American Heart Association

ANNOTATED ANSWER KEY

Advanced Cardiovascular Life Support

Precourse Written Examination

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American Heart Association®
Fighting Heart Disease and Stroke

Annotated Answer Key

ACLS Provider Course
Precourse Written Examination

1. Which of the following actions is done <u>first</u> to restore oxygenation and ventilation to an unresponsive, breathless, near-drowning victim?

a. force water from the victim's lungs by performing the Heimlich maneuver
b. force water from the victim's lungs by starting chest compressions
c. stabilize cervical spine with c-collar and spine board, then start the ABCs
d. open the airway with a jaw-thrust maneuver, provide in-line cervical stabilization, start the ABCs

<u>The correct answer is d.</u>

Answer **d** is the only answer that directs the rescuer to first open the airway and provide rescue breathing. Rescue breathing will restore oxygen to the lungs, so it should begin as soon as possible. Start rescue breathing as soon as the airway is open and rescuer safety is ensured. If the victim remains unresponsive and a pulse does not return, start chest compressions and rescue breathing. Unless known otherwise, always treat submersion victims as trauma victims and assume a high probability of cervical spine injury. The possible presence of cervical spine injury requires rescuers to open the airway with the jaw-thrust maneuver and to provide in-line cervical stabilization.

Answer **a** is incorrect because there is no conclusive evidence that water must be drained from the victim's breathing passages before rescue breathing is started. Most submersion victims aspirate only a small amount of water, which is quickly absorbed by the lungs. Use the Heimlich maneuver for submersion victims exactly as it is used for any victim suspected of having an obstructed airway. The Heimlich maneuver may cause expulsion of gastric contents, aspiration, and a variety of other injuries. Perform the Heimlich maneuver only when 2 attempts to ventilate after repositioning the airway have failed and you suspect complete foreign-body airway obstruction.

Answer **b** is incorrect because rescuers should not start chest compressions first. First provide 2 rescue breaths and then start chest compressions when you find that the victim has no signs of circulation. If you start rescue breathing in the water, continue until the victim is moved to a firm surface that can sustain chest compressions.

Answer **c** is incorrect because the sequence of actions is incorrect. Opening the airway and starting rescue breathing are always the highest priorities. It is true that submersion victims should be treated like trauma victims, and rescuers should always suspect cervical spine injury. But c-spine collars and backboards are unnecessarily elaborate for the first few minutes of the rescue attempt. Use the acceptable alternatives of the jaw-thrust maneuver plus in-line manual spine stabilization while opening the airway and starting rescue breathing.

2. Tracheal intubation has just been attempted for a victim of respiratory arrest. During hand ventilation with a bag, you hear stomach gurgling over the epigastrium, and oxygen saturation (per pulse oximetry) fails to rise. Which of the following is the <u>most</u> likely explanation for these findings?

a. intubation of the hypopharyngeal area
b. intubation of the left main bronchus
c. intubation of the right main bronchus
d. bilateral tension pneumothorax

<u>The correct answer is a.</u>

Intubation of the *hypopharyngeal area* is common. (The hypopharyngeal area extends from the back of the throat and tongue down to the first section of the epiglottis and trachea.) Often tracheal tubes found on later review to be in this region represent not only failed initial intubations but also successful tracheal intubations that later were dislodged. Intubation of the hypopharyngeal area would be the most likely explanation for hearing gurgling over the epigastrium but no breath sounds during hand ventilation. In addition, the oxygen saturation has failed to rise. The other 3 choices would more likely than not be associated with some successful oxygenation. The guidelines suggest that the rescuer perform a 5-point auscultation during hand ventilation as follows: “As the bag is squeezed, listen over the epigastrium and observe the chest wall for movement. If you hear stomach gurgling and see no chest wall expansion, you have intubated the esophagus” (page I-101).

Answer **b** is incorrect because if you intubated the left main bronchus you would definitely hear unilateral breath sounds and see unilateral chest expansion over the left chest. In addition, oxygen saturation would rise.

Answer **c** is incorrect because intubation of the right main bronchus should produce breath sounds and chest expansion in the right chest but not the left chest. Also, oxygen saturation would rise.

Answer **d** is incorrect because bag ventilations through a properly placed tracheal tube, even in a person with bilateral tension pneumothoraces, would not produce stomach gurgling. Furthermore, the ventilations would produce neither breath sounds nor chest expansion. Oxygen saturation would rise.

3. Which of the following patients needs immediate <u>intubation</u>?

a. an elderly woman with severe chest pain and shallow respirations at 30 breaths/min
b. a 55-year-old insulin-dependent diabetic with ST-segment elevation and runs of VT
c. an apneic patient whose chest does not rise with bag-mask ventilations
d. a subdued, alcohol-intoxicated college student with a reduced gag reflex

<u>The correct answer is c.</u>

In a person who is not breathing, bag-mask ventilation <u>must</u> produce adequate chest expansion and bilateral breath sounds. To fail could be fatal. If bag-mask ventilation fails, tracheal intubation or some alternative airway adjunct must accomplish the task of adequate ventilation. This answer matches specific statements in *Guidelines 2000* (page I-100): "Indications for tracheal intubation include (1) inability of the rescuer to ventilate the unconscious patient with less invasive methods and (2) the absence of protective reflexes (coma or cardiac arrest).” Nonetheless in skilled hands most apneic patients will do quite well with bag-mask ventilation alone and do not need tracheal intubation.

Answer **a** is incorrect because the patient described does not have an indication for immediate intubation. Shallow respirations at a rapid respiratory rate may do an adequate job of oxygenation and ventilation. The severe chest pain may lead the unwary ACLS provider to think this patient has "symptomatic" tachypnea and hypoxia and that something must be done about it.

Answer **b** is incorrect because there is no stated reason for complete control of the airway with a tracheal tube, although the patient seems seriously ill and definitely needs supplemental oxygen. The presence of an acute coronary syndrome or premature ventricular contractions is not an indication for control of the airway.

Answer **d** is incorrect because the patient still has a gag reflex, although it is reduced, and because she is "subdued," not unconscious or comatose. This patient needs to be closely watched under professional observation.

4. When treating a trauma victim who is in shock and deeply comatose, which of the following is the airway of choice?

a. a tracheal tube
b. the patient's own airway
c. a nasopharyngeal airway
d. an oropharyngeal airway

The correct answer is a.

The trauma victim described in this question meets the specific criteria for tracheal intubation listed in *ECC Guidelines 2000* (page I-100): "(1) inability of the rescuer to ventilate the unconscious patient with less invasive methods and (2) absence of protective reflexes (coma or cardiac arrest)." This patient is deeply comatose, which indicates possible brain injury that would affect central respiratory drives and protective gag reflexes. The patient is also at risk for compromised oxygen delivery because of blood loss, hypoventilation, and cardiothoracic injury. Indications for intubation of the trauma patient (page I-245) include 2 that are present in this patient: severe head injury and inability to protect the upper airway (eg, loss of gag reflex, depressed level of consciousness, coma).

Answer **b** is incorrect because a deeply comatose patient at risk for other injuries requires a patent artificial airway through which oxygenation and ventilation can be more reliably supplied than they can through the patient's airway.

Answers **c** and **d** are incorrect because these devices cannot support the level of oxygenation and ventilation that are required in the injured and deeply comatose patient. Nonetheless these devices are useful because they can provide an open, clear airway.

5. Which of these lists of CPR performance and AED operation is correct and in the right sequence?

a. send someone to call 911, attach AED electrode pads, open the airway, turn on the AED, provide 2 breaths, check for a pulse
b. wait for the AED and barrier device to arrive, open the airway, provide 2 breaths, check for a pulse, if no pulse attach AED electrode pads, follow AED prompts
c. send someone to call 911, open the airway, provide 2 breaths, check for a pulse, if no pulse attach the AED, follow AED prompts
d. provide 2 breaths, check for a pulse, if no pulse perform chest compressions for 1 minute, call for the AED, when the AED arrives attach electrode pads

The correct answer is c.

Answer **c** lists the recommended steps for a 1-person response that combines providing CPR and using an AED (see *ECC Guidelines 2000*, AED Treatment Algorithm, page I-67, Figure 4).

Answer **a** is incorrect because it contains critical errors: the one signal for attaching the AED or turning on the power is *no pulse*. Rescuers should check for a pulse *before* opening the AED and attaching the electrode pads. Also, the sequence of CPR and AED use is incorrect in this answer.

Answer **b** is incorrect because the rescuer should *not* wait for the AED to arrive before acting. Provide CPR constantly, including during the interval while another rescuer phones 911 and retrieves the AED. CPR improves the chance of survival at any interval to defibrillation.

Answer **d** is incorrect because the rescuer should *not* delay arrival of the defibrillator by going through the ABCs of CPR and performing 1 minute of chest compressions. Send another rescuer to phone 911 and retrieve the AED not after 1 minute of CPR but as soon as the victim is found to be unresponsive. If you are the only rescuer, determine unresponsiveness and then leave the victim to phone 911 and retrieve the AED.

6. You are operating an AED in an attempted resuscitation of a man who collapsed in the airport. After delivery of 3 successive shocks, your pulse check indicates he still lacks a pulse. What is the <u>next</u> thing you do?

a. reanalyze the victim's rhythm
b. perform CPR until EMS personnel arrive
c. perform CPR for 1 minute, then reanalyze the victim's rhythm
d. leave the AED attached and start transport to the nearest ED, stopping every 3 minutes for the AED to reanalyze

<u>The correct answer is c.</u>

AEDs are programmed to "pause" the rhythm analysis and not shock after each set of 3 shocks. This pause allows the rescuer to provide 1 minute of CPR, which enables circulation of oxygenated blood. The rationale is that a period of partial circulation of partially oxygenated blood will increase the likelihood of success with later shocks. The protocols and algorithms for ACLS providers instruct them to use this interval after 3 shocks to gain airway control and intravenous access. They can then administer epinephrine or vasopressin to increase coronary artery perfusion, pressure, and oxygenation. These responses in turn increase the likelihood of success with subsequent defibrillation shocks.

Answer **a** is incorrect because reanalyzing the rhythm is inappropriate at this time. The protocol directs the rescuer to provide CPR at this point. Even if the reanalysis signals "shock indicated," the rescuer is directed to provide 1 minute of CPR now.

Answer **b** is incorrect because it suggests that the rescuer should deliver only 3 shocks. Manufacturers have designed AEDs to pause for 1 minute during analysis to give the benefits of CPR to refractory VF, but CPR should be given for no longer than 1 minute.

Answer **d** is incorrect because it directs the rescuers to stop every 3 minutes during transport for the AED to reanalyze. The guidelines do not recommend this action because it would delay getting the patient to the ED. Transportation should never start until the victim is out of VF. Victims "get out" of VF either because the rescue efforts are successful and the patient has a perfusing rhythm or because shocks and CPR are unsuccessful and the person is in terminal asystole.

7. A patient remains in VF cardiac arrest after 3 stacked shocks, tracheal intubation, epinephrine 1 mg IV, and a 4th shock. Which of the following drug-dose combinations should this patient receive <u>next</u>?

a. amiodarone 150 mg IV given over 10 minutes
b. lidocaine 1 to 1.5 mg/kg IV push
c. procainamide 50 mg/min, up to a total dose of 17 mg/kg
d. magnesium 1 to 2 g, appropriately diluted, IV push

The correct answer is b.

Lidocaine, given at this point in a persistent VF arrest at a dose of 1 to 1.5 mg/kg, is consistent with the ACLS recommendations. If VF/pulseless VT persists after 3 shocks, the ACLS protocols call for tracheal intubation, either IV epinephrine or IV vasopressin, and a 4th shock. If VF persists rescuers should consider antiarrhythmics. This question provides a quick review of the indications and doses of the 4 agents recommended in the *ECC Guidelines 2000*.

Answer **a** is incorrect because the dose is incorrect. A person in cardiac arrest needs amiodarone given as an IV bolus of 300 mg. A dose of 150 mg IV given over 10 minutes requires far too much time to benefit a person in cardiac arrest.

Answer **c** is incorrect because this dose of procainamide is recommended for *recurrent* VF, not persistent VF. Procainamide requires up to 30 to 45 minutes to be given, which is far too long for someone in cardiac arrest. But if the person is going in and out of VF, procainamide can be started to run in during the "inter-VF/VT" periods of perfusing rhythm.

Answer **d** is incorrect because magnesium is recommended only for patients in VF/VT in association with known or suspected hypomagnesemic states or for patients with a torsades de pointes VF/VT pattern.

8. A patient in VF cardiac arrest has failed to respond to 3 shocks, epinephrine 1 mg IV, and a 4th shock. You give the medication nurse a "standing order" to administer epinephrine every 3 minutes as long as the resuscitation continues. Which of the following dose regimens is recommended?

a. epinephrine 1 mg, 3 mg, 5 mg, and 7 mg (escalating regimen)
b. epinephrine 0.2 mg/kg per dose (high-dose regimen)
c. epinephrine 1 mg IV push, repeated every 3 minutes
d. epinephrine 1 mg IV push, followed in 3 minutes by vasopressin 40 U IV

The correct answer is c.

If 1 mg of epinephrine fails, higher doses are acceptable but *not* recommended. A growing body of evidence indicates that higher doses are not beneficial and may be harmful.

Answer **a** is incorrect because although escalating doses of epinephrine may be administered, they are *not* recommended. In a retrospective study of survivors of out-of-hospital cardiac arrest, high cumulative doses of epinephrine, such as those provided when escalating doses are used, were associated with worse neurologic function.

Answer **b** is incorrect because high doses of epinephrine may be administered, but they are *not* recommended. Higher doses of epinephrine have been associated with increased survival in animal studies and small clinical trials. But in large randomized trials, doses of epinephrine >1 mg have been associated with no improvement in survival and greater post-resuscitation neurologic and myocardial dysfunction.

Answer **d** is incorrect because it recommends both epinephrine and vasopressin, given one after another. There is no evidence to support giving the two together. Vasopressin is administered in a single dose IV. Epinephrine should be administered every 3 to 5 minutes during cardiac arrest.

9. EMTs arrive at the side of a 55-year-old man in cardiac arrest. The first AED analysis registers "shock indicated." But before the shock can be delivered, the EMTs learn that the man has gone 12 minutes without any bystander CPR. What actions should the EMTs take <u>next</u>?

a. resume CPR, supplement with 100% O_2, continue until paramedics arrive
b. allow the AED to charge and shock
c. resume CPR, supplement with 100% O_2 for 3 minutes, reanalyze, shock if indicated
d. resume CPR, contact medical control, request permission to stop resuscitative efforts

<u>The recommended answer is b.</u>

This question seems complicated because the clinical scenario suggests futility and "no hope." But according to the rhythm analysis done by the AED, this patient is in VF. With VF there is always the chance of converting the heart to a perfusing rhythm. This person deserves the chance to be defibrillated if the AED indicates the presence of a shockable rhythm. Withholding a shock from a victim with a rhythm identified as VF is a violation of EMS and Emergency Medicine practice. The treatment of VF/pulseless VT requires a shock. Although CPR prolongs the time the heart will be responsive to a shock and bystander CPR doubles survival from out-of-hospital cardiac arrest, successful conversion of this patient's rhythm requires defibrillation.

Answer **a** is incorrect because it recommends that rescuers ignore a "shock indicated" message from the AED. The victim should be shocked, at least this one time, if the AED indicates a shock is needed, particularly in the absence of further information.

Answer **c** is incorrect because 3 minutes is too long a time to perform CPR without reanalyzing to determine if a shock rhythm is present.

Answer **d** is incorrect because it recommends inappropriate and unauthorized clinical decision-making by EMS personnel based on hearsay.

10. While treating a patient in persistent VF arrest after 3 shocks, you consider using vasopressin. Which of the following guidelines for use of vasopressin is <u>true</u>?

a. give vasopressin 40 U every 3 to 5 minutes
b. give vasopressin for better vasoconstriction and β-adrenergic stimulation than provided by epinephrine
c. give vasopressin as an alternative to epinephrine in shock-refractory VF
d. give vasopressin as the first-line pressor agent for clinical shock caused by hypovolemia

<u>The correct answer is c.</u>

Vasopressin is now considered an acceptable alternative to epinephrine to be used as a vasoconstrictor and pressor agent during cardiac arrest due to VF. Vasopressin has a longer half-life than epinephrine, so it does not have to be given as often.

Answer **a** is incorrect because the appropriate dose of vasopressin is 40 U given in a single dose, not repeated every 3 to 5 minutes.

Answer **b** is incorrect because (1) vasopressin does not stimulate β cardiac receptors and (2) it is not considered more potent than epinephrine.

Answer **d** is incorrect because vasopressin is not the drug of first choice for shock. Its primary use is as a second-line agent in vasodilatory shock (ie, septic shock).

11. A patient arrives in the ED. CPR continues with ventilations provided through a tracheal tube inserted in the field. Chest compressions produce a femoral pulse that disappears during a "stop compressions" pause. During the pause the cardiac monitor shows narrow QRS complexes at a rate of 65 bpm. At this point what is the <u>next</u> action you should take?

a. check for tracheal tube dislodgment and improper tube placement
b. start an IV, administer atropine 1 mg IV push
c. start an IV, send blood samples for measurement of serum electrolytes and a toxic drug screen
d. analyze arterial blood gases to check for acidosis, hypoxia, and hypoventilation

<u>The correct answer is a.</u>

This question describes persistent cardiac arrest in association with PEA in a patient being moved from the field to the hospital. Treatment of cardiac arrest begins and continues with good basic life support: establishment of airway, breathing, and circulation. The rescuer should always evaluate the airway that is in place and verify that effective ventilations are being provided. This evaluation is particularly important when the patient initially arrives in the ED after a tracheal tube is placed in the field. Tube position should also be verified if the patient is moved within the hospital (eg, from the ED to the unit). The Primary and Secondary ABCD Surveys in ACLS also require establishment and verification of placement of an advanced airway. Finally, 2 potential reversible causes of PEA listed in the "5 H's and 5 T's" are hypoxia and tension pneumothorax. The rescuer can rule out these causes by verifying that the tracheal tube is in the trachea and is producing bilateral chest expansion and adequate bilateral breath sounds.

Answer **b** is incorrect because it recommends giving atropine even though the rate is 65 bpm. *ECC Guidelines 2000* recommends using atropine for PEA only when the rate is bradycardic.

Answer **c** is incorrect because the actions recommended are not what this patient needs next.

Answer **d** is incorrect because checking an arterial blood gas sample is not the next action that is needed. The results of the arterial blood gas analysis will not be available for several minutes, and identification of a misplaced tube or a tension pneumothorax should be accomplished without delay. Getting an arterial blood gas analysis represents too much attention given to the "D = Differential Diagnosis" part of the Secondary ABCD Survey. The rescuer should search for the D cause of the arrest, but the ABCD steps of the Primary Survey and the ABC steps of the Secondary Survey should be accomplished first.

12. You have intubated a patient with PEA. You hear good bilateral breath sounds, and you see obvious bilateral chest rise. Two minutes after epinephrine 1 mg IV is given, PEA continues at 30 bpm. Which of the following actions should be done <u>next</u>?

a. administer atropine 1 mg IV
b. initiate transcutaneous pacing at a rate of 60 bpm
c. start a dopamine IV infusion at 15 to 20 µg/kg per minute
d. give epinephrine (1 mL of 1:10 000 solution) IV bolus

<u>The correct answer is a.</u>

Atropine should be administered for the patient with PEA if the rate is slow even if there is no pulse. It is too soon to give another dose of epinephrine. Of the therapies listed, atropine is the most appropriate to administer while you search for reversible causes.

Answer **b** is incorrect because transcutaneous pacing is *not* indicated or recommended for PEA. In theory transcutaneous pacing might directly stimulate myocardial contractions, but there is no published evidence to support this idea. Transcutaneous pacing of asystolic cardiac arrest has been proven ineffective.

Answer **c** is incorrect because dopamine, at this dose, is one of the agents to use for symptomatic bradycardia. Dopamine is not recommended for PEA.

Answer **d** is incorrect because epinephrine was administered only 2 minutes ago. It is appropriate to administer epinephrine every 3 to 5 minutes for treatment of pulseless cardiac arrest. In addition, the dose given is incorrect because it would supply only 0.1 mg of epinephrine rather than the recommended 1 mg.

13. For which of the following PEA patients is sodium bicarbonate therapy (1 mEq/kg) likely to be <u>most</u> effective?

a. a patient with hypercarbic acidosis due to a tension pneumothorax
b. a patient with a brief arrest interval
c. a patient with documented severe hyperkalemia
d. a patient with documented severe hypokalemia

<u>The correct answer is c.</u>

Treat a patient with documented severe hyperkalemia with the hyperkalemia "recipe" (see *2000 ECC Handbook*, page 74). This important treatment sequence begins with *calcium chloride* and includes *sodium bicarbonate* and *glucose* plus *insulin*.

Answer **a** is incorrect because sodium bicarbonate is contraindicated for a patient with hypercarbic acidosis and inadequate ventilation. The metabolism of the sodium bicarbonate results in the formation of carbon dioxide, so ventilation must be adequate if bicarbonate is administered. The tension pneumothorax should be treated immediately. Administration of sodium bicarbonate to the patient with inadequate ventilation or ventilation compromised by a tension pneumothorax will result in greater hypercarbia and worsening of the respiratory acidosis.

Answer **b** is incorrect because most patients with a brief arrest interval will not require sodium bicarbonate. The best way to correct any mild acidosis from a brief arrest interval is to provide effective ventilation and restore a perfusing rhythm.

Answer **d** is incorrect because hypokalemia will be worsened by administration of sodium bicarbonate. Sodium bicarbonate alkalinizes the serum, which produces a shift of potassium to inside the cell, so the serum potassium concentration falls.

14. A cardiac arrest patient arrives in the ED in PEA at 30 bpm. CPR continues, proper tube placement is confirmed, and IV access is established. Which of the following medications is <u>most</u> appropriate to give next?

a. calcium chloride 5 mL of 10% solution IV
b. epinephrine 1 mg IV
c. synchronized cardioversion at 200 J
d. sodium bicarbonate 1 mEq/kg IV

<u>The correct answer is b.</u>

Until a specific cause of PEA is identified, the use of epinephrine (1 mg IV every 3 to 5 minutes) is indicated.

Answer **a** is incorrect because no cause that would indicate the need for calcium chloride, particularly hyperkalemia, hypocalcemia, or calcium channel blocker toxicity, has been determined.

Answer **c** is incorrect because there is no evidence that cardioversion will convert PEA to a perfusing rhythm. In addition, cardioversion will only delay the identification and treatment of reversible causes of the PEA.

Answer **d** is incorrect because sodium bicarbonate is not a first-line drug for the treatment of PEA. The indications for sodium bicarbonate are preexisting hyperkalemia, preexisting bicarbonate-responsive acidosis, or tricyclic antidepressant overdose. Consider administration of sodium bicarbonate after cardiac compression, intubation, ventilation, and multiple trials of epinephrine have been administered.

15. Which of the following drug-dose combinations is recommended as the initial medication to give to a patient in documented asystole?

a. epinephrine 3 mg IV
b. atropine 3 mg IV
c. epinephrine 10 mL of a 1:10 000 solution IV
d. atropine 0.5 mg IV

The correct answer is c.

Epinephrine 10 mL of a 1:10 000 solution IV contains 1 mg of epinephrine, which is the standard initial treatment for asystole. Although this question may appear to be a "trick question," demanding recall of a specific detail of how epinephrine is supplied, it really is important for ACLS providers to recognize the equivalency of 1 mL of a 1:1000 solution and 10 mL of a 1:10 000 solution. The more dilute solution (1:10 000) is the most common source of epinephrine in pediatric resuscitation. The 1:10 000 solution is also used widely for treatment of asthma and allergic reaction, and in some emergency situations it may be the only source of epinephrine.

Answer **a** is incorrect because a dose of epinephrine this high is *not* recommended as the first dose. This dose should be considered only if the patient does not respond to the conventional dose.

Answers **b** and **d** are incorrect for the same reasons: atropine should be administered *after* a dose of epinephrine because the possible benefits of epinephrine are more important than the possible benefits of atropine. Besides, the doses are wrong.

16. When a monitor attached to a person in cardiac arrest displays a “flat line,” you should execute the “flat line protocol.” Which of the following actions is included in this protocol?

a. check monitor display for sensitivity or “gain”
b. obtain a right-sided 12-lead ECG
c. change LEAD SELECT control from *lead II* to *paddles* and back
d. administer a lower energy (100 J) defibrillatory shock to “bring out” possible occult VF

The correct answer is a.

The sensitivity or "gain" displayed on the monitor is one of the important things to check to confirm true asystole. Other items to check include the POWER (on/off) switch, all connections between the

monitor and patient, the battery supply, and the setting of the LEAD SELECT switch (if set to *paddles* the monitor will display only a flat line).

Answer **b** is incorrect because you should not halt chest compressions and resuscitative efforts for the rather lengthy time required to obtain a 12-lead ECG.

Answer **c** is incorrect because switching the LEAD SELECT switch from *lead II* to *paddles* does not allow you to "look" at a possible VF vector from different angles. In fact, switching to *paddles* completely shuts off rhythm recording through the monitor leads. In rare instances occult VF may be displayed in some leads but not in others. Examination of the ECG in 2 leads at right angles to one another is sufficient to identify occult VF.

Answer **d** is incorrect because there is no evidence of benefit from shocking "pseudo-asystole" in case the rhythm is really occult VF.

17. An 88-year-old man in normothermic cardiac arrest arrives in the ED after 15 minutes of continuous asystole. Paramedics intubated him, confirmed proper tube placement, gained IV access, and gave epinephrine 1 mg IV × 3 and atropine 1 mg IV × 2. Which of the following actions is <u>most</u> likely to have a positive therapeutic effect and is most consistent with the recommendations in *ECC Guidelines 2000*?

a. ask the nurse to bring members of the immediate family to a private area, where you discuss code termination and family presence at the resuscitation
b. stop efforts at 10 minutes if there is no response to epinephrine 3 mg IV every 3 minutes
c. stop efforts at 10 minutes if there is no response to transcutaneous pacing given with CPR
d. stop efforts if there is no response to 3 empiric defibrillatory shocks of 360 J given 3 minutes apart

<u>The correct answer is a.</u>

This scenario describes what is likely to be an unsuccessful resuscitative effort. The patient has failed to respond to BLS and ACLS, and he has no hypothermia. Unless additional mitigating factors are identified and reversed, this patient is unlikely to survive. Whenever possible family members should be offered the option of being present during resuscitation. Allowing family to be present is particularly important when your resuscitative efforts are unlikely to be effective. Evidence of benefit from family presence has been documented in several studies of family members after the death of a loved one. Family members who were given the option of being present during the resuscitation demonstrated less anxiety and depression and more constructive grief behavior than family members who were not given the option.

Answer **b** is incorrect because there is no evidence that increasing doses of epinephrine are effective in the treatment of asystole that persists in a normothermic patient.

Answer **c** is incorrect because this patient lacks any indication for transcutaneous pacing.

Answer **d** is incorrect because there is no evidence that attempting to "defibrillate" asystole is beneficial. In rare instances occult VF may be present in some leads in patients with an apparent isoelectric ECG that shows up as VF in other leads. Examination of the ECG in 2 other leads, rather than "empiric shocks," is sufficient to identify any VF present.

18. A 50-year-old man has a 3-mm ST-elevation in leads V_2 to V_4. Severe chest pain continues despite oxygen, aspirin, nitroglycerin SL × 6, and morphine 10 mg IV. BP = 170/110 mm Hg; HR = 120 bpm. Which of the following treatment combinations is <u>most</u> appropriate for <u>this</u> patient at <u>this</u> time (assume no contraindications to any medication)?

a. calcium channel blocker IV + heparin bolus IV
b. ACE inhibitor IV + lidocaine infusion
c. magnesium sulfate IV + enoxaparin (Lovenox) SQ
d. reteplase, recombinant (Retavase) + heparin bolus IV

The correct answer is d.

This scenario describes the classic indications for β-blockers and fibrinolytic therapy in a patient having an acute MI. β-Adrenoreceptor blockers are recommended for all patients with ST-segment elevation infarction and continuing or recurrent ischemic pain (and for all patients with non–ST-elevation MI and patients with tachyarrhythmias). β-Adrenoreceptor blocking agents decrease myocardial oxygen consumption, reduce mortality and nonfatal reinfarction, and decrease the incidence of primary VF. Indications for fibrinolytic therapy include chest pain suggesting MI, ST-segment elevation >1 mm in 2 or more contiguous leads, time to therapy <12 hours, and age <75 years (age >75 years is a Class IIa recommendation). The need for an urgent reperfusion strategy is obvious. Potential contraindications to fibrinolytic therapy must be ruled out. Heparin bolus IV is an adjunctive agent that should be administered to patients who receive either reteplase or tPA.

Answer **a** is incorrect because calcium channel blockers have not been shown to reduce mortality after acute MI, and in some patients they may be harmful. Calcium channel blockers should be considered an alternative or additional therapy if β-blockers are contraindicated or the maximum dose has been achieved. Heparin is indicated as an adjunct to fibrin-specific lytics. The recommended dose, however, has been reduced to decrease the incidence of intracerebral hemorrhage, particularly in the elderly. The current dose is a bolus of 60 IU/kg (maximum bolus of 4000 IU), followed by infusion at 12 IU/kg per hour (maximum infusion = 1000 IU/h) for patients weighing >70 kg.

Answer **b** is incorrect because ACE inhibitors are not given in the first 6 hours of MI, although they are given on the first day. ACE inhibitors limit infarct expansion, improve structural remodeling of the ventricle, and increase collateral flow to the peri-infarct ischemic area. ACE inhibitors should be given when the patient is stable, *after* reperfusion, initial measures, and other therapies have been provided. Lidocaine is *not* recommended for primary VF prophylaxis or treatment of asymptomatic "warning" arrhythmias in AMI patients. Lidocaine is used for treatment of hemodynamically stable VT and prevention of *recurrent* VF (secondary prophylaxis).

Answer **c** is incorrect because magnesium has no indication for routine use in management of an acute MI unless the patient has documented low magnesium. Studies are now looking at use in specific subgroups (eg, those ineligible for fibrinolytic therapy and the elderly).

19. Which of the following includes the major components of definitive therapy for a 60-year-old patient with >2mm ST-segment elevation within 30 minutes of the onset of symptoms of acute ischemic chest pain?

a. fibrinolytics or PCI, aspirin, β-blockers, heparin
b. heparin, aspirin, glycoprotein IIb/IIIa inhibitors, IV β-blockers, nitrates
c. serum cardiac markers, serial ECGs, perfusion scan or stress test
d. prophylactic lidocaine, fluid bolus, vasopressor infusion

The correct answer is a.

ECG Findings	Diagnostic Class	Therapy
● ST elevation	● Acute myocardial injury ● ST-elevation AMI	Reperfusion therapy ● Fibrinolytics or ● PCI Aspirin β-Blockers
● ST depression or T-wave inversion	● Acute myocardial ischemia ● HIGH-RISK unstable angina ● Non–ST-elevation AMI	Antithrombin therapy ● Heparin Antiplatelet therapy ● Aspirin ● Glycoprotein inhibitors Nitrates β-Blockers
● Nonspecific ECG findings ● Absence of changes in ST segment or T waves	● Low- to intermediate-risk unstable angina	● Risk assessment ● Serial cardiac markers ● Serial ECGs ● Aspirin ● Heparin

Notice that this patient has acute ST elevation >2 mm on his first 12-lead ECG. The Ischemic Chest Pain Algorithm shows how the 12-lead ECG is used to classify patients with chest pain into 1 of 3 groups. These groupings have both diagnostic and therapeutic significance.

The reperfusion therapy selected will be determined by local resources, presence or absence of contraindications to fibrinolytic therapy, and presence or absence of signs of cardiogenic shock. Maximum myocardial salvage occurs if eligible patients receive fibrinolytics within a few hours after the onset of symptoms.

Answer **b** is incorrect because these therapies comprise the management approach for patients with ST-segment depression or dynamic T-wave inversion strongly suggestive of ischemia.

Answer **c** is incorrect because these therapies comprise the approach to management of the patient with acute ischemic chest pain and a nondiagnostic or normal ECG.

Answer **d** is incorrect for several reasons. Routine lidocaine administration for patients with acute MI is no longer recommended for primary prophylaxis of VF. A fluid bolus and vasopressor therapy may be indicated for patients with shock and hypotension, but those therapies are not part of the routine management of ST-segment elevation MI.

20. Within 45 minutes of ED arrival, which of the following evaluation sequences should be performed for a 70-year-old woman with rapid onset of headache, garbled speech, and right arm and leg weakness?

a. history, physical and neurologic exams, *noncontrast* head CT with radiologist interpretation
b. history, physical and neurologic exams, *noncontrast* head CT, start of fibrinolytic treatment if scan is positive for stroke
c. history, physical and neurologic exams, lumbar puncture, *contrast* head CT if LP is negative for blood
d. history, physical and neurologic exams, *contrast* head CT, start of fibrinolytic treatment when improvement in neurologic signs is noted

The correct answer is a.

This case reinforces the appropriate sequence of actions in the Algorithm for Suspected Stroke. These actions focus on determining eligibility for fibrinolytics, including immediate performance and reading of a noncontrast CT scan of the head.

Answer **b** is incorrect because administration of a fibrinolytic agent would be inappropriate without more information than is provided in this scenario. Such treatment could be dangerous. CT is done to rule out bleeding. A positive CT scan usually indicates bleeding or a massive stroke, which contraindicates the use of a fibrinolytic.

Answer **c** is incorrect because lumbar puncture is recommended only for patients with a high clinical suspicion of subarachnoid hemorrhage and a negative CT scan. *Contrast* CT can obscure the subtle findings of some hemorrhagic strokes, so it is contraindicated in this scenario.

Answer **d** is incorrect because *improving* neurologic symptoms is a contraindication to fibrinolytic therapy in patients with acute stroke.

21. Which of the following conditions <u>most closely</u> mimics the signs and symptoms of an acute stroke?

a. acute insulin-induced hypoglycemia
b. acute hypoxia
c. isotonic dehydration and hypovolemia
d. acute vasovagal or orthostatic hypotension

<u>The correct answer is a.</u>

Hypoglycemia is included in the table of differential diagnoses of stroke in *ECC Guidelines 2000*. Because hypoglycemia can cause signs and symptoms similar to those produced by stroke, a normal serum glucose concentration (between 60 and 400) is specified in the Los Angeles Prehospital Stroke Screen. Determination of the serum glucose concentration and treatment of hypoglycemia are part of the initial management of the patient with signs of acute stroke.

Answer **b** is incorrect because the signs of acute hypoxia (confusion, poor mentation, possible agitation) are not the same as the signs of acute stroke (facial droop, unilateral extremity weakness, speech difficulty).

Answer **c** is incorrect because dehydration and hypovolemia will produce syncope, orthostatic weakness, and dizziness but not the focal signs of a stroke (facial droop, unilateral extremity weakness, speech difficulty).

Answer **d** is incorrect because vasovagal and orthostatic hypotension generally will not produce facial droop, trouble speaking, and arm drift or unilateral extremity weakness, the focal signs of acute stroke.

22. Which of the following rhythms is an appropriate indication for transcutaneous cardiac pacing?

a. sinus bradycardia with no symptoms
b. normal sinus rhythm with hypotension and shock
c. complete heart block with pulmonary edema
d. asystole that follows 6 or more defibrillation shocks

<u>The correct answer is c.</u>

Complete heart block is likely to cause bradycardia, and the development of pulmonary edema suggests that the bradycardia is *symptomatic*. Pulmonary congestion is specifically listed as a potential sign of symptomatic bradycardia in the algorithm review in Part 6 of *ECC Guidelines 2000* (page I-155).

Answer **a** is incorrect because transcutaneous cardiac pacing is recommended for *symptomatic* bradycardia, not *asymptomatic* bradycardia.

Answer **b** is incorrect because transcutaneous pacing is not recommended for a patient who has normal sinus rhythm with hypotension and shock because bradycardia is not present. This patient is more likely to respond to therapy that improves cardiac function and ejection fraction rather than to therapy that increases heart rate.

Answer **d** is incorrect because asystole, after multiple defibrillation shocks, generally indicates a heart with totally depleted energy stores. Such a myocardium is unable to respond with a muscle contraction when stimulated by the transcutaneous pacing impulses.

23. A patient with a HR of 30 to 40 bpm complains of dizziness, cool, clammy extremities, and dyspnea with minimal exercise. What is the first drug to give to this patient?

a. atropine 0.5 to 1 mg
b. epinephrine 1 mg IV push
c. isoproterenol infusion 2 to 10 μg/min
d. adenosine 6 mg rapid IV push

The correct answer is a.

Atropine is the first drug recommended in the Bradycardia Algorithm for treatment of *symptomatic* bradycardia. This patient, with a heart rate of 30 to 40 bpm and symptoms of inadequate cardiac output, including dizziness, cool and clammy extremities, and prolonged capillary refill, is bradycardic. It is likely that these symptoms are related to and caused by the slow heart rate.

Answer **b** is incorrect because if epinephrine is administered for symptomatic bradycardia, an infusion rather than a bolus dose is recommended (see Bradycardia Algorithm).

Answer **c** is incorrect because isoproterenol is the last, not the first, drug to use for symptomatic bradycardia.

Answer **d** is incorrect because adenosine is not recommended for bradycardias.

24. Which one of the following patients needs immediate synchronized cardioversion?

a. a 78-year-old woman with fever, pneumonia, chronic congestive heart failure, and sinus tachycardia at 125 bpm
b. a 55-year-old man with multifocal atrial tachycardia at 125 bpm, respiratory rate of 12 breaths/min, and BP of 134/86 mm Hg
c. a 69-year-old woman with a history of coronary artery disease, chest pain, a 2-mm ST elevation, and sinus tachycardia at 130 bpm
d. a 62-year-old man with a history of rheumatic mitral valve disease, obvious shortness of breath, HR of 160 bpm, and BP of 88/70 mm Hg

The correct answer is d.

This patient has hypotension and a history suggestive of compromised ventricular function. He has *unstable* tachycardia that appears to be causing serious signs and symptoms, so he should be considered for immediate cardioversion.

Answer **a** is incorrect because the patient described appears to have a sinus tachycardia caused by fever, pneumonia, and mild congestive heart failure. Tachycardia should be treated if it appears to be the cause of the patient's symptoms, but in this case the tachycardia appears to be *caused by* rather than the *cause of* the patient's other conditions. In addition, sinus tachycardia is not an indication for cardioversion.

Answer **b** is incorrect because although the patient described does have a tachycardia, the patient is not tachypneic and is not hypotensive. Thus, the patient does not appear to have serious signs and symptoms caused by the tachycardia. In addition, cardioversion will be ineffective in a patient with multifocal atrial tachycardia.

Answer **c** is incorrect because this patient's condition is an acute coronary syndrome. In this case the tachycardia is a response to the chest pain and coronary ischemia. This tachycardia is unlikely to be a primary cause of an acute coronary event, so it does not require cardioversion.

25. Which one of the following patients is <u>most</u> likely presenting with <u>stable</u> tachycardia that you should <u>not</u> cardiovert?

a. a 25-year-old wheezing asthmatic woman who has pneumonia on chest x-ray, who is taking albuterol, and who has the following vital signs: temp = 101.2°F, HR = 140 bpm, resp = 20 breaths/min
b. a 55-year-old man with diaphoresis, bilateral rales, and the following vital signs: HR = 140 bpm, BP = 90/55 mm Hg, resp = 18 breaths/min, rhythm = rapid atrial flutter
c. a 62-year-old man with a wide-complex tachycardia at a rate of 140 bpm, chest pain, shortness of breath, and palpitations
d. a 55-year-old woman with chest pain, shortness of breath, extreme weakness and dizziness, BP of 88/54 mm Hg, and a narrow-complex tachycardia at a rate of 145 bpm

<u>The correct answer is a.</u>

The critical clinical issue in this question is whether the tachycardia is causing the clinical condition (unstable tachycardia) or the clinical condition is causing the tachycardia (stable tachycardia). That is, tachycardia ➔ clinical condition? or clinical condition ➔ tachycardia? In these 4 examples clinicians may disagree over the details, but note that the question asks for the patient who is <u>most</u> likely presenting with stable tachycardia. The tachycardia demonstrated by the patient described in answer **a** appears to be caused by the patient's clinical problems and therapy. Tachycardia is a known complication of albuterol therapy. In addition, the patient has wheezing, pneumonia, and likely respiratory distress, which can contribute to tachycardia.

Answer **b** is incorrect because the patient described is unstable. The patient has heart disease that will likely cause myocardial dysfunction, hypotension, and other signs of shock (faint peripheral pulses) and pulmonary congestion.

Answer **c** is incorrect because ventricular tachycardia, chest pain, and shortness of breath are all signs of unstable tachycardia.

Answer **d** is incorrect because hypotension, chest pain, respiratory distress, weakness, and dizziness are all signs of unstable tachycardia.

26. You prepare to cardiovert an unstable 48-year-old tachycardic woman with the monitor/ defibrillator in "synchronization" mode. She suddenly becomes unresponsive and pulseless right when the rhythm changes to an irregular, chaotic, VF-like pattern. You charge to 200 J and press the SHOCK button, but the defibrillator fails to deliver a shock. Why?

a. the defibrillator/monitor battery failed
b. the "sync" switch failed
c. you cannot shock VF in "sync" mode
d. a monitor lead has lost contact, producing the "pseudo-VF" rhythm

The correct answer is c.

The patient has become unresponsive and pulseless, so pulseless cardiac arrest is present. The potential rhythms are pulseless VT, VF, PEA, and asystole. The "irregular, chaotic, VF-like" rhythm most likely *is* VF. A defibrillator/cardioverter cannot deliver a shock to a highly irregular rhythm while the SYNCHRONIZE button is activated. VF lacks the regular, peaked R waves that a defibrillator in "sync" mode requires before it will discharge. The device will "wait" to deliver the shock until the shock can be synchronized with an R wave.

Answers **a** and **b** are incorrect because there is no evidence that the battery or "sync" button has failed. In fact, the failure of the unit to deliver a shock suggests that the "sync" button is working well.

Answer **d** is incorrect because it does not fit the scenario. The patient has gone into sudden cardiac arrest, presumably from ventricular fibrillation. Although VF can certainly cause cardiac arrest and a loose lead can certainly create a rhythm display that resembles VF, it is unlikely that a loose lead will cause sudden cardiac arrest. (Think about it.) If this same ECG pattern developed in an alert, responsive victim with strong pulses, the "diagnosis" of a loose lead would be more likely.

27. An 80-year-old woman complains of palpitations and mild lightheadedness, but the findings of her physical exam are unremarkable. The 1st ECG shows a regular, narrow-complex tachycardia at 150 bpm. The Valsalva maneuver slows the ventricular rate to reveal classic atrial flutter waves, but it does not convert the atrial flutter. Which of the following interventions should you try <u>next</u>?

a. IV adenosine to slow ventricular rate
b. IV diltiazem to slow ventricular rate
c. urgent DC cardioversion
d. IV dopamine to strengthen cardiac contractions

The correct answer is b.

The patient is an asymptomatic, relatively stable, elderly woman in atrial flutter with a heart rate of 150 bpm. The unknowns in this scenario are (1) the duration of the atrial flutter and (2) whether she has impaired cardiac function. The most pressing clinical issue is to control the rate.

Answers **a** and **d** are incorrect because no indication for either drug is given in the scenario.

Answer **c** is incorrect because the woman is stable and does not need urgent cardioversion. Calcium channel blockers are very effective in reducing the rate of ventricular response in atrial fibrillation and atrial flutter, so diltiazem would be the best intervention right now.

28. A previously healthy 50-year-old man complains of chest tightness, palpitations, and dizziness. HR is 170 bpm, BP is 90/60 mm Hg, and the ECG shows a narrow-complex tachycardia. You decide that the rhythm is multifocal atrial tachycardia. He failed to respond to initial vagal maneuvers and 2 rounds of adenosine. As your next action, which of the following treatments is <u>inappropriate</u>?

a. IV amiodarone
b. IV metoprolol
c. IV diltiazem
d. DC cardioversion

<u>The correct answer is d.</u>

The patient has multifocal atrial tachycardia (MAT). MAT is an *automatic* tachycardia, not a reentry rhythm, so DC cardioversion will be ineffective. The key teaching point here is that *automatic tachycardias need to be suppressed pharmacologically*. They do not respond to electrical cardioversion, which works well to abort reentry tachycardias. Automatic tachycardias will just regenerate from the automatic focus after the immediate effects of a cardioversion attempt dissipate. This important fundamental principle is reflected in the algorithm for narrow-complex tachycardias.

Answers **a**, **b**, and **c** are incorrect because amiodarone, β-blockers, and calcium channel blockers are all acceptable medications for treatment of MAT, junctional tachycardia, and many cases of PSVT. Memory aid: These 3 types of acceptable medications for narrow-complex tachycardias follow a simple "A-B-C" listing: amiodarone, β-blockers, and calcium channel blockers.

29. A 75-year-old man presents to the ED with 1 week of lightheadedness, irregular palpitations, and mild exercise intolerance. The initial 12-lead ECG displays atrial fibrillation, which continues to show on the monitor at a HR of 120 to 150 bpm and BP = 100/70 mm Hg. Which of the following therapies is the <u>most</u> appropriate <u>next</u> intervention?

a. sedation, analgesia, then immediate cardioversion
b. oxygen via nasal cannula at 2 to 6 L/min, normal saline at 60 to 120 mL/h
c. amiodarone 300 mg IV bolus
d. metoprolol 5 mg IV; repeat every 5 minutes to a total dose of 15 mg

<u>The correct answer is b.</u>

This patient is symptomatic and has a potentially serious tachycardia. "Oxygen-IV-cardiac-monitoring" should be instituted promptly. Once oximetry is available, the patient's inspired oxygen concentration can be titrated on the basis of the oxygen saturation.

Answer **a** is incorrect for a number of important reasons. First, the patient is not experiencing severe symptoms, nor does he appear sufficiently "unstable" to require immediate cardioversion. Second, he has been in atrial fibrillation for at least 1 week, which is sufficient time for intramural clots to have formed in his cardiac chambers. Sudden cardioversion without preceding anticoagulation could dislodge one of these clots, leading to a catastrophic stroke or other embolic morbidity.

Answer **c** is incorrect because this dose of amiodarone is indicated only for patients in cardiac arrest due to shock-refractory VF. Amiodarone does, however, play a role in the management of atrial fibrillation. Amiodarone is used to *control the rate* or *convert atrial fibrillation <48 hours in duration* in (1) patients with impaired cardiac function, (2) patients with WPW and normal cardiac function, and (3) patients with WPW and impaired cardiac function.

Answer **d** is incorrect because it is not the best answer to the scenario. β-Blockers can help control the rate in patients with normal cardiac function, but they are contraindicated in patients with atrial fibrillation associated with WPW.

30. A 66-year-old, malnourished, chronic alcoholic presents with polymorphic ventricular tachycardia that resembles torsades de pointes. His HR is irregular at 120 to 160 bpm, and his BP is 95/65 mm Hg. He has no related symptoms and no signs of impaired heart function. Which of the following treatments is <u>most</u> appropriate at this time?

a. IV amiodarone
b. IV magnesium
c. IV lidocaine
d. IV procainamide

<u>The correct answer is b.</u>

This patient has torsades de pointes, a form of polymorphic ventricular tachycardia usually associated with a long QT interval. The treatment approach to torsades is considerably different from the approach to monomorphic ventricular tachycardia. Often torsades is due to an underlying electrolyte or metabolic disorder (most frequently low magnesium) or drug toxicity. In this case the patient is malnourished and has a history of alcoholism, so it is likely that hypomagnesemia has precipitated the torsades.

Answer **a** is incorrect because amiodarone will prolong the QT interval and may make the torsades worse.

Answer **c** is incorrect because lidocaine is considered to be less effective than overdrive pacing or magnesium to treat torsades de pointes. Lidocaine can be administered, but it is not the most appropriate drug to administer at this time.

Answer **d** is incorrect because procainamide and other drugs in the same pharmacological family can lengthen the QT interval and prolong the episode of torsades.

31. You are performing CPR on a man in cardiac arrest when a technician arrives and attaches an AED. With the first rhythm analysis a shock is "indicated" and delivered, but the next rhythm analysis signals "no shock advised." What is the <u>most</u> appropriate next action?

a. check for a pulse
b. press the manual OVERRIDE button and operate the AED as a manual defibrillator
c. insert an oropharyngeal airway and start 100% oxygen at 6 L/min
d. support breathing and place the patient in the recovery position until the hospital code team arrives

<u>The correct answer is a.</u>

A pulse check is necessary because the "no shock advised" message does not explain *why* no shock is needed. "No shock advised" may indicate that defibrillation was successful and that a perfusing rhythm has resumed. In that case support of breathing and monitoring of pulse would be indicated. "No shock advised" may also indicate that asystole followed defibrillation. If that is the case, chest compressions and rescue breathing should be provided for approximately 1 minute, and then the rhythm should be reanalyzed. These measures should continue only until the code team arrives with ACLS equipment and drugs.

Answer **b** is incorrect because authorization to press an OVERRIDE button, which is not present on all AEDs, is granted only to advanced life support personnel. The override option should be used only when personnel have concerns about malfunctioning of the AED, which is rare. This scenario gives no reason to think the AED is not working properly.

Answer **c** is incorrect because insertion of an oropharyngeal airway followed by delivery of 100% oxygen, although acceptable per se, is not the most appropriate next action.

Answer **d** is incorrect because you have not yet determined that breathing and pulse are present. You turn the victim to the recovery position only if breathing and pulse resume.

32. Which of the following patients is most likely to present with vague signs and unusual symptoms of an atypical AMI?

a. a 65-year-old woman with moderate coronary artery disease recently confirmed by angiography
b. a 56-year-old man who smokes 3 packs per day but has no history of heart disease
c. a 45-year-old woman diagnosed with type I diabetes 22 years ago
d. a 48-year-old man in the ICU after coronary artery bypass surgery

The correct answer is c.

The elderly, persons with diabetes, and women are more likely to present with atypical or vague symptoms of an ACS. An acute coronary syndrome should be suspected in a 45-year-old woman with long-standing diabetes who has vague complaints. These complaints can include diffuse *chest discomfort*; *pressure* rather than *pain, pain between the shoulder blades*, and other uncommon or unexpected symptoms. Too often such a patient is thought to be too young to have an MI, yet her long-standing diabetes places her at risk for early development of coronary artery disease.

Answer **a** is incorrect because a 65-year-old woman with known coronary artery disease is more likely to present with typical signs and symptoms.

Answer **b** is incorrect because a 56-year-old man who smokes heavily is more likely to present with typical signs and symptoms.

Answer **d** is incorrect because even after coronary artery bypass surgery, a man is more likely to have typical signs and symptoms.

33. A 60-year-old man (weight = 50 kg) with a history of recurrent VF has converted from VF to a wide-complex perfusing rhythm after epinephrine 1 mg IV and a 4th shock (HR = 60 bpm, BP = 90/60 mm Hg). Which of the following drug regimens is most appropriate to give next?

a. amiodarone 300 mg IV push
b. adenosine 6 mg rapid IV push
c. magnesium 3 g IV push, diluted in 10 mL of D_5W
d. procainamide 20 to 50 mg/min, up to a maximum dose of 17 mg/kg

The correct answer is d.

This patient has been resuscitated from VF and has not received any antiarrhythmics. It would be acceptable to forego antiarrhythmics in this post-resuscitation period. During this period of post-resuscitation perfusion, procainamide could be started to prevent a recurrence of VF, though the evidence to support this approach is weak.

Answer **a** is incorrect because the dose given is the "cardiac arrest dose" of amiodarone. This man is no longer in cardiac arrest.

Answers **b** and **c** are incorrect because nothing in this scenario is an indication for either adenosine or magnesium.