Southwest Texas Regional Advisory Council

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HEAT STROKE

Evidence of Heat Exposure

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Altered Mental Status (Coma, Confusion, Ataxia, Seizure)

If able, obtain initial rectal temperature.

Core Temperature >103.9 (40°C) with altered mental status is Heat Stroke.

Patients with Heat Stroke require active cooling.

Active cooling, preferably immersive cooling, should be started before transport if >12 years old.

Recommendations

EMS

- Early recognition of Heat Stroke is imperative to reducing patient morbidity and mortality (1–3).
- It is imperative that the type of heat stroke (classic vs. exertional) does not affect the chosen cooling method (1,3–5).
- Signs of Heat Stroke include Heat Exposure and Altered Mental Status (Confusion, Coma, Seizures, and Ataxia. Rectal (Core) Temperature associated with heat stroke is >103.9°F (40°C) (2,3,6).
- Core temperature should be done rectally. Temporal, tympanic, axillary, infrared, and oral temperatures are inaccurate enough to monitor core temperature effectively(7–10). Patients should have continuous core temperature monitoring with a goal cooling rate of at least 0.1°C per minute.
- Protocols should include immediate active cooling. Cold water immersion is preferred to axilla cooling and evaporative cooling. Cold water immersion can be accomplished using TEMP-Thermal Emergency Management Patient (body) bags or tarps and cool to cold water (1,3–5,11,12).
- Procedures should be preplanned to get the coldest water possible to the patients' side to start cooling before transport, ice water is the fastest technique (1).
- Cooling should be continued until the patient's core temperature is 101°F (38.5°C) (2,3).
- Shivering or seizure activity can be controlled with benzodiazepines (2).
- Cardiac Arrest is likely to be pulseless electrical activity (PEA) from hyperkalemia and acidosis (2).
- Patients in cardiac arrest should continue to have cooling continued. Cardiac monitoring and electrical cardioversion can be administered during immersion safely (13).
- Consider underlying causes for heat stroke, including other causes of altered mental status (2).
- Prehospital providers should be prepared to cool multiple patients in the event of a mass casualty heat event (14).

Hospital

- An in-house process should be developed to perform or continue cold water immersion cooling of patients arriving with heat stroke (2,3,11,12).
- Cold water immersion can be accomplished using TEMP-Thermal Emergency Management Patient (body) bags or tarps while allowing oscillation of water around patients (2–4,11,12).
- Patients should have continuous core temperature monitoring with a goal cooling rate of at least 0.1^{o}C per minute (2).
- Patients should be evaluated for rhabdomyolysis, kidney failure, disseminated intravascular coagulopathy, intraparenchymal hemorrhage, hyponatremia, hyperkalemia, hypocalcemia, and other evidence of end-organ dysfunction (2).
- The goal of cooling should be to a core temperature of 101^{o}F (38.5^{o}C) (2,3).
- Cardiac Arrest is likely to be a pulseless electrical activity (PEA) from hyperkalemia and acidosis (2).
- Patients in cardiac arrest should have cooling continued. Cardiac monitoring and electrical cardioversion can be administered during immersion safely (13).
- Patients cooled with no evidence of end-organ dysfunction and return to baseline following cooling can be safely discharged after a period of observation.

Pediatrics

- Heat stroke in pediatric patients is similar to that of adults and requires rapid cooling with close monitoring. (15–20)
- There is no information on immersive cooling for patients **12** years or less. Evaporative cooling is proven to be effective in this population.
    - Evaporative cooling measures include:
        - Remove all clothing
        - Cold packs to the axilla, groin, and neck.
        - Cool misting/tepid water wipes
        - Fanning and circulating airflow
- Caution should be taken for pediatric patients less than or equal to **12** as these patients are likely to cool rapidly due to increased body surface area. (19,20) Consultation with medical direction is strongly recommended in concert with starting active cooling.
- Cooling pediatric patients requires strict core temperature monitoring; EMS agencies engaging in actively cooling pediatric patients should have continuous rectal thermometry. If continuous rectal thermometry is unavailable, frequent rectal temperature measurements should be prioritized to avoid hypothermia. (16,19) Temporal, tympanic, axillary, infrared, and oral temperatures are less accurate in effectively monitoring core temperature (7–10,21,22).
- Active cooling must be discontinued once the target temperature is met to prevent hypothermia.
- If a suspected cause of hyperthermia is not related to environmental causes, active cooling should not be employed.

Equipment Selections

- A test was conducted to determine the safest and most reliable TEMP bag.
- Factors that make a suitable bag include appropriate coverage, bag integrity, maintenance of water level, and ease of use by responders.
- For an optimal bag design, it is recommended to have laminated seams of at least 0.5 inches along the edges. These seams should not have anything that affects their integrity, including sewing.
- The bag should feature a single zipper in the center with at least two pull tabs.
- The bag should have a thickness of at least 8mm.
- We recommend using bags with handles to allow for oscillation and safe movement.
- The bag that tested to be most effective is the US Department of Defense Specifications NSN 9930-01-331-6244.

Mass Casualty and Regional Response

- Heat-related mass casualties have occurred in the STRAC region due to human smuggling, sports events, natural disasters, and power grid failures.
- In the preplanned events, organizers and responding agencies should prepare cooling equipment to triage and treat patients suffering from heat stroke.
- In unplanned events, MEDCOM should be notified early to mobilize available resources by calling for a Regional MCI response with a “Heat Response Package.”
- A Heat Response Package will include air and ground mobilization of TEMP bags and Ice.
- Air medical resources can transport 24 bags of ice and 12 TEMP bags to manage 12 patients.
- Ground mobilization can bring up to 96 bags of ice and 48 TEMP bags to manage 48 patients for 60 patients as part of the Heat Response Package.
- Prepositioned TEMP bags and coolers for ice have been put throughout the region to respond to the scene.
- Any agency with ice-making capabilities should have a cooler to transport ice to a heat-related mass casualty site and notify STRAC of availability in the event of a heat mass casualty incident.

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