Newsletter Winter 2011

## CPR and the Hypothermic Patient

Article by Henry Worsp - Peak Safety

*Do we administer CPR to severely hypothermic patients if we can't find signs of life?*

Victims of severe hypothermia are unique in that their vital signs may appear reduced to a point that indicates apparent death while still maintaining some potential for metabolic function. When a person's core temperature falls below about 31°C the brain begins to experience a reduced blood supply leading to unconsciousness, the blood pressure can drop meaning pulses are difficult to detect. Respirations may become so shallow that they are also difficult to detect. The decision on whether or not to commence Cardiopulmonary Resuscitation on a hypothermic patient is one that has faced rescue teams, outdoor leaders and recreationalists for decades.

The challenge around this stems from the complications involved with a potential after drop during patient treatment. By warming the peripheries, moving the patient, or commencing CPR we can encourage the colder blood to move from the extremities to the heart which, if still functional, may be tripped into Ventricular Fibrillation (VF). In addition the blood that has been trapped peripherally may become acetic (acidic) which can also lead to cardiac arrhythmias.

Despite these complications, current thinking is that CPR should be administered to a hypothermic patient who exhibits no breathing or pulse. The pulse may be difficult or impossible to locate, so check for any other signs of life before commencement of CPR (Alaskan Cold Injury Guidelines, 2005). Resuscitation should be continued until the patient is rewarmed or exhibits a pulse or respirations. Obviously the patient must be removed from the source of cold as much as possible before commencing CPR.

If respirations are present then do not initiate CPR. If respirations are absent then begin rescue breathing. This not only provides oxygen to the patient but introduces heat to the core. If breathing and pulse are absent then commence CPR at the usual rate of 30:2. Ordinarily respirations and pulse should be checked for up to 10 seconds. In a hypothermic patient the pulse may be as low

as 2-3 beats per minute and breathing barely detectable. Therefore check these for up to 45 seconds. (JAMA Guidelines, 2006).

Be sure advanced medical assistance has been called when practical. Advanced techniques such as the introduction of warmed IV fluids, peritoneal lavage (heated solutions circulated through body cavities), and extra corporal (outside the body) blood warming may be used by a medical professional so our field care shouldn't overly delay hospitalisation (www.hypothermia-ca.com). Severe hypothermia may render defibrillation less effective but it should still be administered when indicated by an AED.

CPR should be complimented with actively rewarming the core and insulating the patient to prevent further heat loss. Whenever possible a core temperature should be obtained.

Inhalation warming has also proved to be a very effective way of rewarming the patient. By providing warmed, humidified air or oxygen the patient's core temperature can be increased with much less opportunity for after drop to occur. This involves the use of a battery powered pump (Res-q-air) and air warmer which would not be carried normally but could have practical applications for rescue teams. Some proponents go so far as to state that mortality from hypothermia once rescue teams arrive should be a thing of the past due to these devices. They can also be attached to a Bag Valve mask during positive pressure ventilations.

Rewarming the core can also be done by placing heat pads or warm hot water bottles around the neck, armpits or groin. Ensure that any movement of the patient is kept to a minimum. This can be achieved by treating them in a similar fashion to a spinal patient. Insulate the patient by removing wet clothing and replacing it with dry versions if available. Avoid rewarming the arms and legs until the core body temperature is at least 31°C.

**References**

Brugger, H & Drugger, B; Journal of the American Medical Association
October 28, 1992, Updated 2006

Grissom, C; Avalanche Victim Physiology and Medical Treatment After Rescue

Transport Guidelines Severely Hypothermic Patients, Alaskan Cold Injury Guidelines, 2005

# Cold water immersion and hypothermia

Prepared by Drew Coleman – Horizons Unlimited

Statistically New Zealand has, on average, 100 water related deaths each year, of which 16 are boating related. In the outdoors we are often faced with crossing cold rivers, sometimes glacier fed, and occasionally with clients or students. We kayak frigid rivers, lakes and coastal areas. Some of our clients work around water in polar regions.

The response to Cold Water Immersion can be broken down into 4 stages.

**Stage 1: The sudden drop in skin temperature which promotes the 'Cold Shock Response'**.
This response is an uncontrollable large, inspiratory gasp followed by severe hyperventilation. We cannot hold our breath or control our rate or rhythm of breathing. There is also a response from the cardiovascular system which causes the heart to work harder.
Stage 1 is where drowning begins. To drown we need only 1.5ltrs of fluid in our lungs. News reports of people dying from hypothermia in 3 minutes after falling into cold water are misleading and should actually be reported as drowning. The victim cannot control their breathing and, if forced under the surface by waves has no control of their airway.
This 'Cold Shock Response' lasts for approx 2 minutes, after which it stops.
Studies undertaken by the British Royal Navy have shown that groups who are informed of the 2 minute Cold Shock Response react better and respond (physiologically) better than uninformed groups.
**Key learning:** The over-riding message from Dr. Tipton was: 'knowledge through safety briefings is key to increase survival'.
Educate your clients. Tell them what they will feel if they fall in and give them a task to do (eg. Stay calm, swim to 'that' eddy).

**Stage 2: Failure of superficial muscles and nerves.**
This produces incapacitation (or near paralysis) of extremities within 10-15min. Swimming failure is common and chance of self rescue (swimming to shore, pulling self up onto a boat) is diminished. All self rescue attempts and procedures should happen between 2 and 10 minutes.
Posture will help here in maintaining some warmth. Exercise will decrease body temp when in cold water so foetal position is best.

**Stage 3: Long Term Immersion.**
Conductivity of water is 25 times that of air. After half an hour of immersion, hypothermia of the core is starting to develop steadily. Heavy shivering will stop and core temperature will fall

continuously. ** Environmental, individual and intra-individual factors may affect the rate of developing hypothermia. These are:

- Temperature differential - Waves, spray, wind-chill factor - Insulation of clothing.
- Ability of heat production by shivering - Ratio of body mass to surface area.
- Mental state and coping strategies - Physical fitness and compromising health problems.
- Subcutaneous fat layer - Posture in water. **

Anecdotal evidence has shown that 60% of deaths due to Cold Water Immersion can be attributed to Stages 1-3 where the main cause of death is drowning, not hypothermia.

**Stage 4: Rescue Phase.**

Research has shown that 20% of Cold Water Immersion victims die during the Rescue Phase. This can be attributed to decline in mental state ("I'm safe now" response) as well as a sudden and dramatic drop in blood pressure. The hydrostatic squeeze of water supports the function of the heart. Lifting a patient vertically can cause severe hypotension. Keep patient horizontal (head slightly down) during rescue if possible.

Maintain an airway, administer Oxygen via positive pressure if possible (ie. Bag valve mask or rescue breathing).

Stay positive but do not tell your patient to "relax, you're safe now". Instead say, "Keep breathing - good job mate – open your eyes…"

In Nov 2009 Dr Michael Tipton was the key-note speaker at the first International Water Safety Conference of New Zealand. He is a leading UK Water Safety Expert having worked for the Institute of Naval Environmental Medicine for 20 years and published over 150 articles, books and research papers.

**References**

This article is a summary of an interview given by Dr Michael Tipton on Radio New Zealand. The full interview has many more interesting facts about survival at sea and further points on preparation and studies on the "Cold Shock Response".

http://www.radionz.co.nz/search?mode=results&queries_all_query=Dr+Michael+Tipton

** The Norwegian Centre for Maritime Medicine – Sea Survival. Author; Ulrich Van Laach. 2011