



Clinical Practice Guidelines: Environmental/Hyperthermia

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Scope	Applies to all QAS clinical staff.
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Hyperthermia results from thermoregulation failure and occurs when the body produces or absorbs more heat than it can dissipate, exceeding the normal limits required to maintain homeostasis. Heat is transferred to and from the body by radiation, conduction, convection and evaporation.^[1,2] Extreme hyperthermia ($> 40^{\circ}\text{C}$) is a medical emergency and requires immediate treatment to prevent disability or death.

Environmental exposure hyperthermia

Environmental exposure hyperthermia occurs when the body's thermoregulatory mechanisms are overwhelmed through exposure to high environmental temperatures, lack of acclimatisation to hot environments, poor physical fitness or the wearing of excessive amounts of clothing in high temperatures. High humidity is often a contributing factor as it inhibits evaporative cooling from sweat.^[3,4]

Intrinsic hyperthermia

Heat is produced internally through chemical reactions of metabolism, skeletal muscles contraction and chemical thermogenesis and can be exacerbated by illnesses or medications, with or without elevation of the patient's internal thermostat including:

- infection (**Note:** patient may also present hypothermic)
- malignant hyperthermia
- serotonin syndrome
- neuroleptic malignant syndrome
- anticholinergic syndrome

(Continued)

- status epilepticus
- CVA, involving hypothalamus
- central nervous system infection
- endocrine disorders (e.g. thyroid storm, pheochromocytoma)
- drug toxicity (e.g. sympathomimetics) or drug withdrawal syndrome (e.g. alcohol).^[5-8]

The severity of hyperthermia can be classified into the following:^[8]

- **Heat exhaustion (core temperature $37^{\circ}\text{C} - 40^{\circ}\text{C}$)**

A systemic reaction to heat stress, where the depletion of body fluids and electrolytes occurs without adequate replacement. Heat exhaustion may progress rapidly to heat stroke if left unmanaged.^[2]

- **Heat stroke (core temperature $\geq 40^{\circ}\text{C}$)**

Heat stroke is a potentially life-threatening condition that can result in multi-organ failure and death.

Clinical features



Heat exhaustion (core temperature 37°C – 40°C)

- severe headache and/or dizziness (especially postural)
- diaphoresis, nausea and vomiting
- tachypnoea, tachycardia, hypotension (especially postural)
- muscle pain, fatigue and cramps.

Heat stroke (core temperature $\geq 40^\circ\text{C}$)

- central nervous system dysfunction (bizarre behaviour, seizures, ALOC)
- extreme fatigue, headache, syncope
- facial flushing, vomiting and diarrhoea
- skin hot, possibly dry or nil diaphoresis
- dysrhythmias and hypotension
- tachypnoea and acute respiratory distress syndrome
- hypoglycaemia and hyperkalaemia

Risk assessment



- Patients can become hypothermic when cooled too rapidly. If the patient begins shivering, becomes cool to touch or peripherally shut down, cooling should be discontinued.
- Avoid the patient shivering as this will increase core body temperature.
- The elderly, children and patients with underlying illness or co-morbidities are at the highest risk.
- Hyperthermia is a medical emergency with the degree and duration being predictors of outcome.

+ Additional information

- In the pre-hospital setting it is difficult to accurately measure core temperature (tympanic thermometers lack accuracy at temperature extremes).
- The most effective and practical method of actively cooling the patient in the pre-hospital setting is the 'Strip-Spray-Fan-Ice' method.^[1,3,4,7,8] This involves removing all clothing, continuously spraying or pouring tepid water over wet towels that covers the skin and constant fanning or air circulation whilst ice packs are applied to large superficial blood vessels in the neck, axilla and groin. Combined, this method utilises evaporation, convection and conduction to dissipate heat from the body.

