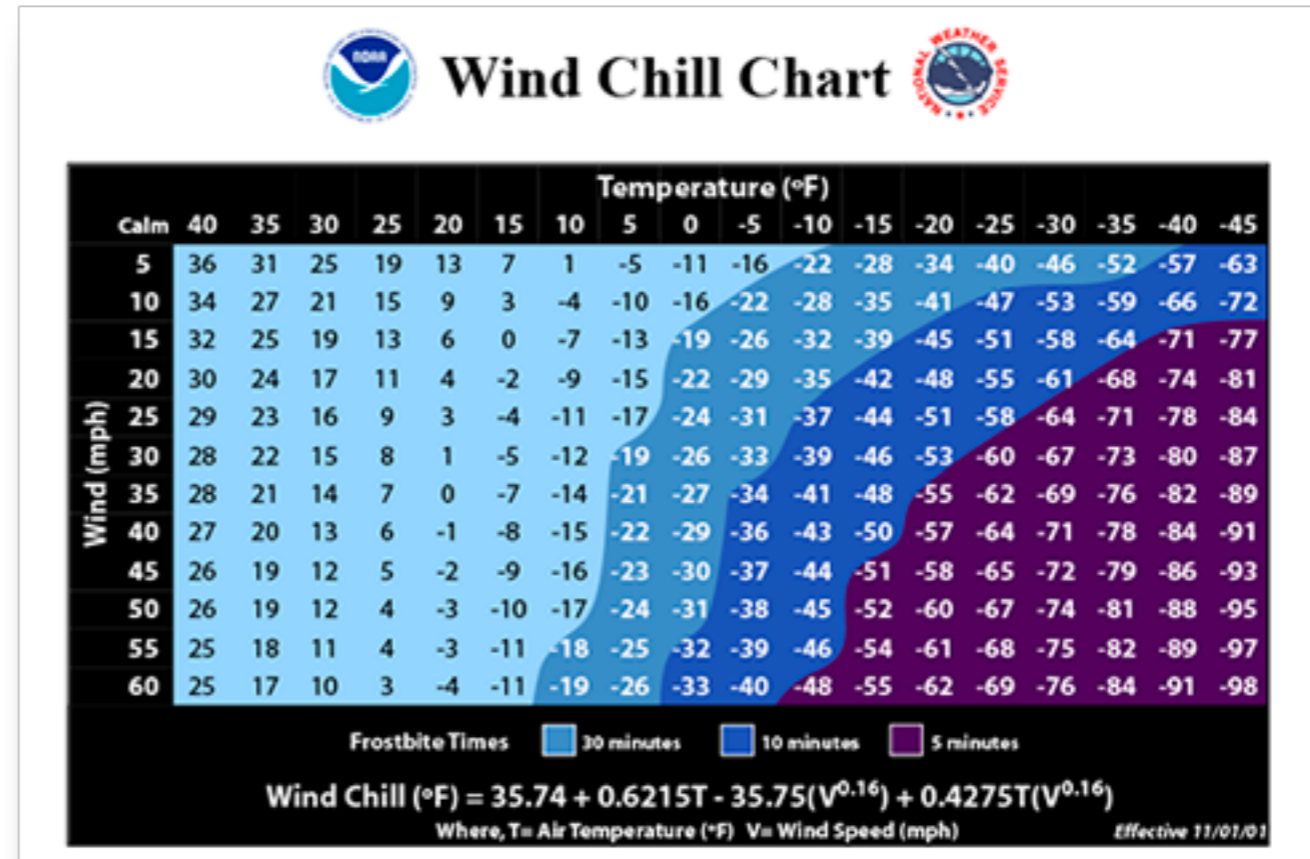


15: Physical and Environmental Hazards



Cold Injury (1/22)

- Hypothermia
- Frostbite
- Cold Immersion
- Chilblains





Cold Injury (2/22)

- Hypothermia
 - General cooling of body core when temperature drops more than 2°F to about 95°F
 - Caused by inadequate clothing
 - Anxiety, drugs, poor nutrition, alcohol
 - Wetness/wind can be a deadly combination
 - Sweating can cause heat loss quickly





Cold Injury (3/22)

- Hypothermia (continued)
 - Different ways to lose heat
 - Convection: Heat is carried away by currents/water
 - Conduction: Direct transfer of heat away from the body by a colder object
 - ◆ Wet clothes or cold ground
 - Evaporation: Sweat or water evaporate from skin surface
 - Radiation: Loss of heat to a surrounding colder environment
 - ◆ Independent of wind or contact
 - ◆ Cold, dark, cloudless night





Cold Injury (4/22)

- Hypothermia (continued)
 - Sources of heat gain
 - Radiation: Heat from the sun or fire
 - Exercise: 75% of muscular energy produces heat – rewarms body
 - Shivering: Increases body metabolism X5, but consumes energy and O₂
 - Food: Provides calories for basic body functions and exercise
 - Carbohydrates provide quick energy
 - Protein provides greater energy, but more slowly and at the expense of more body energy used for digestion
 - Blood vessel constriction: Keeps warm blood to the vital organs
 - Insulation: Prevents heat loss but does not generate heat
 - ◆ Water can reduce effectiveness of some insulation
 - ◆ Wool, polypropylene and pile insulates well with fibers and does not collapse when wet
 - ◆ The more layers the better
 - ◆ Wind/water proof/resistant materials are best for the outer layer





Cold Injury (5/22)

- Mild Hypothermia
 - Body temperature 95°F-91°F
 - Conscious and shivering
 - What to look for
 - Shivering
 - Uncharacteristic behavior
 - Stiff muscles and cramps – fumbles and stumbles
 - Cold, pale and blue-gray skin





Cold Injury (6/22)

- Mild Hypothermia (continued)
 - What to do
 - Find shelter out of the wind and elements
 - Find or create a heat source
 - Change victims clothes – especially sweaty clothes next to the skin
 - Add dry layers
 - If victim is A/O give them food and hot drinks – warm sweet liquids
 - ◆ No alcohol
 - Allow shivering to continue if patient placed in sleeping bag
 - ◆ You no longer get into sleeping bag with victim, you may stop them from shivering
 - Provide rest and warmth
 - Never leave a hypothermic patient alone





Cold Injury (7/22)

- Severe Hypothermia
 - Body temperature falls below 90°F
 - Barely conscious or unconscious and not shivering
 - What to look for
 - No shivering
 - Behavior is erratic, apathetic or LOC
 - Stiff muscles with uncoordinated movement
 - Weak, slow, irregular pulse – check for no less than 45 seconds
 - Slow breathing
 - Coma with dilated pupils
 - May be hard to determine if patient is actually alive





Cold Injury (8/22)

- Severe Hypothermia (continued)
 - What to do in field
 - Rewarming in field is very difficult
 - Concentrate on preventing any more heat loss
 - Shelter the victim from environment – erect a tent, dig a snow hole, lean-to, etc.
 - Provide heat to trunk for first half hour by what ever means possible
 - Heat packs to: groin, armpits and back of neck
 - ◆ Wrap heat packs – do not allow packs to touch skin directly
 - Don't forget to cover victim's head – wool cap works very well





Cold Injury (9/22)

- Severe Hypothermia (continued)
 - What to do as a rescue
 - Get help
 - If you decide to stay and await rescue, do not change plans
 - If you are forced to carry a hypothermic patient, insulate well
 - Move patient gingerly – especially if unconscious
 - ◆ Rough movement could cause V-fib
 - Carry patient with head downhill to maintain blood pressure but in a horizontal position to prevent blood pooling in the legs
 - ◆ Patient should be kept as level as possible
 - ◆ Vertical transport with head up has been known to cause seizures





Cold Injury (10/22)

- Severe Hypothermia (continued)
 - What to do at base camp
 - Rewarm patient in sleeping bag
 - If hypothermia took hours or days, warm slowly
 - ◆ Do not place in rewarming bath or in front of fire
 - If A/O, give patient plenty of warm, sweet liquids
 - ◆ This does not warm the body enough but
 - ◆ Will hydrate and provide usable energy
 - ◆ The feeling of warmth will build morale





Cold Injury (11/22)

- Deep Hypothermia
 - Body temperature falls below 82°F
 - Victim will most likely appear dead
 - Pupils are dilated and fixed
 - Limbs are stiff
 - Skin icy
 - Victim can't generate enough heat to warm themselves
 - They can't be rewarmed in the field
 - This requires special equipment and training
 - Extracorporeal rewarming (cardiac bypass)
 - Protect and insulate the patient during transport
 - The only sure sign of death is failure to revive with rewarming
 - Victims have survived after several hours of CPR

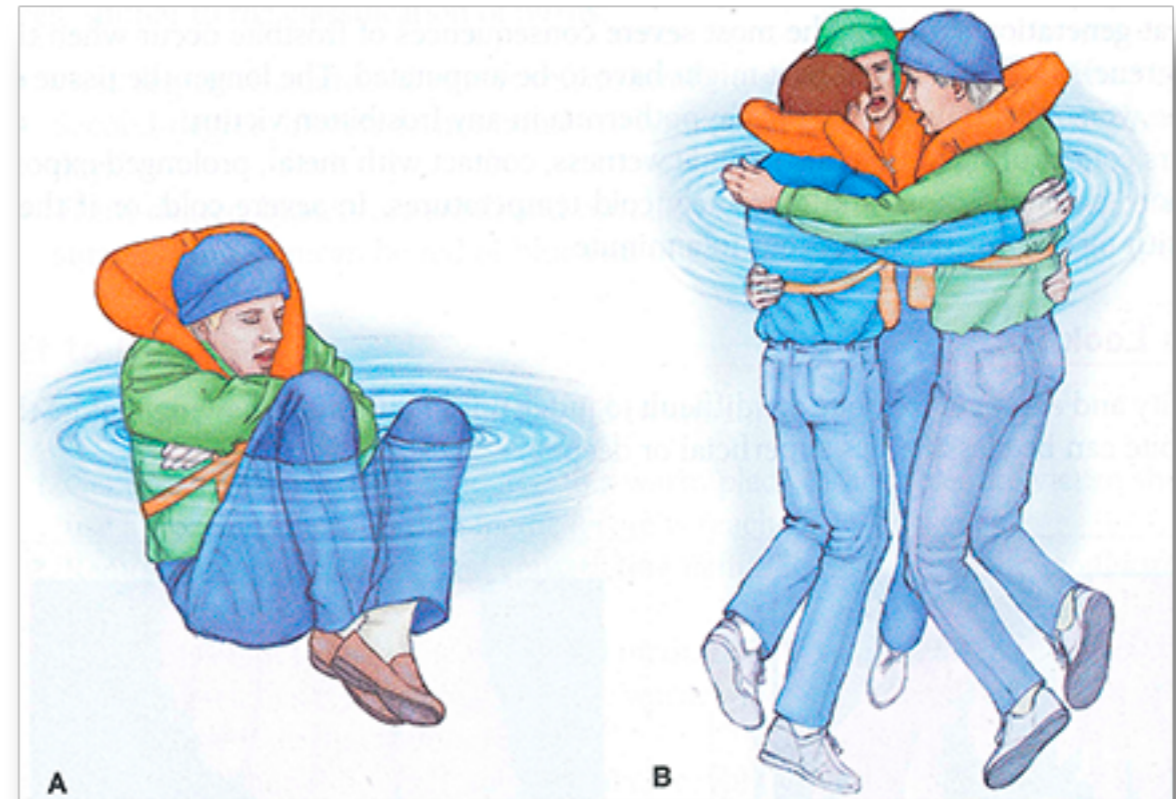


15: Physical and Environmental Hazards



Cold Injury (12/22)

- Immersion Hypothermia
 - Heat loss in water is 25X that of air
 - Water temperature / exhaustion, unconsciousness
 - 50°F-60°F – 1-2 hours
 - 40°F-50°F – 30-60 minutes
 - 32.5°F-40°F – 15-30 minutes
 - 32.5°F – <15 minutes
 - Use the heat escape lessening position (HELP) or huddle position to minimize heat loss and increase survival
 - Having clothes on – even in the water will reduce heat loss
 - Having a wool cap will reduce heat loss by half
 - You are better staying on top of an overturned boat than swimming to shore
 - Better chance for survival and rescue
 - If CPR is warranted, it must be started as soon as patient is out of water
 - Patient should be transported to a hospital as soon as possible





Cold Injury (13/22)

- Frostbite
 - Freezing limited to skin surface is frostnip
 - Freezing that extends deeper is frostbite
 - Most common to face, hands and feet
 - Only occurs in below freezing temperatures
 - Tissue is damaged in two ways
 - Actual freezing of tissue that creates ice crystals within the tissue
 - ◆ As crystals expand, it damages cells
 - Obstruction of blood supply to the tissue
 - ◆ Causes sludged blood clots
 - ◆ Further prevents blood from flowing to tissue
 - ◆ This causes more damage
 - Flesh can freeze in less than a minute





Cold Injury (14/22)

- Frostbite (continued)
 - Most severe cases, tissue dies (gangrene), the affected part may have to be amputated
 - The longer the tissue is frozen, the worse the injury
 - Check frostbite on any hypothermic patient
 - In cold weather, contact with metal can cause frostbite in minutes
 - Contributing factors: wetness, prolonged exposure, dehydration, poor nutrition and extremely cold temperatures
 - What to look for in superficial frostbite
 - White, waxy, grayish skin
 - Affected part feels very cold and numb
 - May have a tingling, stinging or aching sensation
 - Skin surface may feel stiff/crusty with underlying tissue feeling soft when depressed gently





Cold Injury (15/22)

- Frostbite (continued)
 - What to look for in deep frostbite
 - Affected part feels cold, hard and solid
 - Can't be depressed – feels like frozen meat
 - Pain dissipates
 - After thawing, categorize frostbite as follows:
 - First-degree: Part is warm, swollen and tender
 - Second-degree: Blisters form minutes to hours after thawing and enlarge over days
 - Third-degree: Blisters are small and contain reddish, blue or purplish fluid
 - ◆ Surrounding skin can be red, blue or might not blanch when pressed





Cold Injury (16/22)

- Frostbite (continued)
 - What to do
 - Get victim out of elements into warm environment
 - ◆ Don't use frozen extremity
 - Remove wet clothes and replace with dry
 - ◆ Remove rings in case of swelling/constriction
 - Do not attempt to thaw if:
 - ◆ Medical care is less than 2 hours away
 - ◆ Affected area has already thawed
 - ◆ If shelter, warm water and a container are not available
 - ◆ Appendage may refreeze





Cold Injury (17/22)

- Frostbite (continued)
 - What to do (continued)
 - Place frostbitten part in warm water (100°F-104°F)
 - ◆ Test by putting your own hand in water for 30 seconds
 - ◆ Do not burn the patient
 - ◆ Do not use a heat source like a fire, space heater, etc.
 - ◆ Maintain water temperature by adding more warm water as necessary
 - ◆ Takes about 20-40 minutes or until part becomes soft, pliable to touch
 - ◆ Part will take on a red purple appearance
 - ◆ Air dry – do not rub
 - ◆ Pain will be associated with rewarming – give patient ibuprofen
 - ◆ For ears/nose, you may need to rewarm using warm, moist cloths – changing frequently





Cold Injury (18/22)

- Frostbite (continued)
 - What to do (continued)
 - After thawing
 - ◆ Feet: do not allow patient to walk – use a stretcher
 - ◆ Cover with sterile dressings so part doesn't touch clothing/bedding
 - ◆ For toes and fingers: place dressings between to stop them from rubbing and to absorb moisture
 - ◆ Slightly elevate part above heart to reduce pain and swelling
 - ◆ Do not allow part to refreeze
 - ◆ Seek medical attention





Cold Injury (19/22)

- Frostnip
 - Only surface is affected
 - But may lead to frostbite
 - What to look for
 - Yellowish to gray skin
 - Frost (ice crystals) on skin
 - Tingling at first
 - Painful later on
 - May look just like frostbite





Cold Injury (20/22)

- Frostnip (continued)
 - What do to
 - Seek shelter
 - Gently warm area by placing against a warm body part
 - ◆ Inside jacket into armpits
 - ◆ Use heat packs covered with cloth
 - ◆ For nose, breath into cupped hands
 - Do not rub area





Cold Injury (21/22)

- Immersion (Trench) Foot
 - Non-freezing cold injury caused by prolonged exposure (average 3 days) to cold and wet
 - But not freezing
 - Mild numbness can lead to swelling, loss of feeling or burning feeling
 - Blisters develop in severe cases
 - Prevent injury by keeping feet warm and dry with frequent sock changes
 - Treat by elevating feet and exposing to air
 - Burning feeling is relieved by cool air
 - Give victims acetaminophen or ibuprofen for pain
 - In severe cases, patient will not be able to walk





Cold Injury (22/22)

- Chilblains
 - Caused by repeated exposure of bare skin to wet, wind and cold
 - Red, itchy, tender and swollen skin
 - Usually on the fingers
 - Not a severe problem and can be prevented by wearing gloves

