

CME Article

Singapore Armed Forces Medical Corps-Ministry of Health Clinical Practice Guidelines: Management of Heat Injury

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ABSTRACT

The Singapore Armed Forces (SAF) Medical Corps and the Ministry of Health (MOH) have published clinical practice guidelines on Management of Heat Injury to provide doctors and patients in Singapore with evidence-based guidance on the prevention and clinical management of exertional heat injuries. This article reproduces the introduction and executive summary (with recommendations from the guidelines) from the SAF Medical Corps-MOH clinical practice guidelines on Management of Heat Injury, for the information of readers of the Singapore Medical Journal. Chapters and page numbers mentioned in the reproduced extract refer to the full text of the guidelines, which are available from the Ministry of Health website: <http://www.moh.gov.sg/mohcorp/publications.aspx?id=25178>. The recommendations should be used with reference to the full text of the guidelines. Following this article are multiple choice questions based on the full text of the guidelines.

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INTRODUCTION**1.1 Guideline development**

These guidelines were developed by a multidisciplinary workgroup appointed by the Singapore Armed Forces and the Ministry of Health. The workgroup comprised experts in Sports Medicine, Exercise and Sports Science, Emergency Medicine, Family Medicine, Military Medicine and Public Health. They were developed by adapting existing guidelines, reviewing relevant scientific literature and expert clinical consensus.

1.2 Objectives

The aim of these guidelines is to provide an evidence-based guide for the diagnosis, prevention and management of heat injuries in individuals at highest risk of exertional heat injury, i.e. those involved in strenuous physical activities.

1.3 Target group

These guidelines are intended for use by medical practitioners for preventive and clinical management and for consultation to event organisers. It may also be useful for athletes, sports officials, military and non-military personnel organising or participating in physically strenuous activities and endurance sports.

1.4 Review of guidelines

Evidence-based clinical practice guidelines are only as current as the evidence that supports them. Users must keep in mind that new evidence could supersede recommendations in these guidelines. The workgroup advises that these guidelines be scheduled for review five years after publication, or if new evidence appears that would require substantive changes to the recommendations.

EXECUTIVE SUMMARY OF RECOMMENDATIONS

Details of recommendations can be found in the full text of the guidelines at the pages indicated. Details of the system of levels of evidence and grades of recommendations are also in the full text of the guidelines.

Definition and diagnosis of heat injuries

C Core body temperature should be measured using rectal temperature (pg 15).

Grade C, Level 2+

C Aural, oral, skin, temporal and axillary temperature measurements are not reliable and should not be used for the diagnosis of exertional heat stroke and exertional heat exhaustion (pg 15).

Grade C, Level 2+

GPP A normal or lower presenting temperature should not exclude the diagnosis of heat stroke. If there is

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uncertainty in differentiating between heat exhaustion and heat stroke, the patient should be promptly managed as for heat stroke (pg 15).

GPP

Risk factors for heat injuries

GPP Be vigilant about heat injury even when exercising in cooler conditions, especially if relative humidity is high (pg 16).

GPP

GPP The use of wet-bulb globe temperature to assess environmental heat stress should be carefully calibrated, measured and interpreted in the local context (pg 17).

GPP

Prevention of heat injuries

C Individuals who suffer from or who have recently recovered from acute illness or exertional heat injury can be gradually conditioned to participate in intense training following full recovery (pg 20).

Grade C, Level 2+

D Sporting event organisers, coaches, athletes and soldiers should receive information on the prevention, recognition and treatment of heat injury and the risks associated with exercising in hot, humid conditions (pg 20).

Grade D, Level 4

B Individuals involved in working in a high heat stress environment should undergo a heat acclimatisation regime over 10 to 14 days to improve body temperature regulation during heat exposure (pg 21).

Grade B, Level 2++

C Individuals should maintain proper hydration during the heat acclimatisation process. Fluid replacement improves induction and the effects of heat acclimatisation (pg 21).

Grade C, Level 2+

D Individuals undergoing acclimatisation should progressively increase the intensity and duration of work in the heat for up to two hours continuously (pg 21).

Grade D, Level 4

GPP Individuals should drink sufficient water to maintain a clear urine colour before exercise. Fluid intake

should start the night before and in the hours leading to the event to maintain clear urine colour. Quenching of thirst together with maintenance of body weight can also be used as an indicator of euhydration if urine colour cannot be used (pg 22).

GPP

C Individuals should drink to replace water loss of about 2% body weight and to quench thirst (pg 22).

Grade C, Level 2+

D Where possible, a customised personal fluid replacement programme should be developed by measuring fluid requirements to prevent dehydration over a few training sessions (pg 22).

Grade D, Level 4

C For rapid and complete recovery from dehydration, drink 1.5l of fluids for each kilogram of body weight loss after exercise (pg 23).

Grade C, Level 2+

D After exercise, continue to rehydrate at regular intervals until clear urine colour is achieved (pg 23).

Grade D, Level 4

C Consume beverages and snacks with sodium to expedite recovery by stimulating thirst and fluid retention (pg 23).

Grade C, Level 2+

C Wear clothing that is light-coloured and lightweight to facilitate body cooling (pg 23).

Grade C, Level 2+

D Plan physical activities and rest breaks in accordance with the intensity of activity and environmental conditions (pg 24).

Grade D, Level 4

Medical and safety coverage for sports and exercise mass participation events

GPP Ensure adequate and appropriate medical and safety coverage according to accepted guidelines when organising a mass participation sporting event (pg 25).

GPP

Treatment of exertional heat injuries

D To relieve muscle spasms, the individual should stop

the activity and initiate mild stretching and massage the muscle. A recumbent position may allow more rapid distribution of blood flow to cramping leg muscles (pg 26).

Grade D, Level 3

- D** A sodium-containing sports beverage may prevent or relieve cramping in athletes who lose large amounts of sodium in their sweat (pg 26).

Grade D, Level 4

- D** Intravenous hydration with 0.9% normal saline may be required in severe or refractory cases when the symptoms continue to rebound (pg 26).

Grade D, Level 3

- GPP** To treat heat syncope, rest in a cool place and in a supine position with both legs and hip elevated to increase venous return. Other causes of syncope need to be ruled out (pg 26).

GPP

The following general measures should be instituted in the management of heat exhaustion and heat stroke:

1. **GPP** Transfer the patient to a cooler and shaded environment (pg 27).

GPP

2. **D** Assess the patient's airway, breathing and circulation (ABCs) and institute basic resuscitative support as appropriate (pg 27).

Grade D, Level 4

3. **B** Measure core body temperature with a rectal thermometer if available (pg 27).

Grade B, Level 2++

4. **D** Institute immediate and aggressive cooling efforts to reduce core body temperature (pg 27).

Grade D, Level 3

5. **D** Maintain haemodynamic stability (pg 27).

Grade D, Level 3

- D** Individuals who do not improve rapidly should be transported to an emergency department (pg 27).

Grade D, Level 4

- D** Progressive worsening of consciousness should trigger a detailed evaluation for hyperthermia,

hyponatraemia, hypoglycaemia and other medical problems (pg 27).

Grade D, Level 3

- C** Rapid cooling is desirable as decreasing body temperature to below 39° C within 30 minutes of presentation has been shown to improve survival (pg 28).

Grade C, Level 2+

- D** Cooling by tap water and the application of ice packs can be used as the initial cooling methods prior to evacuating a heat injury patient to a medical facility (pg 28).

Grade D, Level 3

- B** Immersion in ice water may be done to manage exertional heat stroke occurring in young people, military personnel and athletes (pg 28).

Grade B, Level 2++

- GPP** Body cooling should be initiated immediately and the selection of method should depend on availability of equipment and the staff's familiarity with the selected technique (pg 29).

GPP

- B** The use of iced peritoneal lavage and gastric lavage has yielded inconsistent results and is therefore not recommended (pg 30).

Grade B, Level 2++

- B** The use of pharmacologic agents has not been shown to accelerate body cooling in the treatment of heat stroke and is therefore not recommended (pg 30).

Grade B, Level 2++

- D** The initial management of heatstroke should include adequate fluid replacement to restore blood pressure and tissue perfusion (pg 31).

Grade D, Level 3

- D** Intravenous fluid replacement should be carefully titrated to clinical endpoints to avoid fluid overload and iatrogenic pulmonary oedema (pg 31).

Grade D, Level 3

- D** Large amounts of intravenous infusions should be guided by invasive haemodynamic monitoring (e.g. using central venous line or pulmonary artery flotation catheter) (pg 31).

Grade D, Level 3

D For heat stroke patients, short acting benzodiazepines are generally effective in controlling seizures (pg 31).

Grade D, Level 4

D In patients with hypotension that is refractive to intravenous therapy, vasopressors may be indicated, but should be used with caution because catecholamines can lead to increased heat production. In such patients, invasive hydrodynamic monitoring (e.g. central venous pressure) is indicated (pg 32).

Grade D, Level 4

GPP Intravenous fluids and diuretics (e.g. mannitol at 0.25 g/kg) help to maintain renal blood flow and may prevent renal destruction in heat stroke. Alkalinisation has been recommended for rhabdomyolysis and haemofiltration should be considered for severe cases (pg 32).

GPP

D Disseminated intra-vascular coagulation is an indication of poor prognosis and should be managed with blood products for bleeding accordingly (pg 32).

Grade D, Level 4

D Non Steroidal Anti-Inflammatory Drugs (NSAIDs) and paracetamol should be avoided in the treatment of exertional heat stroke as these may precipitate hepatic damage (pg 32).

Grade D, Level 4

GPP Cardiac monitoring should be used in a patient with heat stroke (pg 33).

GPP

Prognosis and return to activity

D Rehabilitation of a heat stroke patient follows a slow course. The patient must be asymptomatic, and all laboratory tests and body weight should have normalised before he can be considered to have recovered (pg 34).

Grade D, Level 3

GPP After heat stroke, a gradual and monitored return to physical activity is recommended with progressive exposure to heat to increase tolerance. The specific regime will be determined based on the severity of injury (pg 35).

GPP

SINGAPORE MEDICAL COUNCIL CATEGORY 3B CME PROGRAMME

Multiple Choice Questions (Code SMJ 201010C)

These questions are based on the full text of the guidelines which may be found at <http://www.moh.gov.sg/mohcorp/publications.aspx?id=25178>.

	True	False
Question 1. Core body temperature should be measured using:		
(a) Oral thermometer.	<input type="checkbox"/>	<input type="checkbox"/>
(b) Tympanic/aural thermometer.	<input type="checkbox"/>	<input type="checkbox"/>
(c) Skin temperature.	<input type="checkbox"/>	<input type="checkbox"/>
(d) Rectal thermometer.	<input type="checkbox"/>	<input type="checkbox"/>
Question 2. The following are risk factors of exertional heat injuries:		
(a) Dehydration.	<input type="checkbox"/>	<input type="checkbox"/>
(b) Schizophrenia and other mental illnesses.	<input type="checkbox"/>	<input type="checkbox"/>
(c) Previous history of heat illness.	<input type="checkbox"/>	<input type="checkbox"/>
(d) Concurrent upper respiratory tract infections.	<input type="checkbox"/>	<input type="checkbox"/>
Question 3. State if the following statements are true or false:		
(a) Heat injuries can only occur when there is a large amount of heat stress.	<input type="checkbox"/>	<input type="checkbox"/>
(b) The diagnosis of heat exhaustion and heat stroke is differentiated solely by the core body temperature.	<input type="checkbox"/>	<input type="checkbox"/>
(c) Heat cramps and heat syncope frequently progress to heat stroke.	<input type="checkbox"/>	<input type="checkbox"/>
(d) A patient with heat syncope usually recovers consciousness spontaneously when laid supine with both legs and hip elevated.	<input type="checkbox"/>	<input type="checkbox"/>
Question 4. The following are effective cooling modalities for heat injuries:		
(a) Placing ice packs in the axilla, groin and neck in the pre-hospital setting.	<input type="checkbox"/>	<input type="checkbox"/>
(b) Iced peritoneal and gastric lavage.	<input type="checkbox"/>	<input type="checkbox"/>
(c) Evaporative cooling with a body cooling unit.	<input type="checkbox"/>	<input type="checkbox"/>
(d) Cold water immersion.	<input type="checkbox"/>	<input type="checkbox"/>
Question 5. State if the following statements are true or false:		
(a) Anti-hypertensive medications may inhibit natural physiological responses to heat stress.	<input type="checkbox"/>	<input type="checkbox"/>
(b) Anti-pyretic agents like paracetamol have been shown to be effective in the management of heat injury.	<input type="checkbox"/>	<input type="checkbox"/>
(c) Rapid and effective intravenous fluid administration is the cornerstone of treating heat stroke.	<input type="checkbox"/>	<input type="checkbox"/>
(d) A patient with previous heat stroke can return to full exercise once he is asymptomatic and all his laboratory tests and body weight have normalised.	<input type="checkbox"/>	<input type="checkbox"/>

Doctor's particulars:

Name in full: _____

MCR number: _____ Specialty: _____

Email address: _____

SUBMISSION INSTRUCTIONS:

(1) Log on at the SMJ website: <http://www.sma.org.sg/cme/smj> and select the appropriate set of questions. (2) Select your answers and provide your name, email address and MCR number. Click on "Submit answers" to submit.

RESULTS:

(1) Answers will be published in the SMJ December 2010 issue. (2) The MCR numbers of successful candidates will be posted online at www.sma.org.sg/cme/smj by 15 December 2010. (3) All online submissions will receive an automatic email acknowledgment. (4) Passing mark is 60%. No mark will be deducted for incorrect answers. (5) The SMJ editorial office will submit the list of successful candidates to the Singapore Medical Council.

Deadline for submission: (October 2010 SMJ 3B CME programme): 12 noon, 8 December 2010.