Clinical Practice Guidelines

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CME Article

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


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 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
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** 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**

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

**Grade B, Level 2++**

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

Grade D, Level 4

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

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. Alkalimisation has been recommended for rhabdomyolysis and haemofiltration should be considered for severe cases (pg 32).

GPP

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

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

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

GPP

Prognosis and return to activity

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

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
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.

Question 1. Core body temperature should be measured using:
(a) Oral thermometer. ☐ ☐
(b) Tympanic/aural thermometer. ☐ ☐
(c) Skin temperature. ☐ ☐
(d) Rectal thermometer. ☐ ☐

Question 2. The following are risk factors of exertional heat injuries:
(a) Dehydration. ☐ ☐
(b) Schizophrenia and other mental illnesses. ☐ ☐
(c) Previous history of heat illness. ☐ ☐
(d) Concurrent upper respiratory tract infections. ☐ ☐

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. ☐ ☐
(b) The diagnosis of heat exhaustion and heat stroke is differentiated solely by the core body temperature. ☐ ☐
(c) Heat cramps and heat syncope frequently progress to heat stroke. ☐ ☐
(d) A patient with heat syncope usually recovers consciousness spontaneously when laid supine with both legs and hip elevated. ☐ ☐

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. ☐ ☐
(b) Iced peritoneal and gastric lavage. ☐ ☐
(c) Evaporative cooling with a body cooling unit. ☐ ☐
(d) Cold water immersion. ☐ ☐

Question 5. State if the following statements are true or false:
(a) Anti-hypertensive medications may inhibit natural physiological responses to heat stress. ☐ ☐
(b) Anti-pyretic agents like paracetamol have been shown to be effective in the management of heat injury. ☐ ☐
(c) Rapid and effective intravenous fluid administration is the cornerstone of treating heat stroke. ☐ ☐
(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. ☐ ☐

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) Failures will receive an automatic email acknowledgement. Failure rate is 9%. (4) Successful candidates will receive an automatic email confirmation of their certificate. (5) The SMJ editorial office will forward the list of successful candidates to the Singapore Medical Council.

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