

## **Explanatory notes for Management Flow Chart for First Aid trained Volunteers of LandSAR NZ in casualties with**

### **SUSPECTED HYPOTHERMIA**

**Please note this flowchart can be used without having a thermometer. The body core temperatures referred to are estimates for the clinical symptoms. If the temperature recorded is over 32°C, hypothermia can be ruled out as a cause of unconsciousness or cardiac arrest. Each person responds in an individual way to a specific temperature and the clinical signs and symptoms are more relevant than the actual temperature.**

#### **1: Cold Stress**

This is the stage before hypothermia. Warm drinks are better than hot drinks. There are temperature receptors in the stomach, which will make a person shiver less if they drink a hot drink. Carbohydrates in a warm drink adds fuel for shivering, as does food.

Hot chocolate or Milo made with milk to directions on packet contains as much sugar as a cup of tea with 5 teaspoons of sugar, and unless lactose intolerant, is less likely to make a person vomit. If a person is injured, they are considered hypothermic at 36°C and need active warming, ie heat added.

#### **2: Mild Hypothermia**

These patients need food and drink . Uncontrollable shivering uses up a large amount of fuel, and thus takes a while to replenish the energy stores after eating before they will have enough energy to move around. You may need to weigh up the danger of getting colder if the casualty is located in an exposed, windy spot, and their ability to walk to a sheltered spot or if they need to be carried. Remember the “Lethal Triad “ about increased bleeding and reduced oxygen carrying capacity of the blood, and that 30% more people who are injured will die if their body temperature is below 35°C.

Offer them warm drinks. This is safe even if the injury will need surgery, food is less ideal before an anaesthetic but it all depends on timing. If there is a long wait for evacuation, then it is better to eat to produce heat energy rather than to be hypothermic.

However, if the patient is injured it is also essential to add active heat. This can be done with chemical heat packs in the armpits or with large Ready Heat torso warmer. If these are not

available warm water bottles can be used, however, this is more time consuming and can cause burns so care is needed. Warm water (40°C target temperature) can be achieved by mixing 1 part boiling water with 2 parts of water if it is at 10 °C . If the cold water is warmer than 10°C , more needs to be added. Or if it is colder, less. The result should be a little warmer than baby bath water.

If it is too hot it can cause burns, insulate any water bottles with a layer of material to prevent any skin burning.

Sharing body temperature in a sleeping bag is not an effective way of rewarming a hypothermic patient due to inadequate energy being produced. **You would need 300 normothermic (naked!) people in a sleeping bag in order to rewarm a hypothermic patient.**

### **3: Moderate Hypothermia (conscious)**

The person should not be walking around because this could cause them to collapse by making cold blood from arms and legs reach the heart and cause a heart arrhythmia (irregularity). They may be semiconscious and not able to safely swallow, choking is dangerous.

However, they are not producing any heat themselves (they will likely have stopped shivering) so they must have heat actively added inside the vapour barrier. **If you wrap a cold chicken in tin foil, you will still have a cold chicken!**

If it is possible to remove wet clothes quickly and without moving limbs about (causing cold blood to reach the very sensitive heart muscle) by **cutting**, not laboriously undressing, in a completely sheltered environment ( to prevent heat loss to environment) do so. However, if shelter (like a hut or a tent or a helicopter) is not available then wrap them up in a hypo-wrap with the wet clothing still on.

The actively added heat will cause a “sauna effect” which is OK.

A hypo wrap consists of 4 layers:

- . 1) Vapour barrier: Foil blanket or bubble wrap totally covering the person snugly ( apart from face). Stops evaporative heat loss and keeps sleeping bag dry. The active heat (chemical heat pad or hot water bottle) needs to be inside this layer.
- . 2) Insulation, usually a sleeping bag, zip needs to be done up. Hat (unless person is in cardiac arrest, cold brain is good)
- . 3) Cell foam/ Thermarest mat under patient

4) Carefully wrapped tarpaulin, no gaps

If a person is in a hut, helicopter or ambulance the environmental temperature needs to be approximately 28°C in order to prevent the person losing heat.

**4: Moderate Hypothermia (unconscious)** An unconscious person could go into cardiac arrest at any time and needs to be very carefully monitored. (Their breathing would stop and then CPR would need to be started) They need to be moved horizontally so that cold blood from limbs do not enter the chest and cause the sensitive heart muscle to become irritable.

Active heat needs to be added but because energy requirements are very high they will experience “after drop”. Think of when you cook a roast joint in the oven, you take it out to “rest” and it carries on cooking for a bit longer. After drop is the exact opposite, they

continue to cool down further, think of it as “heat inertia”. Thus, cardiac arrest often happens after the person is removed from the cold environment. This patient needs to get to hospital quickly so they can be rewarmed effectively, it is impossible to do this in the field. Chemical heat packs or hot water bottles can, at best, reduce the amount of further cooling. Do not be complacent that what you do will make them “better”, all you can do is make them “less worse” !

**5: Clearly dead**

Decapitation Transection of thorax (chest cut in half)

Brain exposed and significantly deformed

Avalanche burial with ice or snow blocking airway buried for over one hour

Chest frozen solid so that CPR compressions impossible (frozen arms & legs is OK, can get better once patient is rewarmed)

Decomposition

Core body temperature below 10 C( **some sources quote 4C**) (measured in a reliable way, not available in the field apart from crime scene investigators)

Unless the patient shows any of the signs above, they cannot be declared life extinct until they are at a body temperature of 35°C

Dilated pupils are not a reliable sign of death in a cold patient.

**“You are not dead until you are warm and dead”**

## **6:Not breathing**

Carefully observe for breathing for up to a minute. Breathing can be very slow in a severely hypothermic patient. If there is no breathing, start CPR. Other algorithms (Like USA Wilderness First Aid & First Responder) suggest for First Aiders to check for a pulse, but NZ LandSAR adhere to ICAR recommendations and there is no pulse check because it is very difficult to detect heart activity, even for professionals unless they have an ECG monitor or an Ultra Sound machine because it can be very slow and very low force hear beat.

When a person has become hypothermic their brain uses less oxygen, and when the heart stops beating the brain does not need any blood flow because it has already become “dormant”. It is not possible to rewarm a severely patient in the field, to achieve this needs hospital intervention.

The heart tends to fibrillate around 30-28°C but an AED shock may not be effective at this temperature because electricity does not conduct well when the heart muscle is so cold. At about 19°C the heart stops totally, this cannot be shocked but may restart spontaneously when the heart is warm again.

If CPR is continued until patient is warm, survival with intact brain function is highly likely. **KEEP GOING WITH CPR ! if safe and possible to do so**