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TO: ALL LUCAS COUNTY PARAMEDICS

FROM: Brent Parquette, NREMT-P
Lucas County EMS Continuing Education Program Administrator

DATE: April 20, 2010

SUBJECT: **Continuing Education – May 2010**

With the upcoming summer months, CE classes during the month of May will focus on a review of ***Environmental Emergencies and Drowning***. Additional class time will be dedicated to medical case and chart review. A pre-test has been included for you to complete before attending class. In preparation for class work I ask that you review the following LCEMS Protocols:

- TAB 500 – Medical Procedures / Equipment
 - o Section H: CPAP
- TAB 900 – Medical Emergencies
 - o Section K: Drowning / Near-Drowning
 - o Section O: Hyperthermia

I look forward to seeing you in the coming month. If you have any questions or comments please feel free to contact me thru e-mail or by phone.

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Agenda

15 minutes	Announcements / Pre-Test Review Post-Test Review - April
45 minutes	Environmental Emergencies
15 minutes	BREAK
30 minutes	Drowning / Near-Drowning
30 minutes	Case / Chart Review
15 minutes	BREAK
60 minutes	Case / Chart Review (cont.)
30 minutes	Post-Test / Evaluations

May CE – Class Schedule

Date	Time	Shift
May 4, 2010 (Tues)	1800 – 2200	C
May 5, 2010 (Wed)	1300 – 1700	A
May 6, 2010 (Thurs)	1300 – 1700	B
May 11, 2010 (Tues)	1800 – 2200	A
May 12, 2010 (Wed)	0900 – 1300	B
May 18, 2010 (Tues)	1800 – 2200	B
May 19, 2010 (Wed)	1300 – 1700	C
May 25, 2010 (Tues)	1300 – 1700	C
May 26, 2010 (Wed)	0900 - 1300	A

May 2010 Pre-Test

1. Heat flows from the skin to the air because of:
 - a. Radiation
 - b. Convection
 - c. Conduction
 - d. Evaporation
2. Heat is carried away from the body by a process known as:
 - a. Radiation
 - b. Convection
 - c. Conduction
 - d. Evaporation
3. The key heat-regulating center is located in the:
 - a. Thymus gland
 - b. Thalamus
 - c. Cerebral cortex
 - d. Hypothalamus
4. When the body becomes too hot, which of the following happens?
 - a. Peripheral vasodilation
 - b. Decreased cardiac output
 - c. Decreased respiratory rate
 - d. Increased thermogenesis
5. Heat cramps are caused by:
 - a. A rapid change in extracellular osmolarity
 - b. Potassium and water losses
 - c. Increased thermogenesis (shivering)
 - d. Decreased perfusion of abdominal muscles
6. Heat exhaustion is caused by:
 - a. Increased sodium and water losses
 - b. A rapid, dangerous elevation of body temperature
 - c. Peripheral vasoconstriction
 - d. Increased circulating blood volume
7. Prehospital management of the heat stroke patient includes all of the following **EXCEPT**:
 - a. Rapid cooling
 - b. Oxygen administration
 - c. Dopamine IV
 - d. IV access

8. The primary cause of death from drowning is:
- Acid-base abnormality
 - Asphyxia
 - Pulmonary edema
 - Hemodilution
9. Which of the following factors has an impact on drowning survival?
- Cleanliness of water
 - Length of submersion
 - Age and health of victim
 - All of the above
10. Which of the following is a result of the mammalian diving reflex?
- Tachypnea
 - Bradycardia
 - Vasodilation
 - All of the above
11. Prehospital management of the drowning victim includes all of the following **EXCEPT**:
- C-spine management and oxygenation
 - The Heimlich maneuver
 - Defibrillation as indicated
 - CPR as indicated
12. A person experiencing sinus headache pain, dizziness, and hearing loss after diving too fast may be suffering from:
- Barotrauma
 - Eustachian tube rupture
 - Middle ear infection
 - All of the above
13. A diver who appears to be intoxicated and takes unnecessary risks may be experiencing:
- Carbon monoxide poisoning
 - Barotrauma
 - The bends
 - Nitrogen narcosis
14. A diver who holds his breath during ascent may experience:
- Air embolism
 - Pneumothorax
 - Alveoli rupture
 - All of the above

15. A diver who ascends without allowing time for gradual recompression may experience:
- a. Air embolism
 - b. Pneumomediastinum
 - c. Eustachian tube rupture
 - d. The bends

Questions 16-17 refer to the following scenario:

Your patient is a 23-year-old construction worker who collapsed on the job. The temperature is 88°F with 78% humidity. He presents on the ground with skin that is hot, wet, and red. He has no medical history according to his coworkers, and there is no Medic-Alert identification. His BP is 90/60, pulse 120, respirations 30 and shallow, lungs clear, BS 100, and axillary temperature 41.6°C.

16. This patient is most likely suffering from:
- a. Heat cramps
 - b. Heat exhaustion
 - c. Heat stroke
 - d. Heat prostration
17. Immediate prehospital management of this patient includes all of the following **EXCEPT**:
- a. Rapid cooling
 - b. Oxygenation
 - c. IV fluids
 - d. Vasopressors
18. You respond to a “man down” in a dry cleaning establishment. A 33-year-old pressman collapsed after complaining of weakness and nausea. On arrival, you find the patient has regained consciousness. He is pale, cool, and clammy and has a thready pulse. You would suspect:
- a. Heat exhaustion
 - b. Heat cramps
 - c. Heat stroke
 - d. Any of the above could apply
19. Your Life Squad has been on stand-by at a “diving emergency.” Two firefighters run to your location after a 27-year-old diver rapidly ascended from emergency underwater operations. You find that the patient responds meaningfully to verbal stimuli and has a patent airway. Physical examination reveals abnormal heart sounds and mild cyanosis. His pulse is 130/irregular, respirations 28/labored, and BP is 80/66. When he attempts to describe his chest pain, you note his voice is hoarse. You suspect this patient has:
- a. Hemopericardium
 - b. Tension pneumothorax
 - c. Pneumomediastinum
 - d. Venous air embolism

20. A 17-year-old male dove into a lake from a rock. When he did not surface immediately, one of his friends located and extricated him from the water. The best method(s) for opening this patient's airway is/are:
- a. Modified jaw thrust
 - b. Head-tilt with chin-lift
 - c. Triple airway maneuver
 - d. Either A or C is acceptable

Pre-Test Answers / Rationale

1. **C.** Direct contact of the body surface with another, cooler object causes the body to lose heat by conduction. Heat flows from higher-temperature matter to lower-temperature matter. If the ambient air temperature is cooler than the skin temperature, then heat will flow from the skin to the air.
2. **B.** Heat loss to air currents passing over the body is called convection.
3. **D.** The temperature-regulating centers are located in the hypothalamus at the base of the brain. This area functions like a thermostat. It produces neurosecretions important in the control of many metabolic activities, including temperature regulation.
4. **A.** When the body becomes too hot, it attempts to eliminate body heat through five mechanisms: vasodilation, perspiration, decreased heat production, increased cardiac output, and increased respiratory rate.
5. **A.** Heat cramps are caused primarily by a rapid change in extracellular fluid osmolarity, resulting from sodium and water losses. This causes intermittent painful contractions of various skeletal muscles.
6. **A.** Heat exhaustion results from excessive water and salt losses due to sweating. Deficiencies in water and sodium combine to cause electrolyte volume and vasomotor regulatory disturbances.
7. **C.** Prehospital management of the heat stroke patient includes rapid cooling, oxygen administration, IV access, ECG monitoring, and core temperature monitoring. Vasopressors and anti-cholinergic drugs should be avoided.
8. **B.** Deaths due to drowning and near-drowning are primarily caused by asphyxia from airway obstruction in the lungs secondary to the aspirated water or laryngospasm.
9. **D.** Factors that have an impact on drowning and near-drowning survival rates include the cleanliness of the water, the length of time the victim is submerged, and the age and general health of the victim.
10. **B.** When a person dives into cold water, he or she reacts to the submersion of the face. This is known as the mammalian diving reflex. As a result of this reflex, breathing is inhibited, the heart rate becomes slower, and vasoconstriction develops in the tissues.
11. **B.** Prehospital management of the drowning victim includes C-spine management, oxygenation, defibrillation, and CPR as indicated.
12. **A.** Barotrauma, commonly called “the squeeze,” becomes a concern during descent. If the diver cannot equilibrate the pressure between the Nasopharynx and the middle ear through the Eustachian tube, he can experience middle ear pain.
13. **D.** Major diving emergencies while at the bottom of the dive involve nitrogen narcosis, commonly called “raptures of the deep.” This is due to nitrogen’s effect on cerebral function.

14. **D.** The most serious barotrauma can occur if a diver holds his breath during ascent. As a diver ascends, the air in the lungs, which has been compressed, expands. If it is not exhaled, the alveoli may rupture. If this occurs, the result may be structural damage to the lung and air embolism. This may also produce Mediastinal and subcutaneous emphysema or pneumothorax.
15. **D.** A diver who ascends without allowing time for gradual recompression may experience “the bend.” This is a condition that develops in divers subjected to a rapid reduction of air pressure after ascending to the surface following exposure to compressed air. Nitrogen bubbles enter the tissue spaces in small blood vessels. Bubbles produced by rapid decompression are thought to obstruct blood flow and lead to local ischemia, subjecting tissues to anoxia stress.
16. **C.** This patient is most likely suffering from heat stroke. Heat stroke occurs when the body’s hypothalamic temperature regulation is lost, causing uncompensated hyperthermia, which, in turn, causes cell death and physiologic collapse.
17. **D.** Immediate prehospital management of the heat stroke patient includes cooling the patient rapidly, administering oxygen, establishing IVs, and monitoring the ECG and core temperature. Vasopressors and anticholinergic drugs are contraindicated, since they may inhibit sweating.
18. **A.** Heat exhaustion occurs when a hot environment induces salt and fluid loss due to excessive perspiration. Signs and symptoms include weakness, vertigo, nausea, syncope, pallor, diaphoresis, and tachycardia. The blood pressure may be elevated or decreased depending on the amount of fluid that has been lost. Heat cramps, as the name implies, is associated with painful spasms of the fingers, arms, legs, and/or abdominal muscles. Heat stroke would not be suspected in this case because the patient regained consciousness after the syncopal episode.
19. **C.** Pneumomediastinum is a pulmonary overpressure accident that may occur during rapid ascent, if the diver holds his breath during ascent, or if there is predisposition to rupture due to pulmonary blebs. Rupture may occur during ascent because pulmonary gases expand at this time. Pneumomediastinum occurs when the rupture releases gas through the visceral pleura into the mediastinum and/or pericardial sac. Mechanism of injury produces a high index of suspicion. Signs and symptoms consistent with pneumomediastinum include substernal pain, change in voice quality, irregular pulse, hypotension, narrow pulse pressure, abnormal heart sounds, and possible mild cyanosis. Hemopericardium results from myocardial injury or disruption. Neither tension pneumothorax, hemopericardium, nor venous air embolism affects voice quality.
20. **A.** Cervical spine injury must always be suspected in cases of diving injuries. Since the modified jaw thrust does not involve repositioning the head, it is the most appropriate manual maneuver to establish an open airway. The triple airway maneuver involves head-tilt, jaw thrust, and chin-lift.