

Recognizing and Managing Cold Emergencies: Frostbite and Hypothermia

This month's drill was prepared by
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INSTRUCTOR GUIDE

Time Required: 3 Hours

Teaching/Learning Materials: Easel pad and markers or board and chalk
Patient care materials: bandages, blankets, manikins, AED

References: Brady Emergency Care, 10th ed. (pp. 484-490), Maryland Protocols for Emergency Services (pp. 74-76)

Motivation: How do EMTs determine the difference between the levels of frostbite and hypothermia? How serious can these cold emergencies be? What may be the patient's outcome? EMTs must be familiar with the signs and symptoms of frostbite and hypothermia and the emergency care for these cold emergencies. It may be necessary to convince the patient to go to the hospital for treatment. Cold emergency treatment only begins in the field, and quick evaluation, care, and transport can prevent the loss of fingers and toes.

Student Performance Objective: Given information, resources, and opportunity for discussion and practice, at the completion of this session, EMTs will be able to describe types and signs and symptoms of frostbite and hypothermia and demonstrate patient assessment and care procedures. EMTs will follow acceptable Maryland medical practice and Maryland Medical Protocols for Emergency Medical Providers.

Enabling Objectives

- Describe frostbite and its classifications.
- List the signs and symptoms of frostbite.
- Describe assessment steps and emergency care.
- Describe hypothermia and its classifications.
- List the signs and symptoms of hypothermia.
- Describe assessment steps and emergency care.
- Demonstrate assessment and care of patients exposed to cold environments.

Overview:

- Frostbite Description and Classifications
- Frostbite Signs and Symptoms
- Frostbite Assessment Steps and Emergency Care
- Hypothermia Description and Classifications
- Hypothermia Signs and Symptoms
- Hypothermia Assessment Steps and Emergency Care
- Practice Patient Care

I. Frostbite

A. Description

1. Freezing of a distal or small body part from prolonged cold exposure
 - a. Cold air
 - b. Contact with a cold object
 - c. Wind and/or water chill exposure
2. Local cooling injuries to extremities
 - a. Feet and toes
 - b. Hands and fingers
 - c. Face: nose and cheeks
 - d. Ears
3. Known by several names
 - a. Frostnip
 - b. Immersion foot (trench foot): Injury to skin, blood vessels, and nerves of the feet from continuous immersion in water, even in above freezing conditions
 - c. Chilblains (pernio): Inflammation of the hands and feet from repeated exposure to cold and moisture
4. A result of prolonged cold exposure, outdoors as well as indoors, with constriction of blood vessels in the extremities that diverts warm blood flow and oxygen to central vital organs
 - a. Constriction cycles with dilation to preserve functions of extremities
 - b. As the body temperature continues to drop, the brain permanently constricts vessels in extremities to maintain warmth in vital organs: frostbite begins
 - 1) Cell death begins due to exposure
 - a) Ice crystals form in the space outside the cells
 - b) The cell becomes dehydrated
 - 2) Cell deterioration occurs from lack of oxygen and water
 - a) The lining of the blood vessels has been damaged
 - b) Blood leaks out of the vessels on rewarming
 - c) Small clots form causing blood flow problems and inflammation
 - d) Inflammation causes further tissue damage

B. Classifications

1. Superficial (early stage)
 - a. Blood flow is restricted to body parts
 - b. Body parts freeze
 - c. Ice crystals form inside tissues
2. Deep (late stage)
 - a. Gangrene sets in due to loss of water (cell dehydration) and oxygen loss
 - b. The part may have to be amputated, even after months of trying to heal

II. Frostbite Signs and Symptoms

A. Superficial (early stage)

1. Patient may complain of burning, numbness, tingling, itching or cold in affected areas
2. The affected part first appears red, then turns mottled, bluish, white, or grey as the flesh continues to freeze

- 3. In persons with dark skin, the skin color lightens and then blanches (turns white), and will quickly turn bluish or grey
- 4. The skin feels frozen/stiff/rigid, but has some pliability when pressed
- B. Deep (late stage)
 - 1. Patient may complain of decreased sensation, then lose all sensation or feeling
 - 2. The affected part swells and develops blood-filled blisters over white or yellowish, waxy-looking skin
 - 3. The skin feels hard with no pliability when pressed and may appear black
 - 4. On rewarming
 - a. The affected part turns purplish-blue
 - b. There is painful aching as blood flow returns to the tissues
 - c. Throbbing begins in 2 to 3 days and may last months
 - d. The part may never heal and may require amputation

III. Frostbite Assessment Steps and Emergency Care

- A. Assessment: Perform General Patient Care (Maryland Protocols)
 - 1. Size up the scene and gather information on approach
 - 2. Perform initial assessment
 - a. Superficial
 - 1) Look for color changes: light skin reddens; dark skin lightens; both blanch followed by color changes
 - 2) Feel area for pliability
 - 3) Ask patient how it feels: patient may report numbness, tingling, burning
 - b. Deep
 - 1) Check skin appearance: white and waxy skin turns mottled or blotchy, then to grayish yellow to grayish blue
 - 2) Look for swelling and blistering
 - 3) Gently palpate: Does the surface feel frozen with no pliability in underlying tissue? Do not squeeze or poke the affected part
 - 4) Ask patient how it feels
 - 3. Perform focused history and physical exam
 - 4. Follow treatment protocols
 - 5. Communicate with hospital or other response personnel
 - 6. Disposition: determine priority and mode of transport
- B. Emergency care (adults or peds)
 - 1. Quickly remove the patient from the cold environment
 - a. Outside: Place patient in heated ambulance, wrap in blankets
 - b. Inside: Turn up heat while working in the patient's home, wrap in blankets, move to heated ambulance
 - 2. Gently handle the frostbitten area
 - a. Do not rub affected areas
 - b. Ice crystals within the tissue will cause further damage
 - 3. Wrap the affected area gently and loosely with gauze
 - a. Patient may complain of tingling or burning, which is normal
 - b. If patient does not respond to simple treatment, begin care for deep frostbite
 - 1) Provide high-concentration oxygen
 - 2) Provide rapid transport

- 3) If transport is delayed, re-warm affected part **only** on medical direction
- 4) Do not allow the patient to smoke or consume caffeine or alcohol (vasoconstrictors, raise blood pressure)
- 5) Do not allow patient to use affected part or walk on affected feet
4. Maintain a warm environment: do not re-expose patient to a cold environment
5. Reassess the patient: retake vital signs, recheck injury treatments and medical status
6. Transport/transfer/transition patient and information

IV. Hypothermia

A. Description

1. Generalized body cooling as a result of prolonged cold exposure, reducing body heat and preventing the body from maintaining proper core body temperature; can be life-threatening
2. Loss of body heat through several methods
 - a. Radiation: heat lost to the environment from what the body gives off (radiates)
 - b. Conduction: heat lost by contact with or immersion in cold water or snow
 - c. Convection: heat lost by cold water flow or air currents
 - d. Evaporation: heat lost through perspiration or wet skin
 - e. Respiration: heat lost through expired breaths—warm air to cooler environment
3. Abnormally low core body temperature: 95°F or below; becomes life-threatening at 90°F and below
 - a. Oral measurement: 96.8 to 98.6°F (affected by liquid and food intake and breathing)
 - b. Rectal temperature: generally 0.9 °F higher than oral
 - c. Axillary temperature: generally 0.9 °F lower than oral
 - d. Tympanic temperature: very close to oral measurement

B. Classifications

1. Mild to moderate—95°F to 90°F: Caused by a cold environment, affecting healthy individuals with prolonged exposure but can quickly affect at-risk individuals
 - a. Patients with major trauma and shock, chronic illness, circulatory disorders, infection, burns, and diabetes
 - b. Elderly persons because of an environment with a cool ambient temperature (low thermostat in winter), diet, illnesses, medications, sedentary living
 - c. Infants and children with their large skin surface to body mass ratio, little fat, and small muscle mass (resulting in no shivering, a typical early warning sign)
2. Severe, or extreme—body temperature below 90°F: Presents an unconscious cold patient in a cold environment with no apparent vital signs (heart rate <10 beats per minute)
 - a. Patients will not reach biological death for at least 30 minutes: resuscitate
 - b. Do not assume death based on body temperature and no vital signs

V. Hypothermia Signs and Symptoms

A. General: vary with individual patient factors, length of exposure

1. Begins with shivering, which becomes intense and will cease in severe hypothermia
2. Dizziness and confusion
3. Numbness, stiffness or rigidity in posture, weakness
4. Impaired judgment, speech, and vision, glassy stare
5. Drowsiness, decrease in consciousness to unconsciousness
6. Cool abdominal skin temperature to your touch (back of your hand)
7. Reddened skin turning to pale and cyanotic with prolonged exposure (dark skin initially white, turning cyanotic)

B. Specific

1. Mild to moderate (core body temperature 90 – 95°F)
 - a. Shivering, which becomes intense (generates body heat until muscles are fatigued)
 - b. Pulse and breathing rates and blood pressure initially increase
 - c. Vital signs drop as body temperature drops
 - d. Apathy: patient becomes clumsy, apathetic, confused, and has slurred speech (as if drunk)
2. Severe (core body temperature less than 90°F)
 - a. Loss of consciousness
 - 1) Shivering stops
 - 2) Oxygen intake drops
 - 3) Heart rhythm becomes irregular
 - 4) Patient loses consciousness
 - b. Continued decrease of pulse and breathing rates
 - c. Appearance of death, close to death
 - 1) No reflexes
 - 2) Brain activity slows
 - 3) Pupils dilate
 - 4) Risk of lethal irregular heart rhythm increases
 - 5) Patient appears dead at 82°F

VI. Hypothermia Assessment Steps and Emergency Care

A. Assessment: Perform General Patient Care (Maryland Protocols)

1. Size up the scene and gather information on approach
2. Perform initial assessment
 - a. Assess mental status: check patient's orientation to person, place, time
 - b. Check airway, breathing, circulation
 - c. Consider the following
 - 1) Air temperature, wind chill or water chill
 - 2) Patient's age
 - 3) Clothing worn by patient
 - 4) Patient's general health, illnesses and medications, or injuries
 - 5) Activity at time of incident
 - 6) Use of alcohol or drugs
 - 7) Mental status and motor function, which decreases with degree of hypothermia
3. Perform focused history and physical exam
4. Follow treatment protocols
5. Communicate with hospital or other response personnel

6. Disposition: determine priority and mode of transport
- B. Emergency care (adults or peds)
 1. Quickly remove the patient from the cold environment
 2. Handle the patient gently—rough handling may cause cardiac arrest
 3. Resuscitate as necessary
 - a. Assess the pulse for 30 – 45 seconds
 - b. No pulse, start CPR
 - c. Prepare to use AED if indicated
 4. Use passive rewarming methods to prevent further heat loss
 - a. Remove wet or frozen clothing
 - b. Wrap the patient in thermal blankets and other insulating material
 - c. Be sure to cover the patient's head
 - d. Administer warmed oxygen, if possible/available
 5. Maintain a warm environment: do not re-expose patient to a cold environment
 6. Reassess the patient: recheck vital signs, recheck injuries and treatment, recheck medical status
 7. Transport/transfer/transition patient and information

VII. Demonstrate assessment and care of patients exposed to cold environments

- A. Demonstrate General Patient Care Steps (per Maryland Protocols) for superficial and deep frostbite patients
- B. Demonstrate General Patient Care Steps (per Maryland Protocols) for mild to moderate hypothermia patients
- C. Demonstrate General Patient Care Steps (per Maryland Protocols) for severe hypothermia patients, including resuscitation steps and AED

Summary:

Student Performance Objective: Given information, resources, and opportunity for discussion and practice, at the completion of this session, EMTs will be able to list types and signs and symptoms of frostbite and hypothermia and demonstrate patient assessment and care procedures. EMTs will follow acceptable Maryland medical practice and Maryland Medical Protocols for Emergency Medical Providers.

Review:

Frostbite and Hypothermia

- Describe frostbite and explain why it should be considered serious
- Describe the stages of frostbite
- List the signs and symptoms of frostbite
- Describe hypothermia
- List the classifications with body temperatures of hypothermia
- List the signs and symptoms of hypothermia for each stage
- List the skill steps demonstrated during practice in caring for frostbite and hypothermia patients