Hypothermia

1. **Hypothermia** - "a decrease in the core body temperature to a level at which normal muscular and cerebral functions are impaired." - *Medicine for Mountaineering*

2. **Conditions Leading to Hypothermia**
   - Cold temperatures
   - Improper clothing and equipment
   - Wetness
   - Fatigue, exhaustion
   - Dehydration
   - Poor food intake
   - No knowledge of hypothermia

3. **What are "hypothermia" temperatures**
   - Below freezing
   - 40 degrees - Ex. Shenandoahs, wind and rain
   - 60 degrees - Ex. Rayanna and hurricane
   - Any temperature less than 98.6 degrees can be linked to hypothermia (ex. hypothermia in the elderly in cold houses) or peripheral circulation problems such as trench foot and frostbite.

4. **Signs and Symptoms of Hypothermia**
   a. **Watch for the "-Umbles"** - stumbles, mumbles, fumbles, and grumbles which show changes in motor coordination and levels of consciousness
   b. **Mild Hypothermia** - core temperature 98.6 - 96 degrees F
      - Shivering - not under voluntary control
      - Can't do complex motor functions (ice climbing or skiing) can still walk & talk
      - Vasoconstriction to periphery
   c. **Moderate Hypothermia** - core temperature 95 - 93 degrees F
      - Dazed consciousness
      - Loss of fine motor coordination - particularly in hands - can't zip up parka, due to restricted peripheral blood flow
      - Slurred speech
      - Violent shivering
      - Irrational behavior - Paradoxical Undressing - person starts to take off clothing, unaware s/he is cold
      - "I don't care attitude" - flattened affect
   d. **Severe Hypothermia** - core temperature 92 - 86 degrees and below *(immediately life threatening)*
      - Shivering occurs in waves, violent then pause, pauses get longer until shivering finally ceases - because the heat output from burning glycogen in
the muscles is not sufficient to counteract the continually dropping core temperature, the body shuts down on shivering to conserve glucose

- Person falls to the ground, can't walk, curls up into a fetal position to conserve heat
- Muscle rigidity develops - because peripheral blood flow is reduced and due to lactic acid and CO2 buildup in the muscles
- Skin is pale
- Pupils dilate
- Pulse rate decreases
- at 90 degrees the body tries to move into hibernation, shutting down all peripheral blood flow and reducing breathing rate and heart rate.
- at 86 degrees the body is in a state of "metabolic icebox." The person looks dead but is still alive.

e. Death from Hypothermia

- Breathing becomes erratic and very shallow
- Semi-conscious
- Cardiac arrhythmias develop, any sudden shock may set off Ventricular Fibrillation
- Heart stops, death

5. How to Assess if someone is Hypothermic

- If shivering can be stopped voluntarily = mild hypothermia
- Ask the person a question that requires higher reasoning in the brain (count backwards from 100 by 9's). If the person is hypothermic, they won't be able to do it. [Note: there are also other conditions such as altitude sickness that can also cause the same condition.]
- If shivering cannot be stopped voluntarily = moderate - severe hypothermia
- If you can't get a radial pulse at the wrist it indicates a core temp below 90 - 86 degrees
- The person may be curled up in a fetal position. Try to open their arm up from the fetal position, if it curls back up, the person is alive. Dead muscles won't contract only live muscles.

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<thead>
<tr>
<th>Stage</th>
<th>Core Temperature</th>
<th>Signs &amp; Symptoms</th>
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<tbody>
<tr>
<td>Mild Hypothermia</td>
<td>99º - 97ºF</td>
<td>Normal, shivering can begin</td>
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<tr>
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<td>97º - 95ºF</td>
<td>Cold sensation, goose bumps, unable to perform complex tasks with hands, shiver can be mild to severe, hands numb</td>
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<tr>
<td>Moderate Hypothermia</td>
<td>95º - 93ºF</td>
<td>Shivering, intense, muscle un-coordination becomes apparent, movements slow and labored, stumbling pace, mild confusion, may appear alert. Use sobriety test, if unable to walk a 30 foot straight line, the person is hypothermic.</td>
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<tr>
<td>Temperature</td>
<td>Symptoms</td>
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<td>93° - 90°F</td>
<td>Violent shivering persists, difficulty speaking, sluggish thinking, amnesia starts to appear, gross muscle movements sluggish, unable to use hands, stumbles frequently, difficulty speaking, signs of depression, withdrawn.</td>
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<td>90° - 86°F</td>
<td>Shivering stops, exposed skin blue of puffy, muscle coordination very poor, inability to walk, confusion, incoherent/irrational behavior, but may be able to maintain posture and appearance of awareness</td>
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<td>86° - 82°F</td>
<td>Muscle rigidity, semiconscious, stupor, loss of awareness of others, pulse and respiration rate decrease, possible heart fibrillation</td>
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<td>82° - 78°F</td>
<td>Unconscious, heart beat and respiration erratic, pulse may not be palpable</td>
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<td>78° - 75°F</td>
<td>Pulmonary edema, cardiac and respiratory failure, death. Death may occur before this temperature is reached.</td>
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**Treating Hypothermia**

The basic principles of rewarming a hypothermic victim are to conserve the heat they have and replace the body fuel they are burning up to generate that heat. If a person is shivering, they have the ability to rewarm themselves at a rate of 2 degrees C per hour.

**Mild - Moderate Hypothermia**

1. **Reduce Heat Loss**
   - Additional layers of clothing
   - Dry clothing
   - Increased physical activity
   - Shelter

2. **Add Fuel & Fluids**
   It is essential to keep a hypothermic person adequately hydrated and fueled.
   a. Food types
      - Carbohydrates - 5 calories/gram - quickly released into blood stream for sudden brief heat surge - these are the best to use for quick energy intake especially for mild cases of hypothermia
      - Proteins - 5 calories/gram - slowly released - heat given off over a longer period
      - Fats - 9 calories/gram - slowly released but are good because they release heat over a long period, however, it takes more energy to break fats down into glucose - also takes more water to break down fats leading to increased fluid loss
b. Food intake

- Hot liquids - calories plus heat source
- Sugars (kindling)
- GORP - has both carbohydrates (sticks) and proteins/fats (logs)

c. Things to avoid

- Alcohol - a vasodilator - increases peripheral heat loss
- Caffeine - a diuretic - causes water loss increasing dehydration
- Tobacco/nicotine - a vasoconstrictor, increases risk of frostbite

3. Add Heat

- Fire or other external heat source
- Body to body contact. Get into a sleeping back, in dry clothing with a normothermic person in lightweight dry clothing

Severe Hypothermia

1. Reduce Heat Loss

- Hypothermia Wrap: The idea is to provide a shell of total insulation for the patient. No matter how cold, patients can still internally rewarm themselves much more efficiently than any external rewarming. Make sure the patient is dry, and has a polypropylene layer to minimize sweating on the skin. The person must be protected from any moisture in the environment. Use multiple sleeping bags, wool blankets, wool clothing, Ensolite pads to create a minimum of 4" of insulation all the way around the patient, especially between the patient and the ground. Include an aluminum "space" blanket to help prevent radiant heat loss, and wrap the entire ensemble in plastic to protect from wind and water. If someone is truly hypothermic, don't put him/her naked in a sleeping bag with another person.

2. Add Fuel & Fluids

- Warm Sugar Water - for people in severe hypothermia, the stomach has shut down and will not digest solid food but can absorb water and sugars. Give a dilute mixture of warm water with sugar every 15 minutes. Dilute Jello™ works best since it is part sugar and part protein. This will be absorbed directly into the blood stream providing the necessary calories to allow the person to rewarm themselves. One box of Jello = 500 Kilocalories of heat energy. Do not give full strength Jello even in liquid form, it is too concentrated and will not be absorbed.

- Urination - people will have to urinate from cold diuresis. Vasoconstriction creates greater volume pressure in the blood stream. The kidneys pull off excess fluid to reduce the pressure. A full bladder results in body heat being used to keep urine warm rather than vital organs. Once the person has urinated, it precious body heat will be used to maintain the temperature of vital organs. So in the end urinating will help conserve heat. You will need to help the person urinate. Open up the Hypothermia Wrap enough to do this
and then cover them back up. You will need to keep them hydrated with the dilute Jello solution described above.

3. Add Heat
Heat can be applied to transfer heat to major arteries - at the neck for the carotid, at the armpits for the brachial, at the groin for the femoral, at the palms of the hands for the arterial arch.

- Chemical heat packs such as the Heat Wave™ provides 110 degrees F for 6-10 hours.
- Hot water bottles, warm rocks, towels, compresses
- For a severely hypothermic person, rescue breathing can increase oxygen and provide internal heat.

Hypothermia Wrap
WARNING SIGNS OF HYPOTHERMIA

Tiredness; reluctance to keep moving.

Abnormal behaviour.

Slurred speech; disturbed vision.

Clumsiness; stumbling.

Collapse.