

# Environmental Emergencies

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# Cold-Related Emergencies



# Hypothermia

- Hypothermia is a reduced core temperature where the cold overwhelms heat production and heat retention factors of the body. The rate of onset can be:
  - Acute(minutes to hours)
  - Sub-acute(hours)
  - Chronic(several days): often seen in Homeless, drug addicts, alcoholics, and immunocompromised people
- Normal core temperature: about 37°C (98.6°F), Hypothermia: below 35°C (95°F)

## Symptoms:

Mild Hypothermia (90-95°F)

- Shivering, cold skin, fatigue, slurred speech, confusion

Moderate Hypothermia (82-90°F)

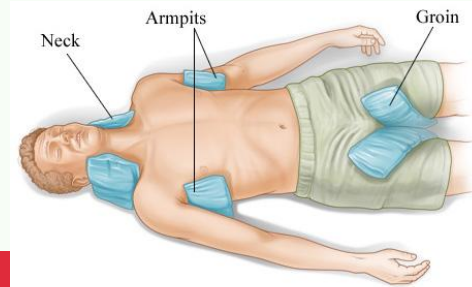
- Pale or blue skin, slowed breathing, weak pulse

Severe Hypothermia (Below 82°F)

- Unconsciousness, rigid muscles, slow or absent breathing, weak or absent pulse

# Treatment

1. Remove the patient from the cold environment and prevent further heat loss
2. Remove wet clothing, begin rewarming
  - Cover with blankets, turn up the heat in the ambulance
3. Administer O2 - titrate to 94-99% (warmed and humidified is preferred)
4. Closely monitor cardiac rhythm
  - Severely hypothermic patients may appear dead. If you find an unresponsive, hypothermic patient, take time (30-45 seconds) to try and find a pulse before beginning CPR
  - CPR should be initiated if there is any doubt about pulselessness
  - If V-Tach or V-Fib is present, defibrillation should be attempted
5. Check blood glucose levels. Administer glucose as needed
6. Transport immediately



# ALCO Protocol

## Patient Care Policy (General)

Modified On: May 6, 2013

### HYPOTHERMIA

#### •Routine Medical Care

- Protect the patient from the environment
- If patient is in extremis, begin treatment prior to secondary survey
- Check skin temperature

1. **INTRODUCTION:** Hypothermia is a reduced core temperature where the cold challenge overwhelms heat production and heat retention factors. The rate of onset can be:

1.1 **Acute** (minutes to hours) e.g. immersion in cold water

1.2 **Sub-acute** (hours)

1.3 **Chronic** (often over several days) Homeless, drug users, alcoholics, and compromised individuals are at high risk. Elderly persons and those taking certain medicines are also at risk. Injured and seriously ill individuals can become hypothermic quickly

→ **Note:** a hypothermic critical trauma patient has a very high mortality and morbidity rate!

#### 2. **SIGNS AND SYMPTOMS OF HYPOTHERMIA:**

2.1 Altered mental status including: confusion, mood changes, and speech difficulties. The patient's judgment may be affecting causing him/her to exhibit inappropriate behaviors such as removing clothing

2.2 Decreased motor function, poor coordination

2.3 Diminished sense of cold sensation

2.4 Pupils that respond slowly or sluggishly

#### 3. **TREATMENT:**

##### 3.1 **General:**

3.1.1 Remove the patient from the cold environment and prevent further heat loss

3.1.2 Remove wet clothing, begin rewarming - cover with blankets, turn up the heat in the ambulance

3.1.3 Do not let the patient walk or exert him/herself

3.1.4 Administer O<sub>2</sub> - titrate to 94-99% SpO<sub>2</sub> (warmed and humidified is preferred)

3.1.5 Closely monitor cardiac rhythm

3.1.6 Check blood glucose levels. Administer glucose as needed (see ALOC [page 31](#) – adult or [page 66](#) - pediatric)

3.1.7 Transport immediately

##### 3.2 **BLS:**

3.2.1 CPR should be initiated if there is any doubt about pulselessness

3.2.2 Severely hypothermic patients may appear dead. If you find an unresponsive, hypothermic patient, take time (30-45 seconds) to try and find a pulse before beginning CPR. Chest compressions should be avoided if any signs of life are present

3.2.3 If VT or VF is present, defibrillation should be attempted. If one shock is unsuccessful, subsequent shocks should be deferred



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# Heat-Related Emergencies



# Hyperthermia

## Heat Cramps

- Usually occur during or after intense exercise in heat
- Symptoms: painful muscle cramps, heavy sweating and thirst

## Heat Exhaustion

- The body struggles to cool itself
- Symptoms: weakness, dizziness, nausea, headache, rapid pulse, and pale, sweaty skin

## Heat Stroke

- Medical Emergency!
- The body's thermoregulatory system fails and core temperature exceeds 104°F
- Symptoms: hot, **dry** skin (though some patients may still sweat), confusion, seizures, or loss of consciousness

HEAT EXHAUSTION SYMPTOMS	HEAT STROKE SYMPTOMS
1. Faint or dizzy	1. Throbbing headache
2. Excessive sweating	2. No sweating
3. Cool, pale, clammy skin	3. Body temp above 103° Red, hot, dry skin
4. Nausea, vomiting	4. Nausea, vomiting
5. Rapid, weak pulse	5. Rapid, strong pulse
6. Muscle cramps	6. May lose consciousness

HOW TO TREAT IT	HOW TO TREAT IT
1. Move to cooler location	1. Get emergency help
2. Drink water	2. Keep cool until treated
3. Take a cool shower or use cold compresses	



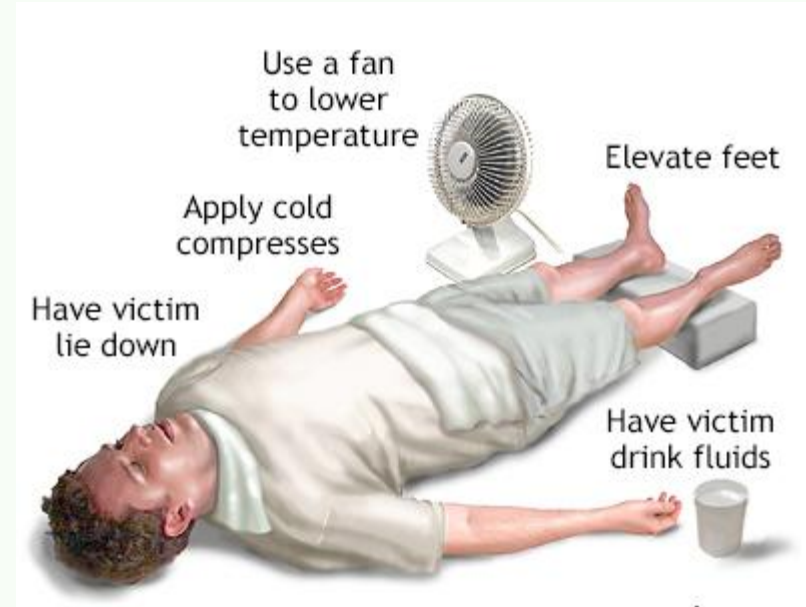
# Treatment for all Heat Emergencies

## If the patient is conscious:

- Remove patient from hot environment
- Loosen/remove clothing
- Place in supine position with legs elevated
- Administer O2
- Fan the patient
- Water may be given if patient is alert, has a gag reflex, and is not nauseated

## If altered mental status is present:

- Place on left side and monitor airway
- Wet the skin and fan aggressively
- Apply cold packs to the axilla, groin and neck
- Rapid transport!\*
- \*If available and higher level provider present: Use ice baths/tarps to rapidly cool the patient before transport



# Thermal/Temperature Induced Shock

Occurs when extreme body temperature causes systemic circulatory collapse and inadequate organ perfusion

## **Hyperthermia:**

- Excessive vasodilation → pooling of blood in the skin → decreased venous return and cardiac output
- Dehydration and electrolyte loss worsen hypovolemic shock
- S/Sx: Hot, dry or flushed skin; weak or absent pulse; altered mental status; low blood pressure

## **Hypothermia:**

- Peripheral vasoconstriction and decreased heart rate → reduced cardiac output and tissue oxygenation
- Severe cases lead to bradycardia, hypotension, and cardiac arrest
- S/Sx: Cold, pale skin; slow, weak pulse; shallow respirations; confusion or unresponsiveness.

## **Treatment:**

- Remove from environment, monitor ABCs, give O2, correct temperature, and rapid transport

# Lightning Strikes and Electrical Shocks

**Lightning strike:** Massive natural electrical discharge

**Electric shock:** Contact with man-made electrical current

- Do not approach until power is off and the scene is safe
- Lightning: Wait for danger to pass
- Electric shock: Turn off power, don't touch patient until confirmed safe

## **Symptoms:**

- Both can cause cardiac arrest, arrhythmias, respiratory failure, burns and trauma from muscle contraction or falls

## **Treatment:**

1. Assume a fall occurred and take spinal precautions
2. Assess airway, breathing, and pulse
3. Start CPR and do early defibrillation if unconsciousness and pulseless
4. Cover entry/exit burn wounds with dry sterile dressings



# ALCO Protocol

## Patient Care Policy (General)

Modified On: December 1, 2011

### **HYPERTHERMIA / HEAT ILLNESS**

#### •Routine Medical Care

- Protect patient from environment.
- If the patient is in extremis, begin treatment prior to secondary survey.
- Consider: the environment, patient age, and pre-existing conditions

#### 1. **SIGNS AND SYMPTOMS OF A HEAT EMERGENCY**

- Weakness or exhaustion
- Dizziness
- Headache
- Sweating may or may not be present
- Fainting or feeling faint
- Rapid heart rate
- Muscle cramps
- Altered mental status (coma, seizures, delirium)

#### 2. **PREEXISTING CONDITIONS THAT CAN CONTRIBUTE TO A HEAT EMERGENCY:**

- ▶ **Psychiatric disorder** (both because of the medications taken and perhaps the patient's poor judgement)
- ▶ **Heart disease**
- ▶ **Diabetes**
- ▶ **Alcohol**
- ▶ **Fever**
- ▶ **Fatigue**
- ▶ **Obesity**
- ▶ **Dehydration** (either decreased fluid intake or sweating)
- ▶ **Medications**

#### 3. **TREATMENT:**

##### 3.1 **If the patient is conscious:**

- 3.1.1 Remove patient from hot environment
- 3.1.2 Loosen or remove clothing
- 3.1.3 Place in supine position with legs elevated
- 3.1.4 Administer O<sub>2</sub>
- 3.1.5 Fan the patient
- 3.1.6 Water may be given if patient is alert, has a gag reflex, and is not nauseated

##### 3.2 **If altered mental status is present:** (see above)

- 3.2.1 Place on left side and monitor airway
- 3.2.2 Wet the skin and fan aggressively
- 3.2.3 Apply cold packs to the axillae, groin and neck (if available)
- 3.2.4 Administer IV fluid challenge (250-500 mL NS)
- 3.2.5 Transport immediately



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# Drowning

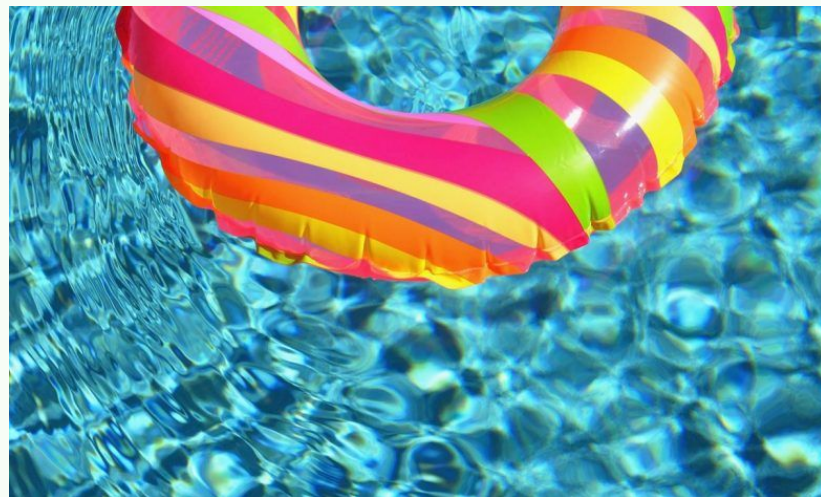


# What is drowning?

Submersion in liquid where the lungs fill with water and block oxygen from reaching the body, causing respiratory impairment.

Not the same as near drowning!

- Around 4000 people die each year from drowning
- **Leading cause of accidental death for children ages 1–4 and second for ages 5–14 & infants**



# 5 Stages of drowning



## 1. Surprise

Initial panic, flailing arms, increased heart rate & breathing, gasping for air

## 2. Hypoxic Convulsion

Hypoxia triggers seizures, up to 1 minute

## 3. Loss of Consciousness

Sinks to bottom of water

\*chances of survival decrease significantly after 1-2 minutes

## 4. Cardiac Arrest

Abnormal heart rhythm (vtach, vfib), breathing and pulse diminish, CPR needed immediately

## 5. Secondary Complications

Organs have been deprived of oxygen for too long, causing irreversible damage

\*ARDS, cerebral hypoxia, hypothermia



# What to do if you see a drowning person

Personal safety is key!!!

Assess all possible options before just jumping in

## Throw-row-reach-go

1. Throwing a rope/life preserver
2. Take a boat to them
3. Reach for them on land
4. Only jump in if absolutely necessary and safe to do so



# Primary Assessment

## Airway

Check for open and clear airway (vomiting is common → suction)

## Breathing

Absent breathing → rescue breaths

\*CPAP if 8+ years old in severe respiratory distress & near drowning

## Circulation

Absent pulse → CPR/AED

Signs of shock → POWR

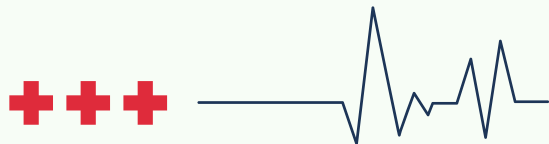
- Position of comfort
- High flow O<sub>2</sub>
- Keep Warm
- Rapid Transport

\*May request EMS aircraft if patient is in cardiac arrest from drowning

## C-spine precautions

- Taking c-spine precautions for suspected trauma and diving incidents

\*however, life > limb



# Alameda County

## Prot

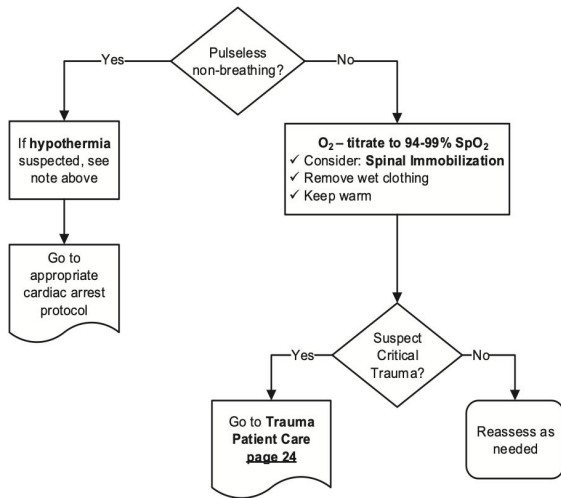
### Patient Care Policy (Pediatric)

Modified On: April 10, 2012

#### SUBMERSION

##### •Pediatric Routine Medical Care

- Contact the Base Physician if patient is also showing signs of pulmonary edema before moving to the appropriate policy
- Consider CPAP (see CPAP [page 122](#) for indications)
- Consider spinal precautions prior to extrication if possibility of neck trauma. Otherwise place the patient on his/her side to protect the airway and prevent aspiration; be prepared to suction
- Rapid extrication from water
- Note:** If hypothermia is suspected and the patient is in ventricular fibrillation, rewarming is essential. Remove wet clothing, wrap in warm blankets and place in warm ambulance
- Initiate rapid transport to the closest most appropriate receiving hospital



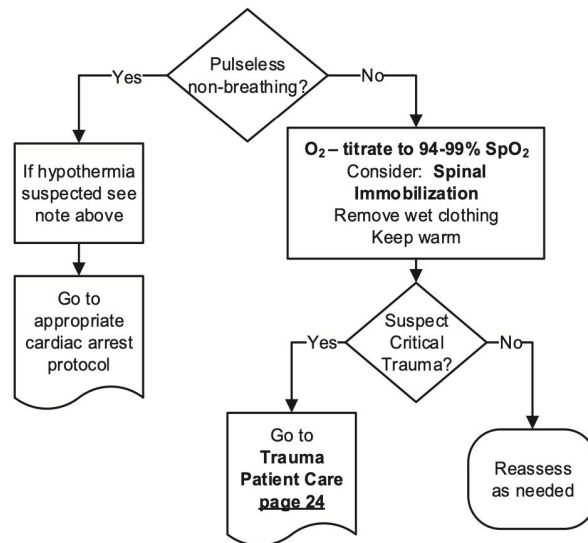
### Patient Care Policy (Adult)

Modified On: December 1, 2011

#### SUBMERSION

##### •Routine Medical Care

- Consider spinal precautions prior to extrication if possibility of neck trauma
- Rapid extrication from water
- If **hypothermia** suspected and the patient is in Ventricular Fibrillation, rapid transport to the closest receiving hospital is essential for rewarming. Patients who are hypothermic rarely respond to treatment. (see Hypothermia [page 16](#))
- Consider CPAP** - see CPAP procedure ([page 124](#)) for indications





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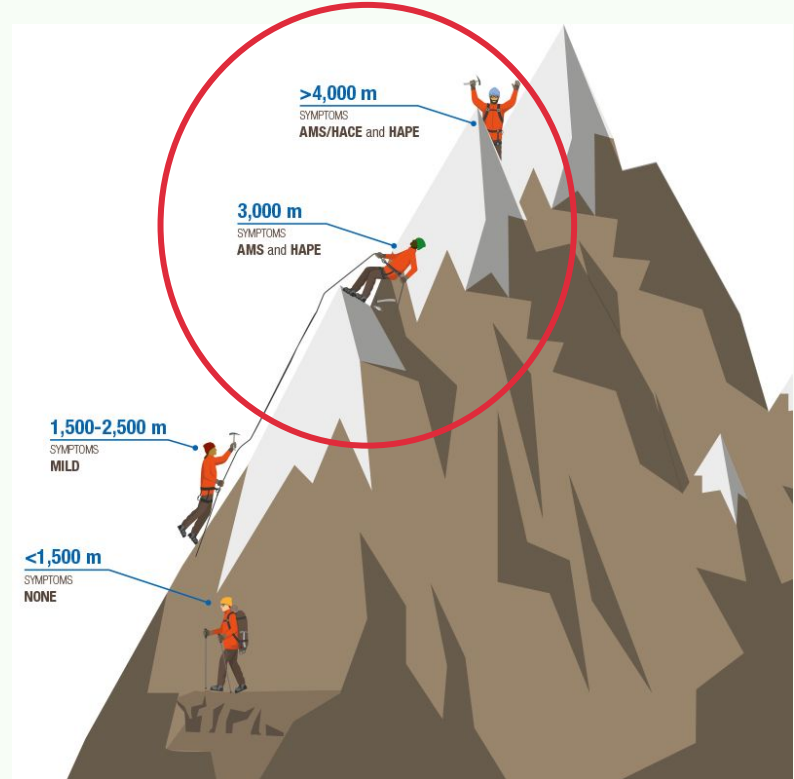
# Altitude Emergencies



# Overview of Altitude Illness



- **Cause:** rapid ascension to high altitude, generally above 8000 feet
- **S&S:** dizziness, headache, nausea, vomiting, fatigue, loss of appetite/thirst, decreased SPO2 levels
- **Treatment:** transport to lower latitude, O2

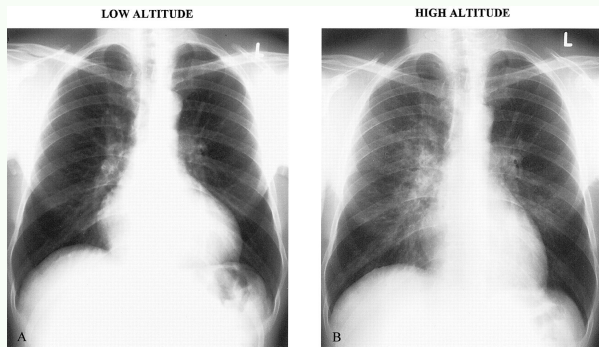


# Types of Altitude Emergencies



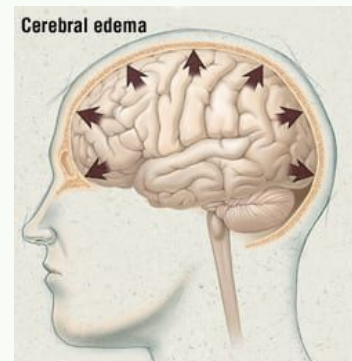
## High Altitude Pulmonary Edema (HAPE)

- **Pathophysiology:** fluid accumulation in the lungs due to hypoxia
- **S/S:** dyspnea, cough w/ pink frothy sputum, chest tightness, fatigue, crackles, tachycardia

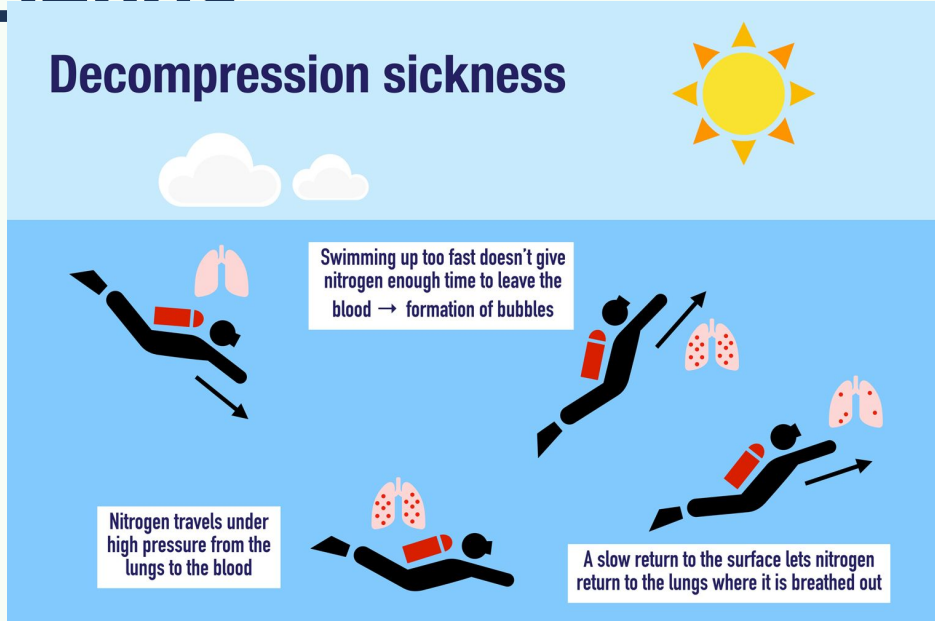


## High Altitude Cerebral Edema (HACE)

- **Pathophysiology:** Brain swelling at high altitude
- **S/S:** shortness of breath (especially at rest), fatigue, headache, nausea/vomiting, confusion



# Decompression Sickness aka “The Bends”



- **Pathophysiology:** rapid ascent causing nitrogen gas to form bubbles in the body, blocking blood flow and damaging tissue
- **Causes:** scuba diving, high altitude flying

# Signs and Symptoms

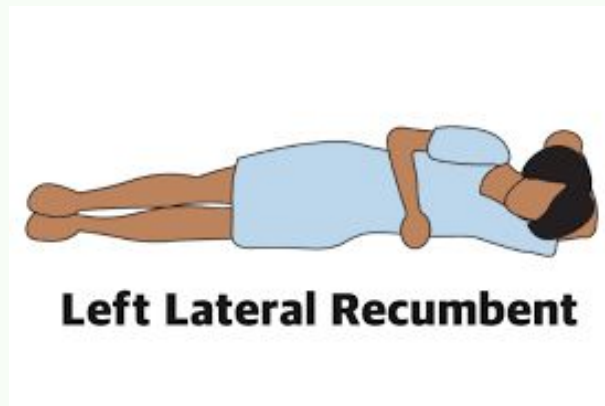
- “The Bends” → joint and muscle pain cause “bending” over of body
- Skin rash / itching
- Fatigue
- Neurological issues: numbness, tingling, dizziness, confusion, weakness, paralysis
- Breathing difficulties: chest pain, coughing (sometimes bloody sputum)
- Shock / death



# Treatment & Prevention

## Treatment

- POWR:
  - Position of comfort: supine or left lateral recumbent position
  - High flow O<sub>2</sub>
  - Keep warm
  - Rapid transport



## Prevention

Before diving:

- Plan and stay within your limits
- Stay hydrated

During Ascent:

- Ascend slowly
- Minimal movement







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# Burns



# Burns

Superficial, partial thickness and full thickness relates to the American Burn Association – Burn Unit Referral Criteria

## Superficial (first degree)

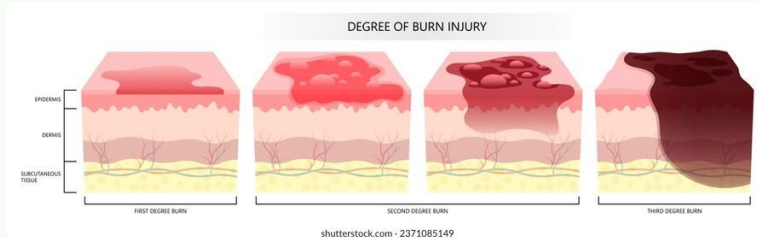
Involves only the top layer of skin (epidermis layer)

## Partial thickness (second degree)

Involves epidermis layer and some portion of the dermis layer. Greater than 10% TBSA

## Full thickness (third degree)

Extends through all skin layers and may involve subcutaneous layers, muscle, bone or internal organs. Burns in any age group



# Superficial (first-degree burn)

- Signs and symptoms:
  - Redness, dry skin, painful burn site, peeling skin, pain subsides after 48–72 hours
- Causes: sunburns, hot water scalds, friction burns
- Common on any exposed skin



# Partial Thickness (second-degree burn)

- Signs and symptoms:
  - Blisters, darker tone and shiny, moist appearance, skin discoloration (deep red to dark brown), intense pain, swelling, skin peeling
- Causes: fire flames, hot objects, sunburns, steam scalding, chemicals, electric shock
- Common in face, hands, arms or legs



# Full Thickness (third-degree burn)

- Signs and symptoms:
  - Dry and leathery skin, swelling, lack of pain because nerve endings have been destroyed, skin discoloration (black, white, brown or yellow skin)
- Causes: scalding liquid, skin in contact with hot surface for extended period of time, fire flames, electrical or chemical source
- Common in face, hands, feet and groin
- Burn victims high risk for infections, hypothermia, hypovolemia, shock



# Prevention

- Sun and UV protection
  - Wear sunscreen (SPF of 30 or higher and reapply every two hours)
  - Wear protective clothing
- Hot appliances protection
  - Be mindful of kitchen handles, use oven mitts, unplug appliances, manage hot items carefully
- Fire protection
  - Beware of fire sources, maintain safety equipment (ie fire blanket or extinguishers)



Flame burn



Scald burn



Contact burn



Chemical burn

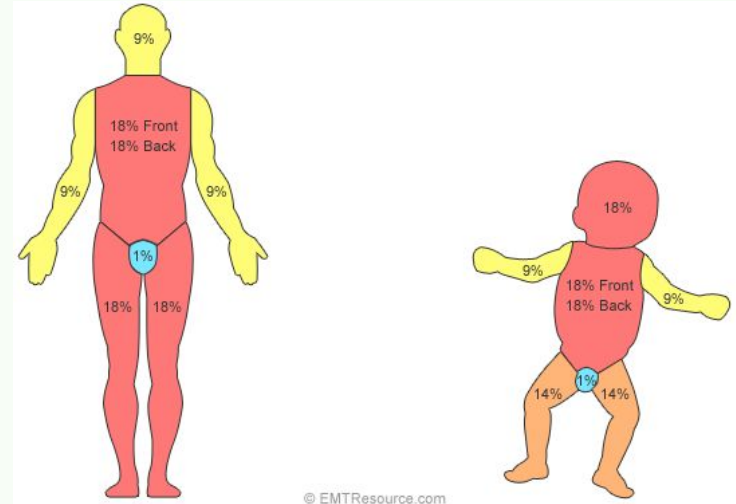


Electrical burn

# Estimated burn area

BSA = Body Surface Area (varies by age)

- a) Rule of 9s: assign a percentage (multiple of 9) to different body regions
- b) Palmar method (patient's palm) = 1%



# Treatment

1. Assess airway and breathing
  - a. Assess for thermal airway injury and smoke inhalation, high flow O<sub>2</sub>
2. Expose and examine patient for areas of burn, remove jewelry but not stuck clothing
3. Estimate severity of burn using rule of 9's
4. Dress infections
  - a. Dry, sterile dressing for any burn involving > 10% TBSA
  - b. Keep patient warm
  - c. Moist, sterile dressings for < 10% TBSA
  - d. Elevate burned body parts 30 degrees
5. Be honest and compassionate
  - a. **Electrical burns**
    - i. Turn off power source if patient is still attached
  - b. **Tar burns**
    - i. Do not attempt to remove the tar
    - ii. Cool with water
    - iii. Maintain body temperature
  - c. **Chemical burns**
    - i. Remove clothing
  1. Liquid chemicals
    - a. Flush immediately with copious amounts of water for 10-15 minutes
  2. Dry chemicals
    - a. Brush off as much as possible, flush with copious amounts of water for 10-15 minutes
    - ii. Identify chemical and assess for associated respiratory burns



# ALCO Protocols

## Patient Care Policy (General)

Modified On: July 21, 2017

### BURN PATIENT CRITERIA

1. **INTRODUCTION** -The intent of this policy is to transport patients with critical burns, who have a manageable airway, directly to a facility that is staffed and equipped to care for the medical needs of the patient, bypassing other receiving facilities. Minor to moderate burn patients will be transported to the closest, most appropriate receiving hospital.
2. **BURN PATIENT CRITERIA** (from the American Burn Association – Burn Unit Referral Criteria)
  - 2.1 Partial thickness burns greater than 10% total body surface area
  - 2.2 Moderate to severe burns that involve the face, hands, feet, genitalia, perineum, or major joints
  - 2.3 Full thickness burns in any age group
  - 2.4 Electrical burns, including lightning injury
  - 2.5 Chemical burns
  - 2.6 Burn injury in patients with preexisting medical disorders that could complicate management, prolong recovery, or affect mortality
3. **DESTINATION**
  - 3.1 **Adult and Pediatric patients** who meet burn patient criteria 2.1-2.6 may be transported directly to an out-of-county burn center (see #5 below).
  - 3.2 Exceptions:
    - 3.2.1 **Potentially unmanageable airway** - (e.g. - soot in the mouth and/or nose, inhalation injury, etc.) transport to the closest trauma center.
    - 3.2.2 **Unmanageable Airway** - The patient requires intubation, and the paramedic is unable to intubate, and an adequate airway cannot be maintained with B.V.M. device, transport to closest basic E.D.
    - 3.2.3 **Patient meets Critical Trauma Patient Criteria** - "Physiologic" or "Anatomic" - transport to the closest most appropriate designated trauma center
4. **OUT-OF-COUNTY TRANSPORT**
  - 4.1 Transporting medic **must** first contact out-of-county hospital to confirm bed availability. This can be done through the appropriate dispatch center or via land-line from the field
  - 4.2 Contact the Base Physician if medical consultation is needed
  - 4.3 Consider EMS Aircraft transport for land transport times greater than 45 minutes
  - 4.4 Give a brief report to the receiving facility including ETA
5. **Out-Of County Burn Centers:**

FACILITY	TRAUMA	HELIPAD	LOCATION	PHONE #
UC Davis Medical Center	YES	YES	2315 Stockton Blvd., Sacramento	(916) 734-3636
Santa Clara Valley Medical Center	YES	YES	751 S. Bascom Ave., San Jose	(408) 885-6666
St. Francis Memorial Hospital	NO	NO	900 Hyde Street, San Francisco	(415) 353-6255



# 6 **Crowd Syndrome**



# Crowd Syndrome

Psychological phenomenon related to enochlophobia which is a fear of crowds → induces irrational and impulsive behavior

- Signs and symptoms:
  - Panic and anxiety, feeling of being trapped or overwhelmed, difficulty breathing, sweating, nausea, loss of self-awareness
- Prevention:
  - Recognize potential for stampedes or crowd-related violence
  - Plan for large gatherings and communicate clearly with fellow EMTs
  - Prioritize own safety and have situational awareness
- Treatment: keep patient calm, separate bystanders from the scene

Examples: concerts, mass casualty incidents



Different from Rock Med crowd syndrome: vasovagal response to loud noise, heat, low oxygen, dehydration etc. (appears as fainting, seizure or stroke)



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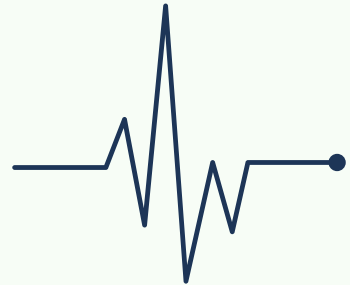
# Bites/Stings





# Overview

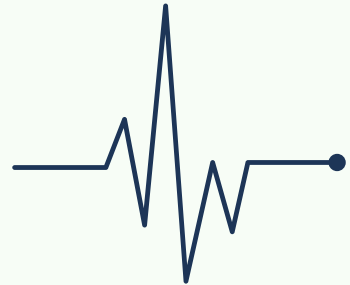
- Spider/snake/tick bites generally non lethal/non harmful
- Some kinds of spider/snake species can be harmful, important to treat these
  - Can progress to anaphylaxis and/or anaphylactic shock
- As EMTs, we focus on stabilizing the patient rather than administering anti venom or treatment (not in our scope)





# General Treatment Bites/Stings

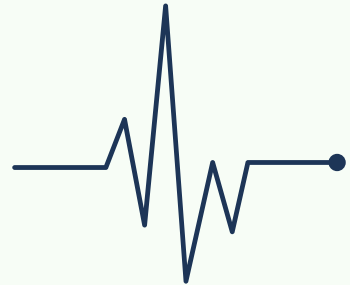
- Draw circles for redness/spread of symptoms
  - Monitor carefully for spread of inflammation/symptoms
- Gently wash the area with cool, wet cloth
- A cold pack could be used to treat swelling/inflammation
- Remove jewelry or tight clothing from affected area, as swelling may occur





# General Treatment Bites/Stings

- One useful trick is to circle the swelling using a sharpie, write the time next to it, and keep repeating this after X amount of time
  - This creates a timeline of the swelling/affected area
- Transport promptly: the patient is a priority patient and should be transported ASAP to the hospital if a higher level of care is needed
- Check vitals and reassess continuously: The patient's breathing and responsiveness should be continuously monitored



# Snake Bites

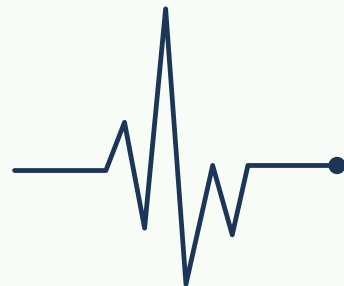


## Venomous Snake Bite

- Priority is rapid transport
- EMT's cannot administer antivenom
- Do not apply suction or attempt to remove the venom from the site of the bite
- Example: rattlesnakes

## Non-Venomous Snake Bite

- Never assume snake-bite is non venomous
- Keep patient calm





# Spider Bites

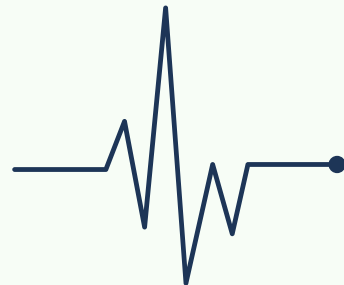


## Venomous Spider Bite

- Priority is rapid transport
- EMT's cannot administer antivenom
- Do not apply suction or attempt to remove the venom from the site of the bite
  - Attempt to capture picture of spider to assist hospital staff in treatment (if safe)
- Monitor ABCs
- Example: black widow

## Non-Venomous Spider Bite

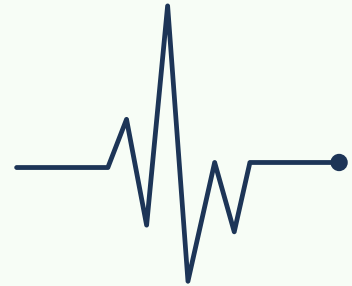
- Never assume spider-bite is non venomous
- Keep patient calm
- Cool cloth, keep area clean





# Anaphylaxis

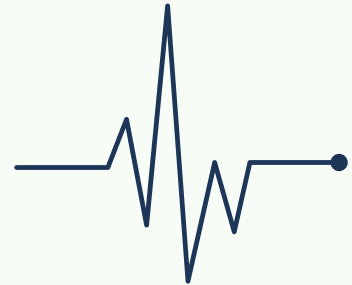
- Anaphylaxis is a severe allergic reaction that can be life threatening
  - Requires prompt medical attention/treatment
- With bites/stings, it is possible for patient to have allergic reaction and progress into anaphylaxis





# Recognizing Anaphylaxis

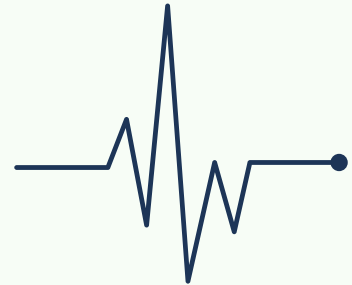
- Recognizing anaphylaxis is crucial to providing treatment
- Signs of Anaphylaxis – wheezing, repetitive cough, tightness in chest, hives/urticaria, stridor, difficulty swallowing or tightness in throat, dizziness or feeling faint, abdominal complaints (pain, repeated vomiting)
- Epinephrine and rapid transport are key for managing anaphylaxis





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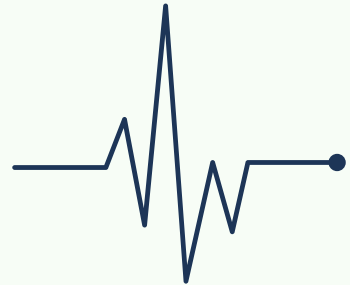
graph TD
    A[ANAPHYLAXIS  
(Systemic Reaction)] --> B[EPINEPHRINE 1mg/ml  
BLS Providers: 0.3mg IM  
ALS Providers: 0.3mg-0.5mg IM  
May Repeat x 1 in 15 min.]
    A --> C[OXYGEN  
If Any Distress]
    C --> D["*ALLERGIC REACTION  
(Skin or mucous membrane  
symptoms only without signs of  
anaphylaxis or airway obstruction)"]
    D --> E["Consider for Urticaria  
(Hives/Itching)  
DIPHENHYDRAMINEs  
1 mg/kg IV/IM  
up to 50mg"]
    B --> F[ ]
    style F fill:none,stroke:none
    F --> G[ ]
    style G fill:none,stroke:none
    
```





# Tick Bites

- Tick bites can carry lyme disease, rocky mountain spotted fever
- Rapid transport if signs of infection
- Remove tick with pair of tweezers, without twisting it
- Wash area thoroughly with soap and water
- Monitor spot of bite, and patient for signs of anaphylaxis





8

# **Importance of Scene Safety**





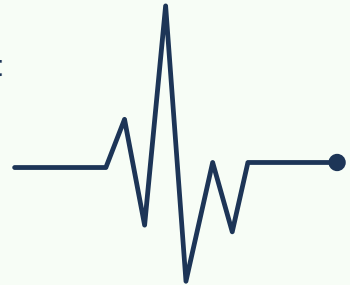
# Scene Safety

*Scene safety is important for environmental emergencies!!!*

## PRIORITY LEVEL

- 1) You
- 2) Your partner
- 3) Patient
- 4) Bystanders

- Ensure PPE and no environmental hazards
- Prioritize yourself to maintain the safety of both the rescuer and the victim
- Be cautious of: downed power lines, spilled chemicals, violent patients, large crowds, ensure the animal that bit the patient is not present





# KAHOOT

