



ENVIRONMENTAL EMERGENCIES

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Objectives

- Review:
 - hypothermia
 - frostbite
 - heat illness
 - sunburn
 - lightning strike injuries
 - drowning
 - envenomations



HYPOTHERMIA

All it requires is clinical suspicion and a thermometer

Hypothermia

- Hypothermia
 - Definition: temperature less than 35 degrees celsius (95 degrees F)
 - Epidemiology: 700 deaths annually in the US



Hypothermia

- risk factors
 - homelessness
 - drugs/alcohol
 - outdoor activities
 - age: 1/2 of hypothermia deaths occur in > 65 y.o.



Heat loss

- wet clothing increased the heat loss up to 5 x
- immersion in water increases the rate 25-30 x



History

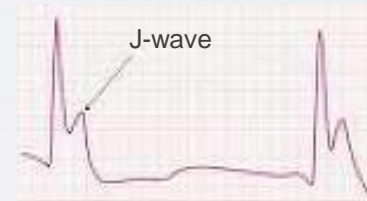
- now that you know they are cold, ask “why?”
 - alcohol?
 - homeless?
 - sepsis?
 - trauma?

Physical exam and ED Care

- Start with the ED safety net: IV, O2, and monitor
 - realize your normal equipment (sat probe, thermometer, etc.) may not work.

- Patients get the “umbles”
 - stumbles, mumbles, grumbles, fumbles

- special considerations:
 - the hematocrit increases about 2% for every 1°C decrease in temperature
 - blood glucose will be elevated
 - EKG: Osborne (J) wave: a slow deflection at the junction of the QRS and the ST segment is common but not pathognomonic



Treatment

- Start with the ABC's.
 - severe hypothermia will require intubation
 - handle these patient's gently as jostling a patient with a temp below 30C/86F can precipitate v-fib and other dysrhythmias
- Give IVFs (warmed)
- Start CPR if pulse is not detectable after a minute of palpation

Treatment

- if the patient is in v-fib:
 - attempt to defibrillate once, then:
 - if it is unsuccessful, start and continue CPR until the patient is rewarmed to at least 30 Celsius (86 F). You may then try to cardiovert again.
 - Medications are usually not helpful

Rewarming techniques

- Passive rewarming: heat is generated by the patient (shivering)



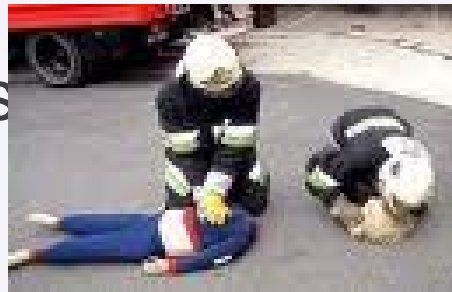
- Active external rewarming: warm blankets, convection blankets



- Active internal rewarming: cardiopulmonary bypass, whirlpool, arteriovenous rewarming

When to stop in hypothermia

- if the potassium is greater than 10
- if the patient is 30C/86F and shows no signs of life
- obvious fatal injuries



Frostbite



- initiate rewarming as soon as possible
- no rubbing of the frostbite
- “Freeze in the winter, amputate in the Spring”



- Hyperthermia (heat exhaustion and heat stroke, and other causes of high temperature)
- elevation of the body's temperature above the hypothalamic set point

Heat illness

- Heat exhaustion
 - constitutional symptoms resulting from the body's loss of salt and water due to exertion
 - different than fever
 - the temperature may not be elevated





Heat stroke

- core body temp greater than 40C/104F and signs of end organ damage
 - **CNS disturbance**, renal failure, liver failure, DIC, rhabdomyolosis

Heat Stroke risk factors

- age: the very young and the very old
- rigorous physical activity
- dehydration
- high humidity
- stimulant drugs



History

- headache
- nausea/vomiting
- myalgias
- fatigue
- lightheadedness

Physical

- VS: tachycardic, temp >104 F, hypotensive
- Altered Mental Status (heat stroke)
- End organ dysfunction
- Trying to answer the question “Why?”

Studies

- focus on possible sources/consequences:
 - endocrine: check blood sugar, TSH, T4
 - infection: CXR, UA, LP
 - kidney failure/liver failure: CMP
 - DIC: coags
 - rhabdomyolysis: CK



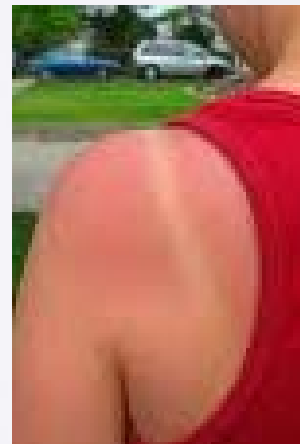
Heat stroke treatment

- IV (x2), oxygen, monitor
- Intubate as needed for airway protection given AMS
- Lukewarm water to skin, then use fans to evaporate
- Prevent shivering as temperature comes down
 - may need to paralyze the patient or use benzo's



Sunburn

- erythema develops after 3-4 hours, peaks at 12-24 hours
- erythema resolves over 4-7 days



Treatment

- NSAIDS: antiprostaglandin properties
- Cool soaks/Burrow's solution
- Aloe vera: symptomatic relief



Inhalation burns

- be wary
 - soot on the face
 - singed nasal or facial hair
 - cough
- INTUBATE EARLY



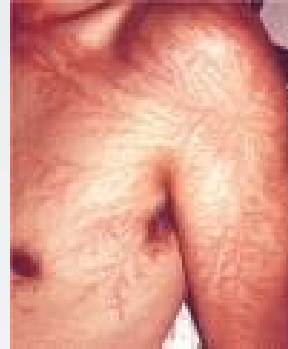
LIGHTNING STRIKES



- death: most often from cardiopulmonary arrest.
- respiratory arrest is often due to prolonged paralysis of the respiratory center in the medulla (this then leads to cardiac arrest)

Exam findings

- vital signs: normal or mild HTN
- neurologic injuries are often transient
- burns
 - by direct effect or secondary heat production
 - most are superficial



Lichtenberg Figures
a transient finding, but not really a burn

Exam findings

- burns on the head indicate severe injury
- search for blunt trauma
- blindness and deafness are common and are often temporary
- amnesia is common
- keraunoparalysis
 - paralysis of the extremities
 - due to sympathetic stimulation with severe vasospasm

Drowning

- a terminal outcome from
a submersion event



Drowning

- Age 0-4: 2000 visits/year
- Age 5-14: 1000/year
- Age 14+: 900/year
- CDC estimates that for every child that dies by drowning in the U.S., 6 are seen in the ED.



Causes

- Drugs
- Alcohol
- Trauma
- Cardiac arrest
- Hypoglycemia
- Seizure
- Attempted suicide or homicide
- Child abuse or neglect

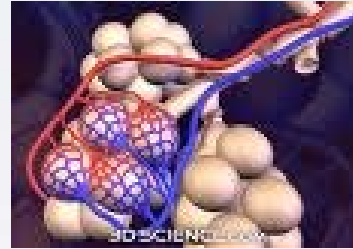
Pathophysiology of drowning

- Unexpected submersion
 - Breath holding, panic and struggle to surface
 - Air hunger and hypoxia
 - Victims starts to swallow water
 - Breath holding is overcome and involuntary gasps result in aspiration



Pathophysiology

- Water destroys surfactant
- Alveolar collapse
- Pulmonary edema
- Hypoxia
- Respiratory and metabolic acidosis
- Cardiovascular collapse
- Death



General Treatment principles

- IV, O2, monitor
- ABCs
- Consider hypothermia
- Search for trauma
- Supportive care
 - consider aspiration

Envenomations and Stings





- We are not going to cover scorpions, stingrays, jellyfish, gila monsters or snakes in depth





Hymenoptera

The biggest concern

- Anaphylaxis
 - watery eyes, throat swelling, rash, wheezing, vomiting
 - Rx: Epi (IM or IV), Histamine blockers, steroids

Don't bring the snake to my department...

- history:
 - What was it?
 - When?
 - Has this happened before?
 - Anaphylaxis previously?



General Treatment principles

- If the stinger is still present, gently remove it.
- Wash the area around the bite or sting.
- Remove any jewelry or other constricting objects.
- Lower the injection site slightly below the level of the heart.
- Apply a cold pack to a bite or sting.
- Observe the patient carefully for signs and symptoms of an allergic reaction.

Snake bites

- 45,000 bites per year in the United States
- 7,000 receive bites from poisonous snakes: coral snakes, rattlesnakes, copperheads, and water moccasins
- Nonpoisonous snake bites are considered minor wounds---poisonous snake bites are considered medical emergencies.
 - the 2 main classes of poisonous snakes (elapids and viperids)





Prairie rattlesnake

The only native venomous snake in SD

Crotalus viridis viridis

treatment

- Things that don't work:
 - application of electric shocks
 - incision and suction
 - the “Sawyer Venom Extractor”
- Does work
 - treatment: antivenom (Crofab)



CroFab™
Crotalidae Polyvalent
Immune Fab (Ovine)

Black Widow Spider

- Shiny black body, thin legs, and a crimson red marking on its abdomen, usually in the shape of an hourglass or two triangles.
- Leading cause of death from spider bites in the U.S.



black widow spider

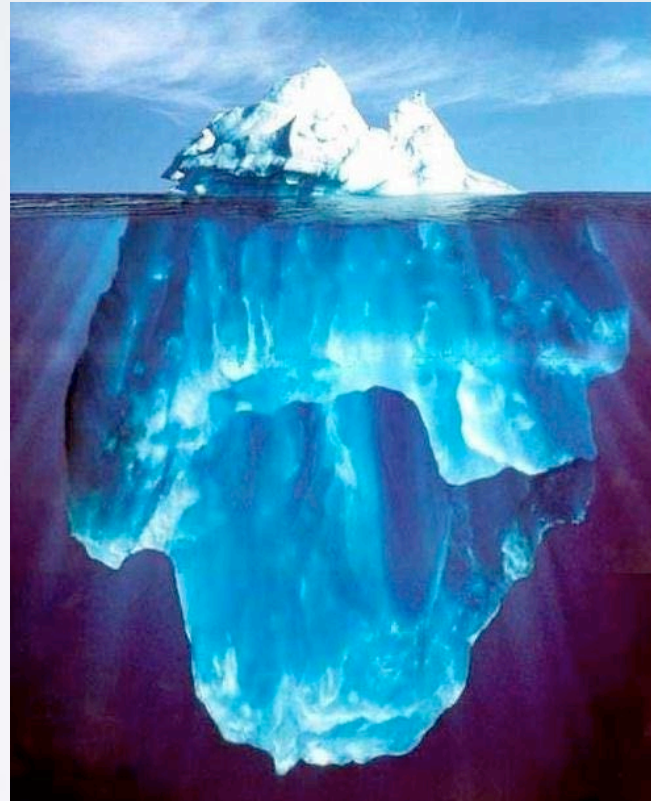
- victims of bites may c/o **severe abdominal pain** which looks like peritonitis, but they have no rebound
- patients are often restless
- **treatment: benzos and narcotics for management of severe pain and muscles spasm and agitation**

Brown Recluse

- Loxosceles
- “Fiddleback”
- Brown violin shaped marking on the upper back
- The bite is often painless at first---several hours after the bite, it becomes bluish surrounded by white periphery, then a red halo or “bull’s-eye” pattern. Within 7-10 days, the bite becomes **a large ulcer.**
- treatment: debridement, ?**
hyperbaric oxygen



Most spider
bites are
actually...



treatment

- sick or not sick
- IV, O2, monitor
- is there an antivenom?
- consult poison control or the local zoo

antivenom

- complications
 - anaphylaxis reactions
 - serum sickness: hives, fever, myalgias, and arthralgias

Summary

- Hypothermia: aggressive rewarming required. Meds rarely help
- Frostbite: rewarm rapidly
- Heat stroke: fever and AMS. Aggressive cooling required. Ask “why” and treat the cause.
- Sunburn: NSAIDS
- Lightning injuries: treat apnea as the heart is usually beating
- Drowning: prevention is the key.
- Envenomations:
 - Hymenoptera: treat anaphylaxis aggressively
 - Snakes: call poison control



Thanks

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