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A. Heat-Related Illness/Hyperthermia

Maintaining an even core body temperature (CBT) is a major component of homeostasis; all of the critical bodily functions operate most efficiently at normal body temperature, which ranges from 36.5° to 37.5° C (97.7°-99.5° F). The body generates most of its heat from metabolic processes in deep organs such as the liver, heart and brain, as well through small musculoskeletal contractions. When the body's thermoregulatory system is taxed beyond its limits or in cases of failure, the CBT will rise rapidly.

General Care

EMR/BLS

1. Initial Assessment/Care [Protocol 1](#).
 - a) Assess and monitor oral/axillary/infrared temperature.
2. Remove the patient from the hot environment to a cool environment.
 - a) Apply passive/active cooling techniques as necessary, but do not allow the patient to begin shivering.
 1. Passive External Cooling Techniques
 - i. Removal from environment causing illness
 - ii. Remove articles of clothing
 2. Active Cooling Techniques
 - i. Provide a cool environment with fans, misting or air conditioning
 - ii. Apply cold packs to back of neck, axilla, and groin
 - iii. Moisten patient with cool saline or place wet towels around the neck and head
3. Care should be directed at supporting vital signs. Follow the appropriate protocol.
 - a) Support life-threatening problems associated with airway, breathing, and circulation.
 - b) Administer oxygen, to maintain SPO2 94% or more.
 - c) Perform Airway Management [Protocol 7](#) and support respirations as necessary with a BVM.

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4. Assess past medical history and nature of illness (NOI):
 - Medications
 - Exposure to increased temperatures, humidity
 - Extremes of age
 - Extreme exertion
 - Time, length of exposure
 - Poor oral intake
 - Fatigue, muscle cramping
5. Assess Signs and Symptoms:
 - Altered mental status
 - Unconsciousness
 - Hot, dry, or sweaty skin
 - Pale, clammy skin
 - Hypotension, shock
 - Seizures
 - Nausea
 - Weakness, dizziness, syncope
 - Rapid, shallow respirations
6. Follow most appropriate heat illness protocol according to presentation upon initial assessment.

B. Heat Cramps

Signs and symptoms begin with slight abdominal cramping and tingling sensations in the extremities (but can also include muscle twitching, followed by painful spasms, especially involving the lower extremities and abdomen). Other signs and symptoms can include nausea and vomiting, weakness and diaphoresis.

General Care

EMR/BLS

1. Follow general protocols for Heat Related-Illness/Hyperthermia, [Section A](#).
2. If patient does not present with nausea/vomiting and maintains a patent airway, provide oral hydration of fluids when available.
 - a) Preferably fluids of a balanced oral electrolyte solution.
3. Do not perform massage of the muscle cramps as it may aggravate the area and increase pain.

ALS

4. If patient is unable to take liquids by mouth, establish vascular access via IV/IO of Normal Saline and administer 500 mL bolus.

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C. Heat Exhaustion

Signs and symptoms include pallor, profuse sweating, hypotension, tachycardia, headache, weakness, fatigue and thirst.

General Care

EMR/BLS

1. Follow general protocols for Heat-Related Illness/Hyperthermia, [Section A](#).
2. If patient does not present with nausea/vomiting and maintains a patent airway, provide oral hydration of fluids when available.
 - a) Preferably fluids of a balanced oral electrolyte solution.
3. Do not perform massage of the muscle cramps as it may aggravate the area and increase pain.
4. Consider application of active cooling techniques gently until comfortable.

ALS

5. Establish vascular access via IV/IO of Normal Saline.
6. If patient's systolic B/P < 90 mmHg administer a **fluid bolus up to 1000 mL of NS**. Monitor B/P and lung sounds often.
 - a) If the patient develops signs and symptoms of fluid overload respiratory distress (dyspnea, crackles, rhonchi, decreasing SpO₂), slow the administration rate of the IV to KVO.
7. Monitor cardiac rhythm continuously and perform a 12-Lead ECG.

D. Heat Stroke

General Care

Signs and symptoms include altered mental status, hallucinations, or confusion, increased body temperature, minimal or no sweating, collapse, shortness of breath, shock, nausea and vomiting.

EMR/BLS

1. Follow general protocols for Heat-Related Illness/Hyperthermia, [Section A](#).

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2. If Cold Water Immersion (CWI) and Tarp Assisted Cooling Oscillation (TACO) has begun by medical staff, continue the procedure for approximately 20-30 min. If CWI or TACO is available, follow [Procedure 60](#).
3. If CWI or TACO is not available, begin application of active cooling techniques rapidly.
 - a) Moisten or wet patient by dripping a NS solution bag until cooling efforts reaches ~102° F or apply wet towels around neck and head.
 - b) Continue moistening and provide fanning during transport.
 - c) Wrap the patient with wet sheets if there is good ambient airflow present.
4. Do NOT administer anything by mouth.

ALS

5. Establish vascular access via IV/IO of Normal Saline.
6. Administer a **fluid bolus up to 1000 mL of NS**. Monitor B/P and lung sounds often.
 - a) If the patient develops signs and symptoms of fluid overload respiratory distress (dyspnea, crackles, rhonchi, decreasing SpO₂), slow the administration rate of IV to KVO.
7. Monitor cardiac rhythm continuously and perform a 12-Lead ECG.
8. If seizures develop, administer **Midazolam (Versed) 5 mg slow IV/IO/IN**. This may be repeated once to a total dose of 10 mg.

E. Cold-Related Illness/Hypothermia

Hypothermia is typically defined as a decrease in core body temperature (CBT) less than 35° C (95° F). While most commonly seen in cold climates, it may develop without exposure to extreme environmental conditions. Hypothermia is not uncommon in temperate regions and may develop indoors even during summer. Hypothermia should be considered in any patient with an altered level of consciousness in a cool and/or wet environment. Individuals at the extremes of age and those of altered mental status are more susceptible to developing hypothermia. Vasoconstriction and bradycardia may cause extreme difficulty while attempting to palpate a pulse. Radiation accounts for the greatest form of heat loss. Conduction normally accounts for a much smaller amount, but increases significantly in wet clothes and astronomically in cold water. In patients that are hypothermic, pulse and respiratory rates may be slow or difficult to detect. ***If the hypothermic victim has no signs of life, begin CPR without delay.***

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*General Care***EMR/BLS**

1. Initial Assessment/Care [Protocol 1.](#)
 - a) Assess and monitor oral/axillary/infrared temperature.
2. Remove the patient from the cold environment to a warm/sheltered environment.
 - a) Apply passive/active warming techniques as necessary.
 - i. Passive External Warming Techniques
 1. Removal from environment causing illness
 2. Prevent additional evaporative heat loss by removing wet garments.
 3. Dry and insulate the patient with blankets from further environmental exposures.
 - ii. Active Warming Techniques
 1. Cover and protect patient against heat loss and excess windchill with the application of blankets and maintain heater unit to 82° F in back of the patient compartment.
 2. If necessary, apply hot packs under the patient's arms, behind the neck and the groin areas.
 - b) Maintain patient in a supine position and limit any rough or excess movement.
3. Care should be directed at supporting vital signs. Follow the appropriate protocol.
 - a) Support life-threatening problems associated with airway, breathing, and circulation.
 - b) Administer oxygen, to maintain SPO2 94% or more.
 - c) Perform Airway Management [Protocol 7](#) and support respirations as necessary with a BVM.
4. Assess past medical history and nature of illness (NOI):
 - Medications
 - Exposure to environment even in normal temperatures
 - Exposure to extreme cold
 - Extremes of age
 - Drug use: alcohol, barbiturates
 - Infection, sepsis
 - Length of exposure, wetness

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5. Assess Signs and Symptoms:

- Cold, clammy
- Shivering
- Mental status changes
- Extremity pain, sensory abnormality
- Bradycardia
- Hypotension, shock

F. Hypothermia with a Perfusing Rhythm (Pulse)

EMR/BLS

1. Follow general protocols for Cold-Related Illness/Hypothermia, [Section E](#).
 - a) Perform assessment and general supportive procedures gently as these patients are prone to develop Ventricular Fibrillation (V-Fib).

ALS

2. Establish vascular access via IV/IO of Normal Saline KVO.
3. Monitor cardiac rhythm continuously and perform a 12-Lead ECG.

G. Hypothermia without a Perfusing Rhythm (No Pulse)

EMR/BLS

1. Begin CPR immediately [Protocol 9](#).
2. Initiate passive rewarming with blankets and establish a warm environment in the patient compartment.
3. If there is any doubt about whether a pulse or breathing is present, immediately begin chest compressions.
4. Apply AED, provide shock if necessary and resume CPR.
 - a) If the patient does not respond to one (1) defibrillation, continue performing CPR.
 1. Further defibrillation attempts should be deferred until active rewarming of the patient is achieved to 86° F.

ALS

5. Monitor cardiac rhythm continuously.
 - a) Deliver shock if necessary and resume CPR.

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- b) If the patient does not respond to one (1) defibrillation, further defibrillation attempts should be deferred until active rewarming of the patient is achieved to 86° F.
6. Establish vascular access via IV/IO of Normal Saline.
7. Provide Airway Management [Protocol 7](#) and secure an advanced airway.
8. Administer initial cardiovascular drugs based on presenting rhythm according to [Protocol 9](#).
 - a) If the patient fails to respond to the initial drug therapy, defer additional medication administrations until active rewarming of the patient is achieved to 86° F.
9. Continue with CPR and perform a thorough secondary assessment while maintaining a warm environment.
10. Transport patient to the closest STEMI facility.

H. Lightning Strike

Bolts of lightning produces energy sufficient enough to induce a depolarizing charge to the entire body. The sudden energy impact to the body causes ventricular fibrillation and/or asystole and respiratory arrest via diaphragm depolarization and a brainstem-induced central apnea. Immediately after depolarization, the heart automatically will attempt to spontaneously resume a normal perfusing rhythm. However, the body's respiratory drive does not resume spontaneously due to the stunned respiratory center of the brain stem (CNS), thus leaving patient to remain hypoxic leading the heart to go into secondary hypoxic arrest. Immediate resuscitation on a victim sustaining a lightning strike will drastically increase chances of survival by preventing hypoxemia. Due to the unusual neurological manifestations of lightning injuries, patients with fixed and dilated pupils may survive and live a normal life

Safety is paramount: When lightning is imminent or occurring, get the patient into the rescue truck or indoors as if your life depends on it — it does. Lightning DOES strike in the same area twice and fatal lightning may strike as much as six miles in front of a storm cloud, out of the clear blue sky.

In contrast with standard START Triage protocols, "Reverse Triage" is called for when treating multiple victims of a lightning strike. Rescuers should give highest priority to patients in respiratory or cardiac arrest. Victims with respiratory arrest may require only ventilation and oxygenation to avoid secondary hypoxic cardiac arrest. For victims found in cardiac arrest, treatment should be early, aggressive, and persistent. Lightning victims have higher resuscitative success rates than cardiac arrest from other causes, even after receiving prolonged resuscitation.

ALL lightning strike patients will be transported ALS to the closest appropriate facility.

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*General Care***EMR/BLS**

1. Perform “reverse triage” when dealing with multiple victims.
 - a) All patients who have **NO** signs of life require to be assessed first and efforts of resuscitation began immediately in order to increase chances of survival.
 - b) Patients that present with signs of life will likely recover from the lightning strike and can be assessed secondarily.
 - c) A lightning strike resulting in an MCI, **ALL** victims with **NO** signs of life shall be assessed first and resuscitation efforts began immediately. Reverse triage is unlike the traditional approach to an MCI.
2. Manually stabilize the head and neck while assuring airway maintenance per Airway Management [Protocol 7](#) and Suspected Head/Spinal Injury [Protocol 21](#).
3. Initial Assessment/Care [Protocol 1](#).
4. Begin CPR immediately [Protocol 9](#).
5. Apply AED, provide shock if necessary and resume CPR.
6. Provide supplemental oxygen to all conscious patients regardless of pulse oximetry.

ALS

7. Monitor cardiac rhythm continuously and treat arrhythmias as necessary according to [Protocol 9](#).
 - a) Deliver shock if necessary and resume CPR.
8. Establish vascular access via IV/IO of Normal Saline.
9. Provide Airway Management [Protocol 7](#) and secure an advanced airway.
10. Administer initial cardiovascular drugs based on presenting rhythm according to [Protocol 9](#) and continue following the most appropriate protocol sections for continued resuscitation.
11. Continue resuscitation and perform a thorough secondary assessment.
12. Transport patient to the closest STEMI facility.

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MCP

13. Hypertension following a lightning strike is usually transient and will only be treated at the discretion of the MCP.

Note: Resuscitation will be attempted on all lightning strike victims. Patients meeting Trauma Transport Criteria will be transported to the closest appropriate Trauma Center; however, a lightning strike in and of itself does NOT necessitate a declaration of a Trauma Alert. Unlike electrical injuries, burns from lightning strikes are usually superficial; however, skin under metal jewelry can sustain severe burns. Lightning can strike persons inside of a structure via plumbing fixtures, appliance wiring and especially hardwired telephones. As most lightning injuries are preventable, education and awareness about prevention practices are paramount.