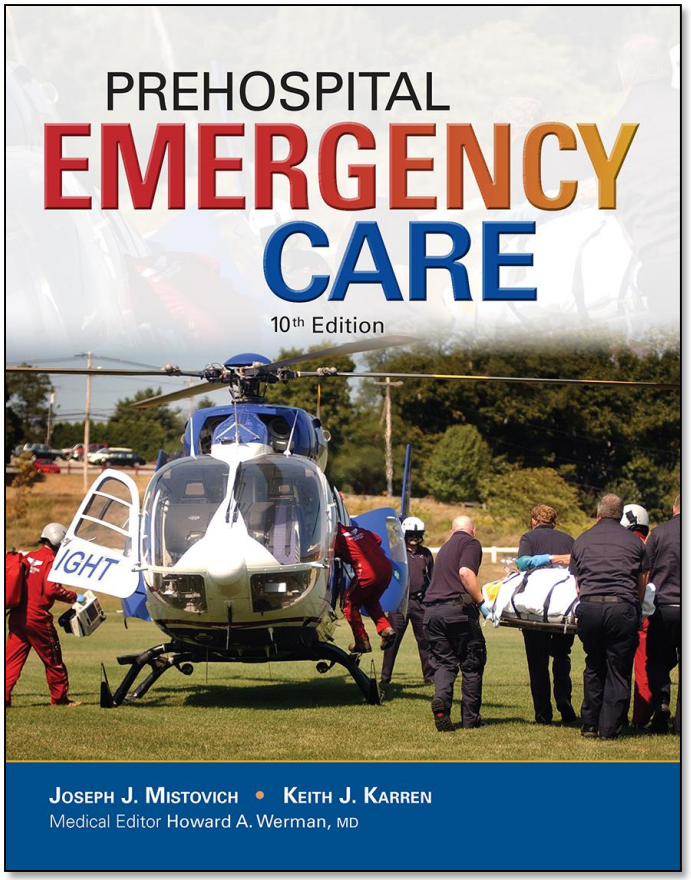
# PREHOSPITAL EMERGENCY CARE

TENTH EDITION




## CHAPTER 24

Part II
Environmental Emergencies

# Learning Readiness

- EMS Education Standards, text p. 676

# Learning Readiness Objectives

- Please refer to page 676 of your text to view the objectives for this chapter.

# Learning Readiness Key Terms

- Please refer to page 677 of your text to view the key terms for this chapter.

# Setting the Stage

- Overview of Lesson Topics
  - Bites and Stings
  - Lightning Strike Injuries
  - High Altitude Sickness

# Case Study Introduction

Randy Wall is on foot, cutting through an open space on the edge of the city, hoping to reach the bus stop in time so he can get out of the desert heat. As he walks by some sagebrush, he feels a sharp stinging at the same time he hears the rattler's warning. Looking down, he sees two small puncture wounds just above his left ankle. "Oh, no!" he thinks, and pulls out his cell phone to call 911.

# Case Study

- When EMTs arrive, what should their initial actions be?
- What is the prehospital treatment for a snake bite?

# Introduction

- Environmental emergencies
  - Disruptions in the body physiology in response to elements in the patient's natural surroundings
  - Elements include the climate, altitude, lightning, and contact with insects or animals

# Bites and Stings

- Poisonous snakes include pit vipers and coral snakes
- Symptoms usually begin immediately if the bite is envenomated
- Pit viper bites are characterized by one or two puncture marks

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Typical rattlesnake bite.

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# Bites and Stings

- Poisonous snake characteristics:
  - Large fangs (except the coral snake)
  - Elliptical pupils
  - A pit between the eye and mouth
  - Blotches on the skin (coral snake is ringed)
  - Large, triangular head

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# Bites and Stings

- Envenomated pit viper bites cause signs and symptoms immediately
- Coral snake bite effects can be delayed 1 to 8 hours
- Several factors affect the severity of the bite

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Snakebite to the hand.

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# Bites and Stings

- Factors affecting snake bite severity
  - Amount of venom injected
  - Location of the bite
  - Presence of pathogens
  - Patient's weight and size
  - Patient's health
  - Amount of physical activity following the bite

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# Bites and Stings

- Insect bites
  - Most are not serious, but severe allergic reactions can occur
  - Localized signs and symptoms include sharp, stinging pain, itching, redness, tenderness, swelling

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# Bites and Stings

- Black widow spider
  - Characteristic black body with red hourglass marking on the abdomen
  - Bite can be fatal
  - Extremes of age, chronic illnesses, and hypertension increase the risk of severe reaction

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# Bites and Stings

- Black widow spider bites can cause:
  - Initial pinprick sensation that becomes a dull ache
  - Severe muscle spasms
  - Rigid, board-like abdomen
  - Dizziness, nausea, vomiting
  - Respiratory distress in severe cases

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# Bites and Stings

- Brown recluse spider
  - Characteristically brown with a darker violin-shaped mark on the back
  - The bite usually does not heal and may require surgical repair

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Wound from a brown recluse spider bite.

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# Bites and Stings

- Brown recluse spider bite characteristics
  - Initial bite may go unnoticed
  - The area becomes discolored
  - A large ulcer develops within 7 to 10 days

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# Bites and Stings

- Scorpion
  - Only one species in the U.S. produces bites that can be fatal
  - The severity depends on the amount of venom injected
  - Signs and symptoms can include sharp pain, drooling, poor coordination, incontinence, and seizures

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# Bites and Stings

- Fire ant
  - Painful bite that produces fluid-filled vesicles
  - Localized reaction can affect the entire extremity

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# Bites and Stings

- Tick
  - Ticks can carry tick fever, Rocky Mountain spotted fever, Lyme disease, and other diseases
  - Ticks should be removed promptly by pulling them out of the skin with tweezers
  - The wound should be washed with soap and water, and an antiseptic applied

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A tick embedded in the scalp. (© Charles Stewart, MD, & Associates)

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# Bites and Stings

- Assessment based approach to bites and stings
  - Scene size-up
    - Exercise caution to avoid the snake or insects
    - Look for clues to what may have caused the bite

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# Bites and Stings

- Assessment based approach to bites and stings
  - Primary assessment
    - Form a general impression
    - Assess the mental status
    - Be alert to signs of anaphylaxis when assessing the airway and breathing

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# Bites and Stings

- Assessment based approach to bites and stings
  - Secondary assessment
    - Look for signs and symptoms of anaphylactic shock and intervene immediately, as needed
    - Look for signs and symptoms of localized reactions, and treat as for injected poisons

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# Bites and Stings

- Signs and symptoms of anaphylaxis
  - Hives
  - Flushing
  - Upper airway obstruction
  - Faintness
  - Dizziness
  - Generalized itching

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# Bites and Stings

- Signs and symptoms of anaphylaxis
  - Generalized swelling
  - Difficulty swallowing
  - Shortness of breath, wheezing, stridor
  - Labored breathing
  - Abdominal cramps

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# Bites and Stings

- Signs and symptoms of anaphylaxis
  - Confusion
  - Loss of responsiveness
  - Convulsions
  - Hypotension

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# Bites and Stings

- Emergency medical care for anaphylaxis
  - Maintain a patient airway
  - Maintain adequate oxygenation
  - Assist ventilations if breathing is inadequate

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# Bites and Stings

- Emergency medical care for anaphylaxis
  - Administer epinephrine by auto-injector, if prescribed to the patient and approved by medical direction
  - Request ALS
  - Initiate early transport

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# Bites and Stings

- General signs and symptoms of bites and stings
  - History of bite or sting
  - Immediate, severe pain or burning; area may become numb
  - Redness or discoloration
  - Swelling
  - Weakness or faintness

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# Bites and Stings

- General signs and symptoms of bites and stings
  - Dizziness
  - Chills
  - Fever
  - Nausea, vomiting
  - Bite marks
  - Stinger

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# Bites and Stings

- Emergency medical care for bites and stings
  - Remove the stinger by scraping
  - Wash the area
  - Remove jewelry or constricting objects
  - Lower the affected area below the heart
  - Apply a cold pack to insect bites (not snake or marine animal bites)

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# Bites and Stings

- Emergency medical care for bites and stings
  - Follow medical direction concerning use of a constricting band for snake bites
  - Observe the patient carefully for anaphylaxis
  - Keep the patient calm and limit physical activity
  - Reassess

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# Bites and Stings

- Marine life bites and stings
  - Venom may cause extensive damage
  - Venom is destroyed by heat
  - Some effective antivenins are available

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# Bites and Stings

- Emergency care for marine life bites and stings
  - Treat as soft tissue injuries
  - Use forceps to remove material that sticks to the sting site, then irrigate with water
  - Do not attempt to remove embedded spines

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# Bites and Stings

- Emergency care for marine life bites and stings
  - For jellyfish, coral, hydra, or anemone, remove dried tentacles and pour vinegar over the area
  - Apply heat for 30 minutes

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# Click on the item below that is characteristic of pit vipers.

A. Alternating bands of red, yellow, and black

B. Small, rounded head

C. Elliptical pupils

D. Small, rounded teeth instead of fangs

# Lightning Strike Injuries

- 100 million to 2 billion volts per bolt
- Amperage as high as 200,000
- Duration of 1/100$^{th}$ to 1/1,000$^{th}$ of a second
- Travels 1 to 2 million meters per second
- Contact temperature 15,000 to 60,000° F

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# Lightning Strike Injuries

- Rapid expansion of air around the lightning bolt propels the person, causing blunt trauma
- Changes in air pressure can damage the body's air-containing cavities

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# Lightning Strike Injuries

- Four mechanisms of lightning strike injury
  - Direct strike
  - Contact strike
  - Splash or side flash strike
  - Ground current or step voltage strike

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# Lightning Strike Injuries

- The heart and nervous tissue are sensitive to the electrical energy of lightning
  - Cardiac or respiratory arrest may occur

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# Lightning Strike Injuries

- Signs and symptoms
  - Nervous system
    - Altered mental status
    - Retrograde or anterograde amnesia
    - Weakness
    - Pain, tingling, numbness
    - Pale, cool, clammy skin; possible mottling or cyanosis

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# Lightning Strike Injuries

- Signs and symptoms
  - Nervous system
    - Temporary paralysis
    - Dizziness, vertigo
    - Loss of pupillary function
    - Seizures

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# Lightning Strike Injuries

- Signs and symptoms
  - Cardiac
    - Asystole, ventricular fibrillation
    - Irregular pulse
  - Respiratory
    - Respiratory distress
    - Apnea

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# Lightning Strike Injuries

- Signs and symptoms
  - Skin
    - Burns
    - Feathering
  - Musculoskeletal
    - Dislocations
    - Fractures

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A feathering pattern on the skin resulting from a lightning strike. (© David Effron, MD)

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# Lightning Strike Injuries

- Signs and symptoms
  - Eye
    - Unequal pupils
    - Drooping eyelids
  - Ear
    - Ruptured eardrum
    - Tinnitus
    - Deafness

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# Lightning Strike Injuries

- Emergency care
  - Focus on nervous system damage and possible cardiac dysrhythmias
  - Ensure the scene is safe
  - If the clothing is on fire, put it out
  - Spinal stabilization

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# Lightning Strike Injuries

- Emergency care
  - If the mental status is altered, open the airway
  - Begin CPR for cardiac arrest and apply the AED
  - Positive pressure ventilation for inadequate breathing

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# Lightning Strike Injuries

- Emergency care
  - Maintain oxygenation
  - Complete spinal immobilization
  - Transport while continuously monitoring the patient's condition

# High Altitude Sickness

- At high altitude, atmospheric pressure is decreased, which makes less oxygen available
- Decreased oxygen can aggravate pre-existing medical conditions
- Illness may occur even in healthy individuals at high altitude

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# High Altitude Sickness

- High altitude is >5,000 feet, but serious illness usually occurs at altitudes >8,000 feet, especially with rapid ascent

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# High Altitude Sickness

- Signs and symptoms include:
  - General ill feeling
  - Loss of appetite
  - Headache
  - Sleep disturbance
  - Respiratory distress on exertion

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# High Altitude Sickness

- Acute mountain sickness occurs when there is rapid ascent to 6,600 feet or higher
- Symptoms develop 6 to 24 hours after ascent

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# High Altitude Sickness

- AMS signs and symptoms
  - Weakness
  - Nausea
  - Headache
  - Shortness of breath
  - Lightheadedness
  - Loss of appetite
  - Fatigue
  - Difficulty sleeping

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# High Altitude Sickness

- Severe AMS signs and symptoms
  - Severe weakness
  - Decreased urine output
  - Vomiting
  - Increased shortness of breath
  - Altered mental status

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# High Altitude Sickness

- AMS emergency care
  - Primary care is descent to a lower altitude
  - Oxygen may relieve signs and symptoms; $SpO_2$ of 90% is normal at high altitudes

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# High Altitude Sickness

- High-altitude pulmonary edema (HAPE)
  - Affects the lungs and gas exchange
  - Can occur at >8,000 feet, but usually occurs at >14,500 feet

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# High Altitude Sickness

- HAPE signs and symptoms
  - Shortness of breath at rest
  - Cough
  - Fatigue
  - Headache
  - Loss of appetite

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# High Altitude Sickness

- HAPE signs and symptoms
  - Tachypnea
  - Tachycardia
  - Cyanosis
  - Crackles or wheezing
  - Weakness

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# High Altitude Sickness

- HAPE emergency medical care
  - The best treatment is descent
  - Oxygen administration may relieve signs and symptoms

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# High Altitude Sickness

- High-altitude cerebral edema (HACE)
  - Most cases occur at >12,000 feet
  - Collection of fluid within the brain tissue results in increased pressure within the skull

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# High Altitude Sickness

- HACE signs and symptoms
  - Severe headache
  - Uncoordination
  - Nausea, vomiting
  - Altered mental status
  - Seizures
  - Coma

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# High Altitude Sickness

- HACE emergency medical care
  - Descent to lower altitude
  - Supplemental oxygen, in some cases with positive pressure ventilation

# Case Study Conclusion

When the EMTs arrive, thankful for boots that reach above the ankle, they look and listen carefully as they approach the Randy, and ask him if he saw where the snake went. Rather than begin secondary assessment and treatment in the open space, the EMTs feel it is safer to place Randy in the ambulance first.

Randy is positioned with his legs flat on the stretcher for the ride to the hospital.

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# Case Study Conclusion

The EMT caring for Randy obtains a history and complete set of vital signs, and places a dressing over the puncture wounds, which continue to ooze blood. He then notifies the receiving hospital, giving a description of the snake as Randy had described it to him.

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# Case Study Conclusion

Medical direction advises against a constricting band. By the time they reach the hospital, Randy's left foot and ankle have begun to discolor, and are swollen. Fortunately, antivenin is immediately available.

# Lesson Summary

- Lightning strikes may cause serious injury to the nervous and cardiovascular systems, as well as causing burns and blunt trauma.
- Altitude sickness generally occurs at levels >8,000 feet.
- An important part of treating altitude illness is to get the patient to a lower altitude.