Chapter 22
Environmental Emergencies
U.S. DOT Objectives are covered and/or supported by the PowerPoint™ Slide Program and Notes for Emergency Care, 11th Ed. Please see the Chapter 22 correlation below.

**KNOWLEDGE AND ATTITUDE**

- **4-7.1** Describe the various ways that the body loses heat. Slides 5-10
- **4-7.2** List the signs and symptoms of exposure to cold. Slides 14, 16-17, 23-24, 26
- **4-7.3** Explain the steps in providing emergency medical care to a patient exposed to cold. Slides 18-22, 25, 27-31
- **4-7.4** List the signs and symptoms of exposure to heat. Slides 34-35, 37-38
- **4-7.5** Explain the steps in providing emergency care to a patient exposed to heat. Slides 36, 39
- **4-7.6** Recognize the signs and symptoms of water-related emergencies. Slide 42
- **4-7.7** Describe the complications of drowning. Slides 44-47, 50
- **4-7.8** Discuss the emergency medical care of bites and stings. Slides 66, 69, 72

(cont.)
U.S. DOT Objectives Directory

*SKILLS

- **4-7.9** Demonstrate the assessment and emergency medical care of a patient with exposure to cold.
- **4-7.10** Demonstrate the assessment and emergency medical care of a patient with exposure to heat.
- **4-7.11** Demonstrate the assessment and emergency medical care of a near-drowning patient.
- **4-7.12** Demonstrate completing a prehospital care report for patients with environmental emergencies.
Effects of Heat and Cold
Temperature Regulation

- The body tries to balance heat loss and heat gain to maintain normal temperature.
Conduction

- Transfer of heat from one material to another through direct contact
  - Water conducts heat away from the body 25 times faster than still air.
Convection

- Currents of air or water pass over the body and carry heat away.
Heat is picked up by the surrounding air or water.
Evaporation

- Occurs when the body perspires or gets wet
Respiration

* Causes loss of body heat as a result of exhaled warm air
Cold Emergencies
Generalized Hypothermia

- Cooling that affects the entire body
- Exposure to cold reduces body heat
- Heat loss exceeds heat gain.
- Hypothermia can lead to death.
Predisposing Factors

**Geriatric:**
- Failing body systems
- Chronic illness
- Poor diet, lack of exercise

**Pediatric:**
- Small muscle mass
- Large skin surface areas and little body fat
## Stages of Hypothermia

<table>
<thead>
<tr>
<th>Core Body Temperature</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>99°F–96°F 37.0°C–35.5°C</td>
<td>Shivering.</td>
</tr>
<tr>
<td>95°F–91°F 35.5°C–32.7°C</td>
<td>Intense shivering, difficulty speaking.</td>
</tr>
<tr>
<td>90°F–86°F 32.0°C–30.0°C</td>
<td>Shivering decreases and is replaced by strong muscular rigidity. Muscle coordination is affected and erratic or jerky movements are produced. Thinking is less clear, general comprehension is dulled, possible total amnesia. Patient generally is able to maintain the appearance of psychological contact with surroundings.</td>
</tr>
<tr>
<td>85°F–81°F 29.4°C–27.2°C</td>
<td>Patient becomes irrational, loses contact with environment, and drifts into stuporous state. Muscular rigidity continues. Pulse and respirations are slow.</td>
</tr>
</tbody>
</table>
Obvious and Subtle Exposure

- Ethanol (alcohol) ingestion
- Underlying illness
- Overdose or poisoning
- Major trauma
- Outdoor resuscitation
- Decreased ambient temperature
Signs and Symptoms

- Shivering, numbness
- Stiff or rigid posture
- Drowsiness
- Rapid breathing and rapid pulse
Signs and Symptoms

- Loss of motor coordination
- Decreased LOC
- Cool abdominal skin temperature
- Skin red initially, then pale to cyanotic
Active vs. Passive Rewarming

**Passive:**
- Allows body to rewarm itself
- Remove wet clothing.
- Cover with blanket(s).

**Active:**
- Application of external heat sources to patient
- Can be more dangerous if condition is serious
Hypothermic Patient Care

1. Remove wet clothing.
2. Actively re-warm during transport.
3. Treat for shock and monitor vital signs.
4. Provide oxygen.
5. Give warm fluids slowly.
Heat applied to lateral chest, neck, and armpits

Avoid re-warming limbs.

Transport delayed—warm bath

Keep patient at rest.
Patient Care—Unresponsive

- Open airway; provide high-concentration oxygen.
- Apply blankets.
- Increase heat in ambulance.
- Transport.
- Active warming can cause VF.
Extreme Hypothermia

- Assess the carotid pulse for 30–45 seconds.
  - No pulse—start CPR and apply the AED.

- Biological death may be delayed for up to 30 minutes.
  - Not dead until they are warm
Localized Cold Injuries

- Early or superficial
- Late or deep
- Occurs in extremities and to exposed nose, ears, and face
- Signs and symptoms are progressive.
Signs and Symptoms—Early

- Numbness
- Light skin—redness
- Dark skin—lightens
- Both light and dark skin blanch (whiten) later
Patient Care—Frostnip

1. Remove patient from environment.
2. Warm affected area.
3. If the injury is to an extremity, splint and cover it.
4. Do not rub or massage, and do not re-expose to the cold.
Assessment—Late or Deep Injury

* Frostbite
  
  - Skin appears white and waxy.
  - Progression: skin mottled or blotchy —> color from white to grayish yellow —> grayish blue
  - Area feels frozen (only on the surface).
Never listen to myths and folk tales about the care of frostbite!

Administer high-concentration oxygen.

Transport.

If transport delayed, get patient indoors.
Active Rewarming

* Seldom recommended
* Perform only if:
  - Transport extremely delayed AND
  - Medical direction orders it OR
  - Protocols allow it.
* Large potential to permanently injure frozen tissue

(cont.)
Active Rewarming

- Fill container with 100–105°F water.
- Remove jewelry, bands, and clothing.
- Completely immerse the frozen part.
- Maintain warm temperature until completely thawed.
Active Rewarming

- Immerse affected part in warm-water bath.
- Remove when part no longer feels frozen and begins to turn red or blue.
- Dress area with dry, sterile dressings.

(cont.)
Active Rewarming

- Protect against refreezing.
- Expect complaint of severe pain.
- Keep the patient at rest.
- Reassess and transport.
Heat Emergencies
Exposure to Heat

- Hyperthermia—abnormally high body temperature
- Can lead to death
- Skin may absorb more than it loses.
Heat Exhaustion

- Prolonged exposure to excessive heat
- Shock secondary to fluid and salt loss
- Moist, pale, and normal-to-cool skin
- Firefighters, construction workers, dock workers, etc.
Findings—Heat Exhaustion

- Muscular cramps—usually legs and abdomen
- Weakness, exhaustion, dizziness, or syncope
- Rapid, shallow breathing with weak pulse
- Diaphoresis
- Brief loss of consciousness
Patient Care—Heat Exhaustion

- Remove from the hot environment.
- Give oxygen via nonrebreather.
- Loosen or remove clothing.
- Place patient in supine position with legs elevated.
- Responsive and not nauseated — small sips of water.
- Transport.
Heat Stroke

- True emergency
- Patient stops sweating.
- Temperature regulation fails.
- Skin is hot, whether dry or moist.
- Athletes, elderly, laborers and others who work or exercise in hot environments
Findings—Heat Stroke

* Rapid shallow breathing
* Strong and rapid pulse
* Loss of consciousness or altered mentation
* Dilated pupils
* Seizures
Patient Care—Heat Emergency

1. Remove from environment.
2. Remove clothing.
3. Apply cold packs to neck, groin and armpits.
5. Transport.
6. If transport is delayed, immerse patient in tub or container.
Water-Related Emergencies
Water-Related Emergencies

- **Drowning**
  - Bathtubs, pools, or open bodies of water
- **Boating, water-skiing, jet-skiing, scuba-diving**

*Do not attempt a rescue unless trained!*
Findings—Water-Related Emergencies

- Airway obstruction
- Cardiac arrest
- Signs of heart attack
- Head, neck, and internal injuries
- Drowning
- Generalized cooling or hypothermia
- Substance abuse
Near Drowning

The term “near drowning” is no longer used.
Drowning

- A process resulting in primary respiratory impairment from submersion/immersion in a liquid medium.

- The victim may live or die after this process, but whatever the outcome, he or she has been involved in a drowning incident.
Drowning—The Process

- Person struggles to keep afloat
- Gulps large breaths of air
- Water enters airway
- Coughing and swallowing ensue
- Reflex spasm occurs and seals airway
Drowning

SOMETHING GOES WRONG
- Swallowing water
- Fatigue
- Unable to cope with currents
- Injuries
- Cold
- Entanglement in plants
- Loss of concentration

PANIC

INEFFICIENT BREATHING

DECREASED BUOYANCY

EXHAUSTION

DROWNING

CARDIAC ARREST
Historical Data

- 10% die from drowning, secondary to lack of air.
- 90% die from drawing water into lungs, or the spasms subside with the onset of unconsciousness.
Decision to Rescue
Treatment—Rescue Breathing

1. Initial assessment, protect C-spine
2. Provide rescue breathing.
3. Chest compressions not effective in water.
4. Control bleeding.
5. Suction as needed.
6. Administer oxygen via nonrebreather.
7. Transport immediately.
**Spinal Injuries**

- Unconscious or head injury
  - Suspect neck and spinal injuries.
- In cardiac or respiratory arrest
- Do not delay basic life support.
Spinal Injury—Removal from Water
Positioning if No C-spine Issues
Diving Accidents

- Involve head and neck injuries
- Additional findings—spine, hands, feet, and ribs
- Perform an initial assessment.
- Focused history and physical exam
Scuba-Diving Accidents

* All types of body injuries
* Air embolism—result of gases leaving damaged lung and entering blood stream
* Decompression sickness—diver comes up too quickly from the deep
Signs—Air Embolism

- Blurred vision
- Chest pains
- Numbness and tingling sensations
- Possible paralysis
- Frothy blood in mouth and nose
- Convulsions
- Lapse in convulsions
- Respiratory arrest and cardiac arrest
Signs—Decompression Sickness

- Personality changes
- Fatigue
- Staggering
- Deep pain to muscles and joints
- Itchy blotches or mottled skin
- Numbness or paralysis
- Choking
- Coughing
- Chest pains
- Respiratory arrest and cardiac arrest
Emergency Care—Diving Injuries

- Maintain an open airway.
- Provide oxygen via nonrebreather.
- Provide rapid transport.
- Contact medical control.
- Keep patient warm.
- Position patient.
Water Rescue Procedures

Reach

Throw and Tow

Row
Ice Rescues

* #1 rule—protect yourself.
* Cold water submersion suit and personal flotation device should be worn.
Ways to Reach Victims

- Flotation devices
- Rope
- Small, flat-bottomed aluminum boat
- Ladder
Bites and Stings

* Source of injected poisons
* 5% of population will have an allergic reaction.
* ALL spiders are poisonous.
  - Most species cannot get their fangs through human skin.
Black Widow

Causes more immediate reaction
Brown Recluse

* Painless bites
* Characteristic lesion in 10% of cases and only after up to 12 hours
Findings—Bites and Stings

- Altered states of awareness
- Noticeable stings or bites on skin
- Puncture marks
- Blotchy skin
- Localized pain or itching
- Numbness
- Burning sensations

(cont.)
Findings—Bites and Stings

- Redness, swelling, or blistering
- Weakness or collapse
- Difficult breathing and abnormal pulse
- Headache and dizziness
- Chills, fever, and muscle cramps
- Anaphylaxis
Emergency Care—Bites and Stings

1. Remove venom sac or stinger.
2. Treat for shock.
3. Remove jewelry from affected limbs.
5. Call medical control.
6. Place constricting band (per protocol).
Snakebite

- Nearly 50,000 people in the United States are bitten by snakes each year.
- More than 8,000 involve poisonous snakes.
- Fewer than 10 deaths are reported annually.
- Two types of poisonous snakes:
  - Pit vipers
    - 25% are “dry bites”
  - Coral snakes
    - 50% are “dry bites”
Findings—Snakebites

- Noticeable bite
- Pain and swelling
- Rapid pulse and labored breathing
- Progressive general weakness
- Vision problems
- Nausea and vomiting
- Seizures
- Drowsiness
- Unconsciousness
Patient Care—Snakebites

1. Contact Medical Control.
2. Treat for shock and conserve heat.
3. Clean bite site.
4. Remove rings, bracelets, etc.
5. Immobilize extremities.
Poisoning—Marine Life

- Jelly fish
- Sea nettle
- Portuguese man-of-war
- Coral
- Sea anemone
- Hydra
Findings and Treatment—Marine Life

Allergic reaction Anaphylaxis
Treatment

1. Oxygen
2. Consult Medical Control
3. Rinse affected areas with vinegar or rubbing alcohol
4. Transport
Review Questions

1. Describe when it is appropriate to treat a cold emergency with active rewarming and when you should perform passive rewarming.

2. List five situations in which a patient may be suffering from hypothermia along with another, more obvious medical condition or injury.

3. Name the signs and symptoms of a late or deep localized cold injury.

(cont.)
Review Questions

4. Describe the management of a patient suffering from a heat emergency who has moist, pale, and cool skin.

5. Describe the management of a patient suffering from a heat emergency who has hot, dry skin.

6. Describe the proper care for a patient suffering from snakebite.
What concerns might you have for this patient?

What assessment needs to be performed?

Should you rewarm this patient? If so, when should you start?
Street Scenes

- How often should you take vital signs?
- When moving the patient out of the ambulance and onto the hospital stretcher, what precautions should be taken?
Sample Documentation

<table>
<thead>
<tr>
<th>VITAL SIGNS</th>
<th>TIME</th>
<th>RESP</th>
<th>PULSE</th>
<th>B.P.</th>
<th>PATIENT AGE: Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2130</td>
<td>28</td>
<td>120</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2135</td>
<td>28</td>
<td>120</td>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>

| DOT Directory |

NARRATIVE  
EMS requested to the scene by local police, who state they found the patient sitting on a heater grate alongside the sidewalk in soaking wet clothing. They state that the patient did not appear alert, so EMS was requested. On our arrival, patient responds to loud verbal stimuli with occasional inappropriate responses. Patient is obviously shivering and initially appears to be hypothermic. Once patient is loaded in the ambulance via the cot, the heat is turned up. We removed patient’s wet clothing and gently dried him prior to wrapping him in warm, dry blankets. Oxygen therapy is initiated prior to transporting the patient with as gentle a ride as possible. The patient is turned over to the hospital slightly more alert and oriented.