AANA Journal Course No. 11
Examination Information

New technologies in anesthesia:
Update for nurse anesthetists

With this issue of the AANA Journal, the eleventh course has been completed.

The course consisted of a six-part series, beginning with the April 1991 issue and concluding in the February 1992 issue. The series was published as follows:

- Part I—(April 1991)—New technologies in anesthesia—Clonidine: An established drug with futuristic indications
- Part II—(June 1991)—New technologies in anesthesia—Monitoring ventilation and compliance with Side Stream Spirometry™
- Part III—(August 1991)—New technologies in anesthesia—Continuous spinal anesthesia
- Part IV—(October 1991)—New technologies in anesthesia—Noninvasive, continuous, cardiac output monitoring by thoracic electrical bioimpedance
- Parts V and VI—(February 1992)—Fundamentals of chest radiography: Techniques and interpretation for the anesthetist

Each article included a self-assessment quiz, along with a suggested reading list for reference and study.

The examination printed in this issue incorporates material from all five articles. The examination consists of 60 multiple-choice questions, 10 questions from each of the first four articles and 20 questions from the last article. The examination is clearly marked as to which questions refer to which article. Remember, as you are taking the examination, you are free to refer to the original articles. Note also that there is but one correct answer to be marked for each question.

About your Continuing Education Credit...

To ensure that a certain level of knowledge has been attained, a minimum of 70% correct answers (42 out of 60) must be achieved. A total of 6 hours of Continuing Education (CE) Credit will be awarded for the successful completion of the examination; partial continuing education will not be awarded.

Only those passing the examination will be notified by mail of the successful completion of the course. (The time of this mailing will be dependent on the volume of response; however, notification will be effected prior to the close of the CE Year—July 31, 1992.) AANA members will automatically have their 6 CE Credits recorded for them. Individuals with record-keeping contracts through the AANA will also have the credits recorded for them.

The correct answers to the examination will appear in the August 1992 issue of the AANA Journal. By keeping a copy of your answers, you will automatically be able to see how you scored.

How to fill out the answer sheet...

It is recommended that you first mark your answers on the examination itself (so that you have your own record). Then, transfer your answers in pencil to the answer sheet, which appears on the other side of this page. Be sure to include your name, address, and AANA identification number. (Non-AANA members should include a $30 processing fee—payable to the AANA: Journal Course—along with their examination answer sheet.)

Important deadline...

The examination answers must be postmarked by June 30, 1992. Adequate time must be allowed for the examination to be processed to ensure that all CE Credits are recorded prior to the end of the CE year. Mail your answer sheet to:

American Association of Nurse Anesthetists
216 Higgins Road
Park Ridge, Illinois 60068-5790
Attn: Journal Course

Much success...

We hope that you have found this eleventh AANA Journal course to be of value. We wish you well in its successful completion.
AANA Journal Course No. 11 Examination
New technologies in anesthesia:
Update for nurse anesthetists
(issued April 1992)

Please PRINT.

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□ If you are not an AANA member, check here. Be sure to enclose your $30 processing fee payable to AANA.

Please circle one response for each question.
For example, 36. 1 2 3 4 would indicate that the third alternative was chosen in response to question 36.
Please erase completely any changed responses.

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AANA Code No. 14294; Expiration date June 30, 1992
Please circle one response for each question. After you have marked your answers on this examination, transfer them to the answer sheet provided. Mail your answer sheet to: American Association of Nurse Anesthetists 216 Higgins Road Park Ridge, Illinois 60068-5790 Attn: Journal Course The examination must be postmarked by June 30, 1992.

New technologies in anesthesia— Clonidine: An established drug with futuristic indications

1. In the United States, clonidine can be administered by all of the following routes except:
   1. oral
   2. intravenous
   3. subarachnoid
   4. epidural

2. Some major indications for clonidine include:
   1. the control of hypertension
   2. to attenuate opioid withdrawal
   3. to decrease intraocular pressure
   4. all of the above

3. Clonidine-induced hypertension seen on abrupt drug withdrawal occurs from stimulation of:
   1. presynaptic central α-2 receptors
   2. the baroreceptors
   3. postsynaptic peripheral α-2 receptors
   4. the pons and medulla

4. Clonidine inhibits nociception and sympathetic reflexes by primarily blocking what neurotransmitter?
   1. norepinephrine
   2. gamma-amminobutyric acid
   3. serotonin
   4. epinephrine

5. Antinociception mediated by clonidine occurs:
   1. in the anterior horn cells
   2. at the spinal level
   3. at peripheral nociceptors
   4. in the midbrain and locus ceruleus

6. The hypotensive effect of clonidine can be clinically reversed with:
   1. naloxone
   2. phentolamine
   3. neostigmine
   4. yohimbine

7. Clonidine is effective in attenuating the hypernoradrenergic symptoms accompanying withdrawal from:
   1. opioids
   2. nicotine
   3. ethanol
   4. all of the above

8. Common side effects of clonidine include:
   1. sedation
   2. dry mouth
   3. hypotension
   4. all of the above

9. At plasma concentrations greater than 2 ng/mL, you might expect to see all of the following except:
   1. dry mouth
   2. sedation
   3. hypotension
   4. all of the above
10. The most likely adverse reactions of regionally administered clonidine include:
   1. pruritis
   2. hypotension and bradycardia
   3. urinary retention
   4. respiratory depression

11. Side Stream Spirometry may be used to monitor all of the following aspects of pulmonary mechanics except:
   1. inspired gas concentration
   2. compliance and resistance
   3. pressure
   4. flow and volume

12. The term “spirometry” is derived from Greek and Latin words that mean:
   1. to rotate and to monitor
   2. to inhale and to exhale
   3. to breathe and to measure
   4. to breathe and to observe

13. Side Stream Spirometry uses a special D-lite™ adapter which should be placed:
   1. in the inspiratory limb of the breathing circuit
   2. in the expiratory limb of the breathing circuit
   3. at the ventilator bellows
   4. between the breathing circuit and the mask or between the breathing circuit and the tracheal tube

14. Clinical benefits associated with using the D-lite adapter include all of the following advantages except:
   1. flow resistance is lower
   2. dead space is minimal
   3. only one adapter is needed for both ventilatory monitoring and gas analysis
   4. a water trap must be inserted in-line, between the tracheal tube and the breathing circuit

15. The range of measurements for airway pressure monitoring is:
   1. 0 to 30 cm H₂O
   2. 0 to 65 cm H₂O
   3. -20 to +80 cm H₂O
   4. +20 to 50 cm H₂O

16. The volume a patient exhales in the first second of exhalation is a percentage of the total exhaled volume and in normal patients is:
   1. used to assess compliance
   2. a reflection of changes in resistance
   3. a factor that implies changes in inspired oxygen concentrations
   4. used to assess inspiratory pressure

17. The compliance loop responds to pressure and volume changes. A closed loop on the display screen indicates all of the following except:
   1. a complete breath has occurred
   2. there is no evidence of circuit disconnection
   3. there is no evidence of a significant leak
   4. the respiratory rate is exceptionally rapid

18. Side Stream Spirometry may be routinely used without extra calibration measures in:
   1. children who have a body weight of greater than 20 kg
   2. all infants
   3. neonates older than 34 weeks
   4. children who weigh less than 20 kg

19. The American Society for Testing and Materials standard for airway pressure monitoring for anesthesia systems include all but one of the following objectives:
   1. to detect pressure levels that are excessively high or low
   2. to minimize the risks of hypoventilation
   3. to reduce the risk of barotrauma
   4. to ensure adequate agent concentration in the inspired gas mixture

20. Side Stream Spirometry is capable of performing all of the following functions except:
   1. allows anesthetists to objectively quantify the feel of the bag
   2. permits evaluation of subtle changes not always heard through a stethoscope
   3. replaces the experienced hand used for manual ventilation
   4. identifies the significance of changes in compliance

21. What component of spinal blockade is first to appear?
   1. loss of temperature discrimination
   2. loss of awareness of pinprick
   3. loss of preganglionic sympathetic function
   4. loss of motor function
22. Spinal anesthesia most likely results from disruption of function of which axonal structure?
   1. phospholipid bilayer
   2. mitochondria
   3. sodium channel
   4. microtubules

23. Which of the following factors has no clinically significant effect on the distribution of local anesthetics in the subarachnoid space?
   1. baricity of anesthetic solution
   2. position of patient
   3. dose of local anesthetic
   4. sex of the patient

24. What anatomic structures provide local anesthetic molecules in the cerebrospinal fluid with direct access to deeper areas of the spinal cord?
   1. sodium channels
   2. spaces of Virchow-Robin
   3. interlaminar foramina
   4. arachnoid villi

25. The mean load at which microcatheters tend to break is approximately:
   1. 0.1 kg
   2. 0.5 kg
   3. 1.0 kg
   4. 1.5 kg

26. Which of the following steps should be followed if difficulty is encountered in threading the catheter through the spinal needle?
   1. rotate the needle
   2. flush the needle with saline
   3. rotate the catheter as it is being advanced
   4. all of the above

27. What common feature do all cases of cauda equina syndrome after continuous spinal anesthesia seem to have in common?
   1. higher than expected doses of 5% lidocaine in 7.5% dextrose were required
   2. all patients underwent transurethral resection of the prostate gland
   3. each dose of anesthetic contained a vasoconstrictor
   4. none of the patients was more than 42 years old

28. The reported incidence of postdural puncture headache after continuous spinal anesthesia ranges from:
   1. 0.1% to 6%
   2. 0.9% to 16%
   3. 0.5% to 37%
   4. 2% to 83%

29. Cerebrospinal fluid can be aspirated through a microcatheter most quickly using what size syringe?
   1. 1 mL
   2. 3 mL
   3. 10 mL
   4. 60 mL

30. What type of spinal needle, in comparison to conventional needles, has been reported to greatly reduce the incidence of postdural puncture headache?
   1. Sprotte
   2. Crawford
   3. Huber
   4. Quincke

New technologies in anesthesia—Noninvasive, continuous, cardiac output monitoring by thoracic electrical bioimpedance

31. Which of the following pairs are noninvasive methods used to measure cardiac output?
   1. impedance plethysmography/transesophageal Doppler
   2. transcutaneous Doppler/transesophageal Doppler
   3. impedance plethysmography/transcutaneous Doppler
   4. transesophageal Doppler/Fick method

32. Most pulmonary artery catheters derive cardiac output based on the underlying principle of:
   1. Fick
   2. indicator dilutional
   3. impedance plethysmography
   4. Doppler

33. What is the correct formula for the Fick (simplified) method?
   1. \( V = W/C \)
   2. \( V = IR \)
   3. \( V/T = W \cdot T^{-1} \cdot C^{-1} \)
   4. \( VC = W \)
34. Which of the following is a limitation of pulmonary artery catheter derived cardiac output?
1. expensive
2. invasive
3. requires specialized training for insertion
4. all of the above

35. Ohm’s law states that for a given conductor there is a linear relationship between voltage and current. Therefore, if resistance increases, voltage will:
1. decrease
2. increase
3. no change
4. none of the above

36. Which of the following is an advantage of thoracic electrical bioimpedance (TEB) cardiac output monitoring?
1. noninvasive and continuous
2. ease of use
3. clinically accurate
4. all of the above

37. Cardiac output correlates best with:
1. body surface area
2. body weight
3. height
4. upper arm circumference

38. Identify the two primary constituents of TEB cardiac output monitoring.
1. thoracic fluid index (TFI)/pulsatile impedance
2. TFI/erythrocyte conductivity
3. pulsatile impedance/erythrocyte conductivity
4. impedance plethysmography/TFI

39. Identify the following factor which is not a component of impedance variation.
1. physical motion
2. blood pumping action
3. respiration
4. erythrocyte conductivity

40. TEB-derived cardiac outputs are less accurate in all but which one of these situations?
1. severe dysrhythmias
2. pacemaker activity
3. bradycardia
4. tachycardia

41. A patient develops dyspnea following a Hickman catheter insertion. The chest x-ray would be useful in diagnosing:
1. pneumothorax
2. cardiac arrhythmia
3. hypotension
4. electrolyte imbalance

42. A preoperative chest x-ray may provide for early recognition of pulmonary bullous disease which would contraindicate the use of:
1. thiopental and succinylcholine
2. fentanyl and vecuronium
3. rapid sequence induction
4. nitrous oxide and positive pressure ventilation

43. When an x-ray beam encounters bone, you know that:
1. an insignificant amount of the rays are absorbed
2. a significant amount of the rays are absorbed
3. a dark area will be formed on the underlying film
4. an unpredictable interaction of bone and x-rays results

44. As the x-ray tube moves closer to the patient, the resultant image size:
1. enlarges
2. decreases
3. Ohm’s law states that there will be no change
4. part of the image is enlarged and part decreases

45. Which of the following basic steps is not part of the approach to x-ray interpretation recommended by the author?
1. initial evaluation
2. evaluation of radiographic technique
3. systematic analysis of the chest x-ray
4. economic assessment of the procedure

46. According to the author, it is important to know what position the patient was in for the x-ray because marking the position on the x-ray is:
1. customary
2. not always customary
3. present about 20% of the time
4. present about 80% of the time
47. Why might a chest x-ray exposed during expiration be of low quality?
1. lung tissue is compressed
2. lung tissue is expanded
3. lung tissue is more vascular
4. the diaphragm will obscure the bronchi

48. Under normal circumstances the right side of the diaphragm is:
1. approximately 10-12 cm higher on the right side compared to the left side
2. approximately 10-12 cm lower on the right side compared to the left side
3. approximately 1-2 cm higher on the right side compared to the left side
4. approximately 1-2 cm lower on the right side compared to the left side

49. When studying the x-ray specifically for the visceral pleural line, one should remember that:
1. intrapleural air will produce a dark density and fluid an intermediate gray density
2. intrapleural air will produce a white density and fluid a dark density
3. intrapleural air will produce an intermediate gray density and fluid a white density
4. both intrapleural air and fluid will produce a white density

50. Which of the following is the least likely to accentuate the lung hila on a chest x-ray?
1. emphysema
2. pulmonary tumor
3. exercise-induced asthma
4. congestive heart failure

51. A general rule for screening for an enlarged heart on a chest x-ray is:
1. it should be less than 75% of the transverse diameter of the chest
2. it should be less than 50% of the transverse diameter of the chest
3. it should be less than 3 inches in diameter
4. it should be longer in the horizontal plane compared to the vertical plane

52. The “water bottle” appearance of the heart occurs with which of the following conditions?
1. chronic obstructive pulmonary disease
2. hypertension
3. acute loss of blood
4. cardiac tamponade

53. A correctly placed endotracheal tube’s tip should lie approximately how far above the carina when the patient’s head is in a neutral position?
1. 4-5 inches
2. 4-6 cm
3. ½-1½ inches
4. 1-2 cm

54. A properly placed central venous pressure line should be in the:
1. right ventricle
2. pulmonary artery
3. inferior vena cava
4. superior vena cava

55. The so-called “pericardial reflection” might serve to obscure the early chest x-ray provided diagnosis of:
1. pneumothorax
2. pericardial effusion
3. myocardial infarction
4. dehydration

56. A properly placed intra-aortic balloon pump is confirmed by noting its position in:
1. the ascending aorta
2. the coronary artery
3. decreasing aorta
4. the pulmonary artery

57. The concept of “airspace filling” best refers to:
1. infiltrate
2. pneumothorax
3. cardiac tamponade
4. renal failure

58. The “air bronchogram” occurs when:
1. fluid fills a bronchus
2. tumor fills a bronchus
3. air-filled bronchi are surrounded by consolidated tissue
4. blood fills a bronchus

59. Chest x-ray changes associated with aspiration pneumonitis can be best described as:
1. always present within 6 hours of the insult
2. always present within 24 hours of the insult
3. hardly ever present
4. variable in their presentation

60. The chest x-ray reveals a highly lucent field due to excessive air or overinflation and compression of the small pulmonary vessels. This is probably a patient with:
1. congestive heart failure
2. chronic obstructive pulmonary disease
3. pulmonary edema
4. diffuse interstitial pulmonary fibrosis