

## Hypothermia and Frostbite

- 1) What is Hypothermia?
  - a) Definition
    - i) Core body temp is usually 98.6 degrees Fahrenheit
    - ii) Hypothermia is a core temp below 95 degrees Fahrenheit
    - iii) Hospital classification (important because it determines the aggressiveness of Tx)
      - (1) Mild = 90-95 degrees
      - (2) Moderate = 82-90 degrees
      - (3) Severe = < 82 degrees
  - b) What happens to the body when it gets too cold?
    - (1) Barrier around the cells that protects its contents becomes leaky, allowing loss of fluids and proteins into surrounding tissue
    - (2) Shifting fluid can freeze in the area around the cells, resulting in impaired blood flow to tissues
    - (3) This causes disruption of cell function eventually cell death
    - (4) Cell death on a large scale results in impaired organ function and eventually organ death
  - c) How does the body respond to decreasing temperature?
    - i) Cold temperature prompts the body's temperature regular center in the brain to ramp up activity
      - (1) Shivering is an involuntary response that generates heat by activating muscles
      - (2) Stress hormones cause increased heart rate, rapid breathing, constriction of blood vessels in arms and legs to minimize the heat lost from those areas
      - (3) As cells start to malfunction, normal functions start to become impaired
        - (a) Heart: no longer able to pump as quickly or effectively, so heart rate slow and blood pressure drops; death can result from total heart dysfunction
        - (b) Brain: no longer able to process effectively, so people becomes confused and clumsy with slurred speech
- 2) What is Frostbite?
  - a) Spectrum of "Localized Cold Injuries"
    - i) Frostnip: localized numbness of an area exposed to cold; no permanent damage
    - ii) Pernio: localized redness, pain, and swelling from exposure to damp cold above freezing
    - iii) Trench foot: prolonged trapping of feet in damp cold boots that results in compromised blood flow and tissue damage; feet are red, swollen, very painful, with reddish-purple blisters
    - iv) **Frostbite**: full freezing of tissue
  - b) Pathophysiology
    - i) Ice crystals form in and around body cells, leading to cell death
    - ii) Cell death activates the body's immune response, which paradoxically results in more tissue damage because blood vessels are blocked
    - iii) Effected area eventually dies and area of involvement increases with duration of freezing

- c) Severity of frostbite
  - i) 1<sup>st</sup> degree: effected area is pale and numb with surrounding tissue swelling  
*\*\*If at this stage, okay to use thawing techniques at home, as long as exposure to cold has ended (need to prevent refreezing, which can worsen tissue damage)\*\**
  - ii) 2<sup>nd</sup> degree: blisters with clear or milky fluid surrounded by redness and swelling  
*\*\*Good idea to go to hospital at this point for treatment to prevent permanent tissue damage and loss\*\**
  - iii) 3<sup>rd</sup> degree: deeper injury with red-purple blisters; evolves into black scab that consists of dead tissue of the top layers of the skin  
*\*\*VERY IMPORTANT to go to hospital here for extra treatment to prevent addition tissue damage and complications, including antibiotics and tetanus booster \*\**
  - iv) 4<sup>th</sup> degree: the damaged/dead tissue extends deeper into muscle and bone, which can lead to eventual auto-amputation of affected body part
- d) What on the body does it affect?
  - i) Most commonly effected areas: ears, nose, cheeks, fingers, feet

### 3) What puts people who are homeless at risk?

- a) Facts/Numbers
  - i) 700 people experiencing or at risk for homelessness are killed from hypothermia annually in the United States
  - ii) 44% of the nation's homeless are unsheltered
  - iii) People experiencing homelessness have a much higher risk of developing exposure-related conditions like hypothermia and frostbite
- b) What types of factors put someone more at risk?
  - i) Anything that increases localized heat loss or decreases heat production
  - ii) Inadequate clothing
  - iii) Dehydration
  - iv) Malnutrition
  - v) Comorbidities: Peripheral vascular disease, diabetes
  - vi) Underlying infection
  - vii) Alcohol and substance abuse
    - (1) Why?
      - (a) Acute behavioral changes
      - (b) Increased heat loss due to vasodilation
- c) Why do they put someone at risk?
  - i) Ex.: alcohol, smoking exacerbates heat loss → WHY?
  - ii) Where on our bodies can we lose a lot of heat? → head → why?

### 4) What can we do to keep ourselves safe?

- a) Guests can share tips with each other
- b) Info we offer if people have to sleep outside
  - i) Awesome site w/advice:
  - ii) <http://hubpages.com/hub/Safe-outdoor-sleeping-tips-for-homeless-in-the-city>
    - (1) There are a lot, but I highlighted some of the ones I *might* share

- (a) If you have trouble keeping your feet warm, try lining your shoes with newspaper and then apply a liberal sprinkling of black pepper.
- (b) If you're sleeping outside, put a thick layer of newspaper between your sleeping bag and the earth. If the earth is damp, put a heavy piece plastic down first, then the newspaper, then the sleeping bag. To keep your feet warm, heat some large rocks in the fire and wrap them in a light blanket or something that won't scorch or melt.
- (c) Remember C O L D: C Clean - dirty clothes lose their loft and get you cold. O Overheat - never get sweaty, strip off layers to stay warm but not too hot. L Layers - Dress in synthetic layers for easy temperature control. D Dry - wet clothes (and sleeping bags) also lose their insulation.
- (d) COTTON KILLS! Do not bring cotton. Staying dry is the key to staying warm. Air is an excellent insulator and by wearing several layers of clothes you will keep warm.
- (e) Remember the 3 W's of layering - Wicking inside layer, Warmth middle layer(s) and Wind/Water outer layer. Wicking should be a polypropylene material as long underwear and also sock liner. Warmth layer(s) should be fleece or wool. The Wind/Water layer should be Gore-Tex or at least 60/40 nylon.
- (f) Use plastic grocery bags or bread bags over socks. This keeps your boots dry and you can easily change those wet socks.
- (g) Keep your hands and feet warm. Your body will always protect the core, so if your hands and feet are warm, your core will also likely be warm. If your hands or feet are cold, put on more layers, and put on a hat!
- (h) Dress right while sleeping. Change into clean, dry clothes before bed. Your body makes moisture and your clothes hold it in - by changing into dry clothes you will stay warmer and it will help keep the inside of your sleeping bag dry. Wearing wool socks and long underwear (tops and bottoms) in the sleeping bag is OK.
- (i) Put on tomorrow's t-shirt and underwear at bedtime. That way you won't be starting with everything cold next to your skin in the morning.
- (j) Wear a stocking cap to bed, even if you have a mummy bag.
- (k) Put tomorrow's clothes in your bag with you. This is especially important if you're small of stature. It can be pretty hard to warm up a big bag with a little body, the clothes cut down on that work.
- (l) Put a couple of long-lasting hand warmers into your boots after you take them off. Your boots will dry out during the night.
- (m) Fill a couple of Nalgene water bottles with warm water and sleep with one between your legs (warms the femoral artery) and with one at your feet. Or use toe/hand warmers. Toss them into your sleeping bag before you get in. Some of the toe/hand warmers will last 8 hours.
- (n) Use a sleeping bag that is appropriate for the conditions. Two +20°F sleeping bags, one inside the other will work to lower the rating of both bags.

- (o) Use a bivvy sack to wrap around your sleeping bag. You can make a cheap version of this by getting an inexpensive fleece sleeping bag. It isn't much more than a blanket with a zipper but it helps lower the rating by as much as 10 degrees.
- (p) Use a sleeping bag liner. There are silk and fleece liners that go inside the sleeping bag. They will lower your sleeping bag's rating by up to 10 degrees. Or buy an inexpensive fleece throw or blanket and wrap yourself in it inside the sleeping bag.
- (q) Most cold weather bags are designed to trap heat. The proper way to do this is to pull the drawstrings until the sleeping bag is around your face, not around your neck. If the bag also has a draft harness make sure to use it above the shoulders and it snugs up to your neck to keep cold air from coming in and warm air from going out.
- (r) Don't burrow in - keep your mouth and nose outside the bag. Moisture from your breath collecting in your bag is a quick way to get real cold. Keep the inside of the bag dry.
- (s) Put a trash bag over the bottom half of your sleeping bag to help hold in the heat. A zipped up coat pulled over the foot of a sleeping bag makes an extra layer of insulation.
- (t) Don't sleep directly on the ground. Get a closed cell foam pad to provide insulation between your sleeping bag and the ground. A foam pad cushions and insulates. The air pockets are excellent in providing good insulation properties. Use more than one insulating layer below you - it's easy to slide off the first one.
- (u) In an emergency, cardboard makes a great insulator. Old newspapers are also good insulation. A layer of foam insulation works too.
- (v) Bring a piece of cardboard to stand on when changing clothes. This will keep any snow on your clothes off your sleeping bag, and help keep your feet warmer than standing on the cold ground.
- (w) A space blanket or silver lined tarp on the floor of the tent or under your sleeping bag will reflect your heat back to you.
- (x) No cots or air mattresses! Better to lay on with 30° earth instead of -10° air.
- (y) Drain your bladder before you go to bed. Having to go in the middle of the night when it is 5 degrees out chills your entire body. Drink all day, but stop one hour before bed.

## 5) Conclusion:

### a) Take away points

#### i) Pre-hospital points

- (1) Move to warm environment or shelter
- (2) Remove wet clothing
- (3) Avoid walking on frostbitten feet
- (4) Do not rewarm frostbitten tissue if there is possibility of refreezing; this may result in worse tissue damage

- (5) Do not rub frostbitten area in attempt to rewarm them (can cause further tissue damage)
- (6) Prehospital warming options: warm water (NOT hot), warm compresses or body heat (e.g. placing frostbitten fingers under armpits)
  - (a) Warm center of body first – chest, neck, head and groin using electric blanket or skin-to-skin contact under loose, dry layers, towels, sheets
  - (b) Heat applied to extremities first forces cold blood back toward the heart, lungs and brain – causes drop in core body temperature
- ii) Get medical attention as soon as possible
- iii) When to seek medical care points
- b) Survey and hygiene items, socks, thermal blankets

**\*\*Our Interactive Activity\*\***

We're going to have basins filled with water at varying temperatures so participants can do comparisons throughout the discussion.