



**Patient Safety Considerations**

- Do not apply ice packs directly to the skin
- Take cooling measures but do not delay extrication from environment

## Types of heat stroke

### Classic (non-exertional) heat stroke

- Children and elderly are more vulnerable. Occurs with high ambient temperatures, for example when children are left in an unventilated, hot vehicle.
- Passive fluid loss through sweating.
- Can develop over hours to days.

### Exertional heat stroke

- Extreme environmental conditions combine with high metabolic rates of heat production to overwhelm the body's ability to lose heat.
- High humidity limits heat loss.
- Generally seen in fit populations during exertional activities (e.g. long distance runners, firefighters, soldiers).

Classic heat stroke carries a high mortality rate. Mortality correlates with the degree of temperature elevation, time to initiation of cooling measures, and the number of organ systems affected. The management of classic heat stroke consists of ensuring adequate airway protection, breathing, and circulation, as well as rapid active cooling and the treatment of complications.

## Interventions

### Passive cooling

Use passive cooling in instances of heat cramps and heat exhaustion.

1. Cramping; apply direct pressure to muscles with your hand
2. Remove from heat source, lie down, elevate legs, give water or sports drink

### Active cooling

Use active cooling in the presence of heat stroke.

1. Remove the patient from the warm environment; remove outer clothing and activate air conditioning if available
2. Apply water gently to patient's skin and promote evaporation using a fan or an open window if possible
3. Apply ice packs to the groin, neck, and axilla. Do not apply ice directly to patient's skin. Wrap ice pack in towel or other cloth barrier.

## Recognizing heat stroke

Heat stroke can be difficult to recognize because the signs can mimic those of a head injury, intoxication, hypoglycemia, and other conditions. Ensuring a full set of vital signs is taken, including a blood glucose level, is important in determining a differential diagnosis. Keep in mind, someone could be hypoglycemic and hyperthermic at the same time, so more than one treatment pathway may need to be considered.

It is very possible to have one patient with heat stroke within a group where no one else is affected, especially if the patient is pediatric or geriatric, or suffers from an underlying health condition. Patients who have exerted themselves to a greater degree or those who have consumed prescription drugs, street drugs or alcohol may be more prone to heat exhaustion than their cohort.

## Cooling in outdoor environments

If you're in an outdoor environment or the patient is in a backcountry rescue situation, active cooling will require some creative adaptations. Passive cooling will be easier and should be continually performed on all heat illness patients, incorporating active cooling for all heat stroke patients.

1. The ambient temperature will be much less in the shade than in direct sun. If the patient is stationary, select the coolest spot you can. Pick an area that has been in the shade the longest, when possible. If you are transporting the patient out of the backcountry or to rendezvous with EMS, try to remain in the shade when possible.
2. When shade is not available, utilize a reflective blanket, or light-coloured tarp or blanket to shade the patient from direct sunlight. Lightweight clothing or linens can be tied together when there is nothing else available, and tent components can work very well.
3. When creating a sunshade, ensure cross-directional wind can blow across the patient's skin from under the shade. You want to create shade without losing the effect of any draft.
4. Continually apply water to the patient's skin while transporting to ensure evaporative cooling continues as much as possible.
5. Encourage the patient to drink (but not gulp) water to rehydrate. Rehydration with normal saline via intravenous access is indicated in patients with heat stroke.
6. If safe to do so, consider immersing the patient in cool water if a shallow stream or pool is nearby or is passed during extrication when a patient is experiencing heat stroke. Be wary of currents and other hazards. The patient should not be left alone to cool themselves.
7. If awaiting rescue or extrication and the patient is stationary, in the absence of water in the environment, digging into shaded ground will reveal ground at a much lower temperature. Carving out a cooler place for the patient to await extrication along with evaporative cooling is better than simply waiting in the shade.
8. Removing clothing to cool the patient while in a shaded environment is appropriate. However, if the patient must be extricated for rescue or transport, draping them in lightweight and light-coloured clothing will help shield them from direct sunlight.
9. In backcountry situations where the patient must be extricated for further medical care, heat stroke patients must receive immediate active cooling interventions. Ongoing cooling efforts should continue to take place without unreasonably delaying extrication.

## What to expect when EMS arrives

Incoming EMS crews will want to know how a heat stroke patient initially presented to first responders. Relay all neurological signs, any vital signs trending, and what cooling treatments have been performed. If you've been able to identify the precipitating event that caused the heat illness, provide that information. EMS crew will continue efforts to cool the patient and may want to move the patient to the back of the ambulance with air conditioning immediately.

### Patient Safety Considerations

- Do not apply ice packs directly to the skin.
- There is no role for antipyretic agents such as acetaminophen or aspirin in the management of heat stroke, since the underlying mechanism does not involve a change in the hypothalamic set-point and these medications may exacerbate complications such as hepatic injury or disseminated intravascular coagulation (DIC).