Treating the Hyperthermic Athlete

Demonstration of the

Full Ice Immersion Method
Marine Corp Method
Taco Method
Materials Needed: Full Body Ice Immersion

- 50 or 100 gallon Rubbermaid stock tanks
- Rectal thermometers with long thermistors
- Water source
- At least 4 (30lbs) bags of ice per tank
- Folding cot or bed
- BP cuff and stethoscope
- Pulse oximeter
- Towels
- IV set ups/fluids
- Change of clothes for runner
- When available, 12 lead monitor/AED
Materials Needed: Marine Corp Method

- 300-600 gallon round stock tanks that can accommodate a stretcher laid across the top
- Water pitchers to pour water over athlete
- Rectal thermometers with long thermistors
- Water source
- At least 10 (30lbs) bags of ice per tank
- Folding cot or bed
- BP cuff and stethoscope
- Pulse oximeter
- Towels
- IV set ups/fluids
- Change of clothes for runner
- At least a staff of 2-4 people to continuously pour ice water over patient
- When available, 12 lead monitor/AED
Materials Needed: Taco Method

- Water impervious tarp at least 6 x 8 feet
- Water pitchers or water pails to pour water over athlete into tarp
- Rectal thermometers with long thermistors
- Water source
- At least 2 (30lbs) bags of ice
- Folding cot or bed
- BP cuff and stethoscope
- Pulse oximeter
- Towels
- IV set ups/fluids
- Change of clothes for runner
- At least a staff of 4-6 people to hold support tarp edges
Set-up: Medical Tent

- Pre stage cots and immersion tubs, leaving room between each for staff movement and support
- Fill immersion tubs to ¾ full of water
- Keep ice bags adjacent to tanks
- Have table set up with supply materials listed
- Ensure that all staff follow Universal precautions at all times
- Establish location to drain tub if water becomes soiled
- Keep back up water source close in tent
Why Ice Immersion?

In heat stroke, every minute counts. When core temperature is very high, body and brain cells begin to die, so fast cooling is vital. The ultimate goal is always to get the body temperature under 104°F within 30 minutes of collapse (or faster if possible).
Treating Heat Stroke: Medical Emergency

- Number of minutes an athlete is over 105°F will dictate if they live or die, and if they live, if they have long-term or permanent disability as a result of the condition.
- When an athlete collapses, the best gauge of core temperature is rectal temperature. Oral, axillary, or tympanic temperature is not sufficient to diagnose or exclude heat illness.
- Early features of heat stroke
  - Subtle central nervous system (CNS) changes, altered cognition or behavior, and core temperature over 104-105°F (40.0-40.6°C) at time of collapse.
- Advanced features of heat stroke
  - Collapse with core temperature over 106-107°F (41.1-41.7 °C) and striking CNS changes, including delirium, stupor, seizures, or coma.
- A lucid interval may present, do not let this prevent necessary rapid cooling.
Early Warning

− Early warning signs of impending heat stroke may include irritability, confusion, apathy, belligerence, emotional instability, or irrational behavior. Giddiness, undue fatigue, and vomiting can also be early signs.
− Paradoxical chills and goose bumps signal shutdown of skin circulation, portending a faster rise in temperature.
− The runner may hyperventilate, this can cause tingling fingers as a prelude to collapse.
− Loss of coordination and staggering are late signs, followed by collapse with seizure and/or coma.
Cool First

- Field treatment for heat stroke is fast cooling with ice water immersion. No faster way to cool exists than placing the athlete into an ice water tub.
- If necessary, the Marine Corps Method is an appropriate alternative, especially for those patients experiencing a cardiac event.
- EMS transport should not be considered until after the runner’s temperature decreases to 102°F.
Medical Chain of Command

The tent MD, or highest medical authority, should be notified immediately on the presentation of a hyperthermic patient who is undergoing cooling.
Key Element to Cooling the Athlete

Ice water immersion has been clearly shown to have the most expedient cooling rates, with survival rates of 100% when implemented within 10 min of collapse.
Medical Tent Evaluation

- Evaluation should involve prompt assessment of body temperatures.
- If athlete is conscious and coherent, postural hypotension may be assumed. He or she should be placed in the recumbent position under a blanket with legs and pelvis elevated above the level of the heart.
- The athlete should be asked about any significant medical illnesses, drug allergies, any unusual symptoms during the day's event, and fluid intake during the race.
- If fluid intake has been excessive (more than 1 to 1.5 L/hr) and the athlete reports little urine production, fluid overload and hyponatremia needs to be considered.
Initial Medical Exam for Vital Signs & Altered Mental Status

- Evaluation includes an assessment of two critical findings: level of consciousness and body core temperature.
- If the athlete is unresponsive, confused and disoriented—or exhibiting bizarre behavior or convulsions—heatstroke (or hypothermia depending on environmental conditions) or hyponatremia should be assumed to exist if no other obvious medical cause such as cardiac arrhythmia is discovered.
- Hypoglycemia may also occur, but is less common in this setting. Glucose is checked with the sodium level (where available by iSTAT or EMS).
Why Rectal Temperatures verses Tympanic?

- Tympanic temperature has been shown to be invalid when people have been doing intense exercise in the heat and are extremely hyperthermic. The tympanic device can be off as much as 5-7°F in such circumstances.
- Reasons to transfer to hyperthermia treatment area include, but are not limited to:
  1. Any signs of CNS dysfunction not related to hyponatremia, head injury, or hypoglycemia.
  2. Development of CNS changes throughout the medical evaluation.
  3. Any suspicion of heat stroke. Since time is a key factor for heat stroke outcome, medical staff should be encouraged to consider heat stroke.
- A quick rectal temperature can quickly rule out or rule in heat stroke and help focus a treatment plan.
Rectal Temperatures

- Rectal temperature should be done at individual stations before transfer of care to hyperthermia treatment area so as to not overwhelm care in this area. However, if there is a high level of suspicion of heat stroke patients should be transferred immediately.
- Any patient suspected of having heat stroke who is transported to the hyperthermia treatment area will have temperature assessed via rectal thermometer.
- A flexible rectal thermistor is the recommended temperature assessment device at the hyperthermia treatment area since it only has to be placed once and can be utilized throughout care.
- If performing rectal temperature, personnel should make every attempt to ensure patient privacy.
Immersion Tips: Cold Water Immersion Cooling Guidelines

Practical guidelines for implementing cold water immersion for an exertional heat stroke patient.
Initial Response

Once exertional heat stroke is suspected, prepare to cool the patient and contact emergency medical services (EMS).
Prepare for Ice Water Immersion

- On the field or in a temporary medical tent, half-fill the tub or wading pool with water and ice.
- Stock tanks can be filled with ice and cold water before an event, or, have tub half-filled with water and 3-4 bags of ice next to tub to prevent having to keep tub cold throughout the day.
- Ice should cover the surface of the water at all times.
- Water temperature should be under 15ºC (under 60ºF).
Assess Responsiveness

- When did runner finish the race?
- Does runner know their name and location?
- Brief history and physical
- No medical problems (look on their bib)
- No meds
- Vitals
  - HR-90, T-100.1°F, BP-120/78, R-18
- Marked alteration of consciousness
- Answers all questions appropriately
Determine Vital Signs

- Just before immersing the heat stroke patient, take vital signs
- Assess core body temperature with a rectal thermistor
  - Thermistor implies flexible thermometer that stays in during cooling and allows for continuous monitoring of temperature during immersion therapy
- Check airway, breathing, pulse, and blood pressure
- Assess the level of CNS dysfunction
Begin Ice Water Immersion

Place the athlete in the ice water immersion tub. Medical staff, volunteers, and/or teammates may be needed to assist with a smooth and safe entry and exit.
Total Body Coverage

- Immerse as much of the body as possible including trunk, both arms, and as much of both legs as possible.
- If full body coverage is not possible due to the tub’s size, cover the torso as much as possible.
- To keep the athlete’s head and neck above water, an assistant may hold the patient under the axillae – armpits – with a towel or sheet wrapped across the chest and under the arms.
  - This will also allow for monitoring of the patient throughout the immersion.
- An ice/wet towel can be placed around the patient’s neck while body is being cooled in tub.
  - Ice/wet towels should be alternated every 2-3 minutes to maintain cooling.
Vigorously Circulate Water

- During ice water immersion, water should be continuously circulated or stirred to enhance the water-to-skin temperature gradient, which optimizes cooling.
  - Have 1-2 people stir the water during cooling.
- Towels can be used to help circulate the water, however, towels should not be placed on the patient during ice water immersion. Likewise, ice bags do not need to be placed on the patient during ice water immersion.
Cooling is the Primary Goal Before Transport

If appropriate medical staff is available on-site (team physician or athletic trainer), an aggressive cooling modality is readily available (i.e. cold water immersion, high flow cold water dousing [MCM]), and no other emergency medical services are needed besides the rapid lowering of temperature, then always follow the “cool-first, transport second” doctrine.
Cooling Duration

- Continue cooling until the patient’s rectal temperature lowers to 39ºC (102ºF).
- **If no rectal temperatures is available and ice water immersion indicated:**
  - Cool for 10-15 min and then transport to a medical facility.
  - If after 10-15 min the patient’s symptoms have not improved, medical personnel should use their best clinical judgment as to whether additional cooling time is warranted.
  - If a less effective cooling method is utilized (i.e. MCM, tarp method, etc.) cooling time should be increased, 15-20+ min.
- An approximate estimate of cooling via cold water immersion is 1ºC every 5 min or 1ºF every 3 min (if the water is aggressively stirred).
  - Cooling rate will be slower initially, and increase the longer the person is in the tub.
  - Cooling for 15 min should bring temperatures down approximately 3ºC/5ºF.
Continue Medical Assessment

- Vital signs should be monitored at regular intervals.
- Throughout immersion, an assistant should be near the head to continuously monitor the athlete.
- It may be helpful for an assistant to stand nearby in case the athlete becomes combative.
- Other assistants may be needed to lift or roll the athlete if vomiting occurs.
Fluid Administration

- If a qualified medical professional is available, an IV fluid line should be placed for hydration and support of cardiovascular function.
- Rest the arm to be used on the side of the water immersion tub.
- If athlete becomes combative, protect IV and staff.
Patient Transfer Out of Tub *

- Remove the patient from the immersion tub after rectal temperature reaches 39°C (102°F) and then transfer to the nearest medical facility via EMS as quickly as possible.
- Patients with moderate to severe hyperthermia, especially those with underlying medical conditions should be encouraged to undergo transfer to a medical facility for continued monitoring, even if hyperthermia has resolved.
- The rectal probe should be kept in place and the patient monitored for at least 10 minutes after being removed from ice water immersion. Rebound hyperthermia phenomenon is rare, but could occur.

* Make sure you have adequate staffing to move the athlete in and out of the immersion tub – medical team safety is imperative.
Advanced Medical Support

During transportation, maintain the rectal thermistor to allow body temperature to be monitored continuously. Once the athlete has arrived at the hospital, tests and other treatments will address issues resulting from the hyperthermia.
Medical Complications

- After removing the athlete/runner from the ice bath at 102°F, body core temperature will continue to go down to normal. Overcooling (lower than normal body temperature) may occur. If overcooling occurs, begin methods of rewarming by removing wet clothes and adding blankets.
- The athlete may seize, if this occurs, continue to monitor vitals, maintain airway and initiate EMS support. Anti-seize meds may be considered.
- If a cardiac event occurs on a hot day, consider hyperthermia after resuscitation. If resuscitation fails consider adding cooling with caution, especially if using an AED. In this case, the MCM is preferred to allow for simultaneous resuscitation and cooling. Be sure to dry the patient off if using an AED.
- If a cardiac arrest occurs during ice water immersion, start EMS procedures, immediately remove the athlete from the water, and dry the body.
Taco or Tarp Method

- An alternative method of cooling when ice water immersion is not available is the Taco or Tarp Method.
- The patient is placed on an impermeable tarp with the head elevated.
- The sides of the tarp are elevated and ice water is poured into the tarp on and around the patient.
- If possible, rectal temperatures should be taken as our normal protocols have indicated.
- An individual should be near the head to continue to monitor the patient during this method.
Marine Corp Method
Remember to always check with your Chief Medical Officer or Medical Tent Lead on any runner/patient medical treatments.