. Which of the following factors has been shown to decrease the risk of this complication?**
- A. use of a transtrochanteric approach  
B. use of a temporary prosthesis in the interim period  
C. use of skeletal traction in the interim period  
D. use of a cemented acetabular socket  
E. use of a hip brace
- 46. When performing a surface arthroplasty of the hip, which aspect of surgical technique has been shown to be associated with a successful clinical outcome:**
- A. decreased femoral offset  
B. valgus positioning of the femoral component  
C. shortening of the femoral neck  
D. low femoral neck ratio  
E. notching of the lateral cortex of the femoral neck
- 47. Which of the following statements is most correct regarding combined dorsal and volar plate fixation of the distal part of the radius?**
- A. the fixation is sufficiently strong to allow immediate functional mobilization of the wrist so it is advisable even for simple extra-articular fractures
- B. the risks of osteonecrosis and nonunion are high  
C. it is useful for very complex fractures with extensive articular and metaphyseal comminution, but a second surgical procedure for removal of the dorsal plate is often requested  
D. the prevalence of deep infection is increased  
E. excessive hand swelling and stiffness limit the usefulness of the technique
- 48. Inferior subluxation of the fibular head may occur in association with:**
- A. generalized ligamentous laxity  
B. athletic activities  
C. tibial lengthening by distraction osteogenesis  
D. substantial trauma to the knee  
E. fracture of the tibial shaft
- 49. Which of the following statements is most correct regarding the results of operative treatment of femoral neck fractures in young patients between the ages of fifteen and fifty years old?**
- A. nonunion is the main reason for a reoperation  
B. osteonecrosis rates of <5% can be expected if excellent reduction is achieved in a timely fashion  
C. the femoral neck fracture is rarely associated with other orthopaedic and visceral injuries  
D. osteonecrosis is the main reason for conversion to total hip arthroplasty  
E. the ten-year survivorship of the native femoral head without conversion to total hip arthroplasty is <60%
- 50. In a review of surgical management of trapezius palsy, the most common cause of the palsy was found to be:**
- A. lymph node biopsy  
B. penetrating injury  
C. radial neck dissection  
D. thoracic outlet syndrome  
E. spontaneous palsy
- Conflict of Interest**  
The author of these CME questions does not have any financial conflict of interest with regard to the subject matter discussed in these review questions.

**RESPONSE FORM**

**EXAMINATION EVALUATION**

Did the October 2004 CME Review Questions meet these educational objectives\*:

1. Provide a broad-based review and update specifically in the areas of spine and knee surgery and orthopaedic research?  Yes  No
2. Strengthen your problem-solving abilities related to patient care particularly in the areas of the spine and the knee?  Yes  No
3. Make you aware of new advances in orthopaedic surgical techniques and technology?  Yes  No

Comments (please comment on the quality of the questions and their relationship to your practice): \_\_\_\_\_

\*Note: These objectives will change every quarter.

**SURVEY (optional)**

1. Which of the following best describes your practice type?
  - General orthopaedics
  - General orthopaedics with subspecialty interest
  - Exclusively subspecialty
  - Resident or student
  - Researcher
  - Other: \_\_\_\_\_
2. What are your specialty interests? Please rank in order of importance (1 = highest importance).
 

___ Adult	___ Spine
___ Geriatric	___ Hand
___ Pediatric	___ Rheumatology
___ Rehabilitation	___ Foot and Ankle
___ Sports	___ Other: _____
___ Trauma	
3. Which is your number-one priority to read when you receive *The Journal* (American volume only) each month?
  - Commercial advertising
  - Current Concepts
  - Classified advertising
  - Letters to The Editor
  - Clinical scientific articles
  - Basic scientific articles
  - Orthopaedic Forum
  - Instructional Course Lectures

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The deadline to submit your answers for grading this set of questions is January 15, 2005.

**QUESTIONS?**

Please contact the CME Division of *The Journal of Bone and Joint Surgery* at 781-449-9780 x124.

**ANSWER KEY**

**Black out the correct answers**

- |               |               |                                   |
|---------------|---------------|-----------------------------------|
| 1. A B C D E  | 18. A B C D E | 35. A B C D E                     |
| 2. A B C D E  | 19. A B C D E | 36. A B C D E                     |
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| 5. A B C D E  | 22. A B C D E | 39. A B C D E                     |
| 6. A B C D E  | 23. A B C D E | 40. A B C D E                     |
| 7. A B C D E  | 24. A B C D E | 41. A B C D E                     |
| 8. A B C D E  | 25. A B C D E | 42. A B C D E                     |
| 9. A B C D E  | 26. A B C D E | 43. A B C D E                     |
| 10. A B C D E | 27. A B C D E | 44. A B C D E                     |
| 11. A B C D E | 28. A B C D E | 45. A B C D E                     |
| 12. A B C D E | 29. A B C D E | 46. A B C D E                     |
| 13. A B C D E | 30. A B C D E | 47. A B C D E                     |
| 14. A B C D E | 31. A B C D E | 48. A B C D E                     |
| 15. A B C D E | 32. A B C D E | 49. A B C D E                     |
| 16. A B C D E | 33. A B C D E | 50. A B C D E                     |
| 17. A B C D E | 34. A B C D E | <b>CME Credits Claimed*</b> _____ |

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