

**SECTION:** Environmental Emergencies

**REVISED:** 06/2015

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|----|--|----------------|
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# Section

# 5

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# ENVIRONMENTAL EMERGENCIES

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# Protocol 5-1

**SECTION:** Environmental Emergencies

**PROTOCOL TITLE:** Environmental – Hypothermia

**REVISED:** 06/2017

**OVERVIEW:**

Hypothermia is typically defined as a core temperature less than 35° Celsius / 95° Fahrenheit. 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.

| HPI  | Signs and Symptoms   | Considerations   |
|--|--|--|
| <ul style="list-style-type: none"> <li>• Past medical history</li> <li>• Medications</li> <li>• Exposure to environment even in normal temperatures</li> <li>• Exposure to extreme cold</li> <li>• Extremes of age</li> <li>• Drug use: alcohol, barbiturates</li> <li>• Infection, sepsis</li> <li>• Length of exposure, wetness</li> </ul> | <ul style="list-style-type: none"> <li>• Cold, clammy</li> <li>• Shivering</li> <li>• Mental status changes</li> <li>• Extremity pain, sensory abnormality</li> <li>• Bradycardia</li> <li>• Hypotension, shock</li> </ul> | <ul style="list-style-type: none"> <li>• Sepsis</li> <li>• Environmental exposure</li> <li>• Hypoglycemia</li> <li>• CNS dysfunction               <ul style="list-style-type: none"> <li>○ Stroke</li> <li>○ Head injury</li> <li>○ Spinal cord injury</li> </ul> </li> </ul> |

|  | EMR | EMT | A | I | P |
|--|-----|-----|---|---|---|
| 1. Perform general patient management.   | •   | •   | • | • | • |
| 2. Support life-threatening problems associated with airway, breathing, and circulation.   | •   | •   | • | • | • |
| 3. Hypothermia <b>WITH</b> a perfusing rhythm (pulse):   |     |     |   |   |   |
| a. Prevent additional evaporative heat loss by removing wet garments and insulating the victim from further environmental exposures. | •   | •   | • | • | • |
| b. Initiate passive rewarming with warmed blankets and a warm environment.   | •   | •   | • | • | • |
| c. Perform procedures gently. These patients are prone to develop ventricular fibrillation.  | •   | •   | • | • | • |
| 4. Hypothermia <b>WITHOUT</b> a perfusing rhythm (pulse):  |     |     |   |   |   |

HYPOTHERMIA

# Protocol

# 5-1

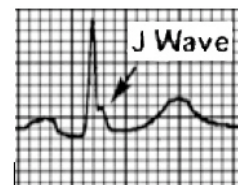
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# HYPOTHERMIA

|  | EMR | EMT | A | I | P |
|--|-----|-----|---|---|---|
| a. Begin CPR immediately.  | •   | •   | • | • | • |
| b. Initiate rewarming procedures as noted in step #3 above.  | •   | •   | • | • | • |
| c. If not breathing, start rescue breathing immediately. If possible, administer warmed, humidified oxygen.  | •   | •   | • | • | • |
| d. If pulseless with no detectable signs of circulation, start chest compressions immediately. If there is any doubt about whether a pulse is present, begin compressions. | •   | •   | • | • | • |
| e. Assess cardiac rhythm:  |     |     |   |   |   |
| i. Attach AED / cardiac monitor. If the patient does not respond to one (1) defibrillation, <i>further defibrillation attempts should be deferred.</i>                     | •   | •   | • | • | • |
| f. Secure airway with a definitive ( <i>Supraglottic / dual lumen</i> ) airway device or an <i>endotracheal tube</i> (levels I and P only).                                |     | •   | • | • | • |
| g. Establish an IV of Normal Saline.   |     |     | • | • | • |
| h. Give initial cardiovascular drugs based on presenting rhythm. If the patient fails to respond to the initial drug therapy, defer additional boluses of medication.      |     |     |   | • | • |
| i. Continue CPR and transport immediately.   |     | •   | • | • | • |
| 5. Transport and perform ongoing assessment as indicated.  |     | •   | • | • | • |

| Stages of Hypothermia  |  |
|--|--|
| <b>Normal Cold Response (35° C – 37° C / 95.1°F – 98.6°F)</b>  |  |
| <ul style="list-style-type: none"> <li>Feeling of cold</li> <li>Shivering</li> </ul>   | <ul style="list-style-type: none"> <li>Vasoconstriction</li> </ul>   |
| <b>Mild Hypothermia (34°C – 35°C / 93°F – 95°F)</b>  |  |
| <ul style="list-style-type: none"> <li>Maximum shivering at 35°C / 95°F</li> <li>Cold, pale skin (vasoconstriction)</li> <li>Pulse and BP are normal or <u>elevated</u></li> </ul> | <ul style="list-style-type: none"> <li>Increasing rate of respirations</li> <li>Mild confusion</li> <li>Slurred speech</li> <li>Unsteady gait</li> <li>Amnesia</li> </ul>    |
| <b>Moderate Hypothermia (30°C – 34°C / 86°F – 93°F)</b>  |  |
| <ul style="list-style-type: none"> <li>No longer shivering</li> <li>Bradycardia</li> <li>Decreased respirations</li> <li>Increased risk of cardiac arrhythmia (A-Fib)</li> </ul>   | <ul style="list-style-type: none"> <li>Intense vasoconstriction – surface pooling</li> <li>Decreased LOC</li> <li>Increased mortality in major trauma by 40 - 50%</li> </ul> |
| <b>Severe Hypothermia (&lt; 30°C / &lt; 86°F)</b>  |  |
| <ul style="list-style-type: none"> <li>Intense vasoconstriction – surface pooling</li> <li>Lethal cardiac dysrhythmias (V-Fib)</li> </ul>  | <ul style="list-style-type: none"> <li>Non-cardiac pulmonary edema</li> <li>As core temp continues to decrease, risk of cardiac arrest increases dramatically</li> </ul>     |

If the core temperature falls below 32°C / 90°F, a characteristic J-wave (Osborn wave) may occur. The J-wave occurs at the junction of the QRS complex and the ST segment. T-wave inversion and prolongation of the PR, QRS, and QT interval may be noted.



## PEARLS:

1. Resuscitation efforts should not be ceased until rewarming efforts have been exhausted, unless patient presents with injuries incompatible with life.
2. Extremes of age, young and old, are more susceptible to effects of temperature.
3. With temperature less than 31°C / 88°F, ventricular fibrillation is a common cause of death.
4. Patient with extreme hypothermia **MUST** be handled gently.
5. Cardiac arrest patients should be warmed before administering medications, as they may build in the system due to metabolism being ineffective.
6. Defibrillation should be limited to one (1) shock prior to warming core.
7. If the temperature is unable to be measured, treat based on the suspected temperature.
8. Hypothermia may cause severe bradycardia.
9. Shivering typically ceases when core temperature is below 32°C / 90°F.
10. Hot packs can be activated and placed in the armpit and groin areas, if available.
11. If patient is found with wet clothes, patient should be exposed prior to application of blankets.
12. Hypothermic patients also exhibit cold diuresis. Peripheral vasoconstriction initially causes central hypervolemia, to which the kidneys respond by excreting large amounts of dilute urine, causing dehydration. Alcohol and water immersion increase this process.

# Protocol 5-2

**SECTION:** Environmental Emergencies

**PROTOCOL TITLE:** Environmental – Heat Exposure/Heat Exhaustion  
Environmental – Heat Stroke

**REVISED:** 06/2017

**OVERVIEW:**

The body temperature is contingent upon the balance between heat production and heat loss. Regulation of body temperature is dependent upon the principals of conduction, convection, and evaporation. Populations at a greater risk for hyperthermia emergencies include: the elderly, the poor (who lack adequate air conditioning), those who suffer from malnutrition, and those who have chronic illnesses or substance addiction. Predisposing factors commonly intervene over days rather than minutes or hours. Hyperthermia may occur in the presence of numerous host factors. These factors include many that affect thermoregulation through heat loss mechanisms (lack of acclimatization, fatigue, lack of sleep, dehydration, and skin disorders), while others contribute to heat production (obesity, lack of physical fitness, febrile illness, or sustained exercise). Changes in cognitive function appear to occur before the development of the physical symptoms associated with heat stress. Time distortion, memory impairment, and/or deterioration in attention are frequent characteristics associated with heat stress.

| HPI  | Signs and Symptoms   | Considerations  |
|--|--|---|
| <ul style="list-style-type: none"> <li>Past medical history</li> <li>Medications</li> <li>Exposure to increased temperatures, humidity</li> <li>Extremes of age</li> <li>Extreme exertion</li> <li>Time, length of exposure</li> <li>Poor PO intake</li> <li>Fatigue, muscle cramping</li> </ul> | <ul style="list-style-type: none"> <li>Altered mental status</li> <li>Unconsciousness</li> <li>Hot, dry, or sweaty skin</li> <li>Pale, clammy skin</li> <li>Hypotension, shock</li> <li>Seizures</li> <li>Nausea</li> <li>Weakness, dizziness, syncope</li> <li>Rapid, shallow respirations</li> </ul> | <ul style="list-style-type: none"> <li>Fever</li> <li>Dehydration</li> <li>Medications</li> <li>Hyperthyroidism (storm)</li> <li>Delirium tremens (DT's)</li> <li>Heat cramps</li> <li>Heat exhaustion</li> <li>Heat stroke</li> <li>CNS lesions, tumors</li> </ul> |

|   | EMR | EMT | A | I | P |
|---|-----|-----|---|---|---|
| 1. Perform general patient management.  | •   | •   | • | • | • |
| 2. Support life-threatening problems associated with airway, breathing, and circulation.  | •   | •   | • | • | • |
| 3. Remove the patient from the hot environment to a cool environment. Do not allow the patient to shiver with cooling techniques. | •   | •   | • | • | • |
| 4. Administer oxygen, to maintain $SPO_2$ 94 - 99%. Support respirations as necessary with a BVM.                                 | •   | •   | • | • | • |

HYPERTHERMIA



# Protocol

# 5-2

Continued

## HYPERTHERMIA

|  | EMR | EMT | A | I | P |
|--|-----|-----|---|---|---|
| 5. <b>Heat Cramps:</b> Signs and symptoms include muscle twitching, followed by painful spasms, especially involving the lower extremities and abdomen, nausea and vomiting, weakness and diaphoresis.   |     |     |   |   |   |
| a. PO fluids may be given as long as the patient maintains a patent airway and is not vomiting.  | •   | •   | • | • | • |
| 6. <b>Heat Exhaustion:</b> Signs and symptoms include: pallor, profuse sweating, orthostatic hypotension, headache, weakness, fatigue and thirst.  |     |     |   |   |   |
| a. Establish an IV of Normal Saline. Infuse the fluid amounts listed in the <i>Medical – Hypotension/Shock</i> protocol. If the patient develops signs and symptoms of fluid overload respiratory distress (dyspnea, crackles, rhonchi, decreasing SpO <sub>2</sub> ), slow the IV to KVO.       |     |     | • | • | • |
| b. Place on cardiac monitor.   |     |     |   | • | • |
| 7. <b>Heat Stroke:</b> Signs and symptoms include: <i>altered mental status</i> , increased body temperature, minimal or no sweating, collapse, shortness of breath, shock, nausea and vomiting.   |     |     |   |   |   |
| a. Remove the patient's clothing.  | •   | •   | • | • | • |
| b. <i>Do not</i> give anything by mouth.   | •   | •   | • | • | • |
| c. Spray the patient's skin with a lukewarm water mist and fan the patient. Continue misting and fanning during transport.   | •   | •   | • | • | • |
| d. Wrap the patient with wet sheets if there is good ambient airflow present.  | •   | •   | • | • | • |
| e. Establish an IV / IO of Normal Saline. Infuse the fluid amounts listed in the <i>Medical – Hypotension/Shock protocol</i> . If the patient develops signs and symptoms of fluid overload respiratory distress (dyspnea, crackles, rhonchi, decreasing SpO <sub>2</sub> ), slow the IV to KVO. |     |     | • | • | • |
| f. Place on cardiac monitor and obtain <u>12 lead ECG</u> per assessment.  |     |     |   | • | • |
| 8. Transport and perform ongoing assessment as indicated.  | •   | •   | • | • | • |

### PEARLS:

1. Extremes of age, young and old, are more susceptible to extreme temperatures.
2. Cocaine, amphetamines, and salicylates may elevate body temperature.
3. Sweating generally stops as core temperature rises above 104° F.
4. Intense shivering may occur as patient is cooled.



# Protocol 5-3

**SECTION:** Environmental Emergencies

**PROTOCOL TITLE:** Injury – Bites and Envenomations – Land

**REVISED:** 06/2017

## BITES AND ENVENOMATIONS

**OVERVIEW:**

Insect stings and human, animal, snake, or spider bites from a variety of species can result in serious illness and injury. Animal bites from wild animals such as skunks, bats, raccoons, and foxes pose a special risk of rabies. Snakebites or stings from insects or spiders inject poisonous venom into their victims, generally affecting the cardiovascular or neurological system. Individual reactions to venom vary greatly depending on the person's sensitivity. Five percent of the general population is allergic to the stings of wasps, bees, hornets, yellow jackets, and ants. Insect stings cause twice as many deaths as snakebites each year. Anaphylactic shock can occur from any source, refer to the *Allergic Reaction / Anaphylaxis Patient Care Protocol* as needed. Do not apply ice or cold packs to snakebites as this can cause additional tissue damage. However, ice or cold packs can be applied to insect bites to reduce pain and swelling.

| HPI  | Signs and Symptoms  | Considerations  |
|--|---|---|
| <ul style="list-style-type: none"> <li>Type of bite / sting</li> <li>Description of creature for identification</li> <li>Time, location, size of bite / sting</li> <li>Previous reaction to bite / sting</li> <li>Domestic vs. wild</li> <li>Tetanus or rabies risk</li> <li>Immuno-compromised patient</li> </ul> | <ul style="list-style-type: none"> <li>Rash, skin break, wound</li> <li>Pain, soft tissue swelling, redness</li> <li>Blood oozing from the bite wound</li> <li>Evidence of infection</li> <li>Shortness of breath, wheezing</li> <li>Allergic reaction, hives, itching</li> <li>Hypotension or shock</li> </ul> | <ul style="list-style-type: none"> <li>Infection risk</li> <li>Rabies risk</li> <li>Tetanus Risk</li> </ul> |

|   | EMR | EMT | A | I | P |
|---|-----|-----|---|---|---|
| 1. Perform general patient management.  | •   | •   | • | • | • |
| 2. Support life-threatening problems associated with airway, breathing, and circulation.  | •   | •   | • | • | • |
| 3. Treat for shock and conserve body heat. Keep the patient calm.   | •   | •   | • | • | • |
| 4. If applicable, locate the fang marks and clean the site with soap and water. Note: There may be only one fang mark.  | •   | •   | • | • | • |
| 5. Remove any rings, bracelets, or other constricting items on the bitten / stung extremity.  | •   | •   | • | • | • |
| 6. Keep any bitten / stung extremities immobilized – the application of a splint will help. Keep the injury at the level of the heart. When not possible, keep the injury below the level of the heart. | •   | •   | • | • | • |
| 7. DO NOT apply light constricting bands above and below the wound.   | •   | •   | • | • | • |

# Protocol

# 5-3

Continued

## BITES AND ENVENOMATIONS

|  | EMR | EMT | A | I | P |
|--|-----|-----|---|---|---|
| 8. If envenomation is suspected, every 15 minutes, use a pen to mark the border of the advancing edema and document the time.  | •   | •   | • | • | • |
| 9. Consult Medical Control or Poison Control. For serious envenomation, the patient may need to be transported or evacuated to a hospital with the appropriate anti-venom. | •   | •   | • | • | • |
| 10. Start an IV of Normal Saline at KVO.   |     |     | • | • | • |
| 11. For signs and symptoms of shock, follow the <i>Medical – Hypotension/Shock</i> protocol.   | •   | •   | • | • | • |
| 12. Transport and perform ongoing assessment as indicated.   |     | •   | • | • | • |

\*\*\*Adequate identification of the snake is important. If the snake is live, contact local animal control and relay any available information regarding the identification of the snake to the receiving facility\*\*\*

### DO NOT TRANSPORT A LIVE SNAKE IN THE AMBULANCE

#### PEARLS:

1. Do not apply any type of constricting band or tourniquets as a treatment for any kind of bite or envenomation unless used to control severe hemorrhage.
2. Human bites are worse than animal bites due to the normal mouth bacteria.
3. Carnivore bites are more likely to become infected and all have risk of rabies exposure.
4. Cat bites may progress to infection rapidly due to a specific bacterium.
5. Poisonous snakes in this area are generally of the pit viper family: eastern diamondback rattlesnake, copperhead, and water moccasin.
6. The amount of envenomation with snake bites is variable, but is generally worse with larger snakes and early spring.
7. If no pain or swelling is noted, envenomation is unlikely.
8. Black Widow spider bites tend to be minimally painful but, over a few hours, muscular pain and severe abdominal pain may develop.
9. Brown Recluse spider bites are minimally painful to painless. Little reaction is noted initially, but tissue necrosis at the site of the bite normally develops over two to three days.
10. Signs and symptoms of infection include swelling, redness, drainage, fever, and red streaks proximal to the wound.
11. Immuno-compromised patients with diabetes, chemotherapy, organ transplants, HIV / AIDS, etc, are at an increased risk for infection.

**SECTION:** Environmental Emergencies

**PROTOCOL TITLE:** Injury – Diving Emergencies  
Injury – Drowning/Near Drowning

**REVISED:** 06/2017

**OVERVIEW:**

Drowning is a leading cause of accidental death. Drowning, like other causes of death, often strikes young or otherwise healthy people. Prevention of drowning and near drowning is the most effective way to reduce the number of deaths. The outcome of a patient following near drowning is dependent upon rapid recognition, rescue and resuscitation. Treatment of near drowning begins at the scene with rapid, cautious removal of the victim from the water. Spinal precautions should be observed if there is suspicion of a significant mechanism of injury, such as: high velocity impact, diving, or surfing. The concern of saltwater vs. freshwater aspiration is not of immediate importance in the pre-hospital environment. Factors that increase survivability include: younger age, cold water, and less time submerged.

| HPI  | Signs and Symptoms   | Considerations  |
|--|--|---|
| <ul style="list-style-type: none"> <li>Submersion in water, regardless of depth</li> <li>Possible history of trauma (i.e., diving board)</li> <li>Duration of submersion</li> <li>Temperature of the water</li> <li>Type of water</li> </ul> | <ul style="list-style-type: none"> <li>Unresponsive</li> <li>Mental status changes</li> <li>Decreased or absent vital signs</li> <li>Vomiting</li> <li>Coughing</li> </ul> | <ul style="list-style-type: none"> <li>Trauma</li> <li>Pre-existing medical problem</li> <li>Pressure injury (diving)                             <ul style="list-style-type: none"> <li>Barotraumas</li> <li>Decompression sickness</li> </ul> </li> </ul> |

|  | EMR | EMT | A | I | P |
|--|-----|-----|---|---|---|
| 1. Perform general patient management.   | •   | •   | • | • | • |
| 2. Support life-threatening problems associated with airway, breathing, and circulation. Assess mechanism or injury and C-spine precautions. | •   | •   | • | • | • |
| 3. Administer oxygen to maintain $SPO_2$ 94 - 99%. Consider supporting respirations with a BVM.  | •   | •   | • | • | • |
| 4. If the patient is in critical respiratory distress, consider placement of <b>orotracheal</b> intubation.                                  |     |     |   | • | • |
| 5. Remove wet clothing and prevent heat loss. If suspected, refer to <i>Hypothermia protocol</i> .   | •   | •   | • | • | • |
| 6. Monitor <i>capnography</i> .  |     |     | • | • | • |
| 7. Place patient on cardiac monitor and obtain / interpret <i>12 lead ECG</i> .  |     | •   | • | • | • |
| 8. Establish an IV of normal saline at KVO.  |     |     | • | • | • |
| 9. Transport and perform ongoing assessment as indicated.  |     | •   | • | • | • |



### PEARLS:

1. Near drowning patients are at high risk for experiencing secondary drowning several hours after the initial event. Secondary drowning occurs when delayed flash pulmonary edema occurs. All patients suspected of submersion should be transported for further evaluation.
2. Adult Respiratory Distress Syndrome (ARDS) and pneumonia can both occur following the inhalation of water into lungs, causing damage to the alveoli. Make every effort to transport these patients to the hospital for further evaluation.
3. For cold water submersion, attempt resuscitation on all patients unless the patient presents with injuries incompatible with life.
4. Drowning is a leading cause of death among would-be rescuers.