The Republic of the Union of Myanmar

Ministry of Health

Standard Operating Procedure

for Heat Disorders

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Table of Contents

Page

- Basic facts for heat disorders
  - (1) Heat cramps 1
  - (2) Heat Exhaustion 1
  - (3) Heat Stroke 2
- Standard operating procedure
  - (1) Purpose 3
  - (2) Scope 3
  - (3) Responsibility 3
  - (4) References 3
  - (5) Prodedures
    - (A) Patient with heat cramps 4
    - (B) Patient with heat exhaustion 4
    - (C) Patient with heat stroke (at Emergency OPD) 5
    - (D) Patient with heat stroke (at Medical Ward) 7
    - (E) Patient with heat stroke 9
      (critically ill patients at Emergency OPD)
  - (6) Records 11

Hyperthermia is the state of an elevated core body temperature above 37ºC (98.6ºF) in a hot environment and represents a failure of the body's normal thermoregulatory mechanisms.

Three heat exposure syndromes are recognized.

(1) Heat Cramps
(2) Heat Exhaustion
(3) Heat stroke

(1) **Heat Cramps**: painful muscle cramps occur most commonly in the legs of young people following vigorous exercise in hot weather. There is no elevation of core temperature.

Clinical Features

- Painful muscle contractions, commonly in calves or feet, following vigorous exercise and profuse sweating in hot weather
- No elevation of core temperature

(2) **Heat Exhaustion**: occurs when there is an elevation in core (rectal) temperature between 37 - 40ºC (98.6 - 104 ºF) and is usually seen when an individual is undertaking vigorous physical work in a hot environment.

Clinical Features

- Hot and sweating
- Dehydration, tachycardia, irribility, fatigue, headaches and weakness
- Symptoms reflect the effects of salt and water depletion, dehydration and accumulation of metabolites
- Predominant salt loss present insidiuosly over days
    - Cramps, nausea, weakness
    - Postural dizziness, malaise
- Prominant water loss presents more acutely
    - Headache, nausea and
    - CNS symptoms (Confusion, Delirium, Incoordination)

- Examination ; usually the patient is flushed and sweating with evidence of dehydration.
- Body temperature may be normal or mildly elevated (37 ºC to 40ºC)98.6º to 104 ºF

(3) **Heat Stroke** : is defined clinically as a core body temperature that rises above 40ºC (104ºF) and that is accompanied by hot, dry skin and central nervous system abnormalities such as delirium, convulsions, or coma.

Clinical features

Diagnostic criteria

1. High fever: >40ºC/104ºF (oral) >41ºC/105.8º F (rectal)
2. Hot and dry skin with absence of sweating
3. Cerebral symptoms (confusion, delirium, convulsion, coma)

Awareness of possibility of heat stroke in all patients with above triad of symptoms during hot season is very important.

- The core temperature ranges from 40º-47ºC (104-117ºF). Brain dysfunction is usually severe but may be subtle, manifesting only as inappropriate behaviour or impaired judgment leading to delirium to frank coma. Seizures may occur.
- All patients have tachycardia and hyperventilation. $PaCO_2$ is < 20mmHg.
- Some patients may have hypotension.
- Other features: respiratory alkalosis, lactic acidosis, hypophostaemia, hypokalemia, rarely hypoglycaemia, hypocalcaemia, hyperproteinameia.
- Exertional heat stroke: rhabdomyolysis, hyperphosphataemia, hypocalcaemia, hyperkalaemia.

Standard Operating Procedure (Heat Disorders)

1. Purpose

To enable the medical officers to effectively manage patient with heat related medical conditions.

2. Scope

This SOP applies to all medical officers.

3. Responsibility

All medical officers

4. References

- Chit Soe and Wai WaiLwin (2010), *Heatstroke, Experience from Ward 1-2, YGH*. MJCMP, 14:22-25
- IMS- MMA(2016), *Therapeutic Manual (Internal Medicine)*, 1st Ed
- Melissa Conrad Stoppler and William C.Shiel Jr.(n.d) *Heat Stroke*. Available from http://www.medicinenet.com/heat-stroke/article.htm (accessed 1 March 2016)
- Ministry of Health, *SOP for medical staff*
- NHS choices, *Heat Exhaustion and heatstroke*, Available from http://www.nhs.uk/Conditions/Heat-exhaustion-and-heatstroke/Pages/Introduction.aspx (accessed 3 March 2016)
- Robert S Helman and Joe Alcock (n.d.) *Heat Stroke*. Available from http://emedicine.medscape.com/article/166320-overview (accessed 2 March 2016)
- WHO (2015), *Heat waves and health; Guidance on warning system development*
- Whang.R. (1998), *Electrolyte and Water Metabolism in Sports Activities, Comp Ther*. 24(1):5-8

5. Procedures

(A) Patient with Heat Cramps

- Admission to hospital rarely indicately.
- Immediate rest in a cool place is advised.
- Stretch muscles and massage gently.
- Fluid replacement, either intra-venous normal saline 300-500 ml is needed in severe attack, or Oral rehydration salt is needed in mild attacks.
- Medical attention should be sought if heat cramps are sustained for more than one hour.

(B) Patient with Heat Exhaustion

- Move the patient to a cool, shaded room or air-conditioned place.
- Lay the patient down and raise his or her legs and hips to increase venous return.
- Active evaporative cooling is needed. Tepid spray/sponging. Apply cold wet sheet or spray cold water and use fan if available.
- Start oral hydration. If nausea prevents oral intake of fluids, consider intravenous hydration.
- Youth may just require aggressive oral rehydration with oral rehydration salt and may require 4-6 litres over 6-8 hours; upto 5 litres positive fluid balance may be required in first 24 hours.
- Elderly will require more cautious fluid replacement.
- Intravenous therapy should be guided by clinical state and Urea & Electrolytes. (caution should be taken if decreased or increased Sodium (Na^+)). Normal saline 1 litre over 30 minutes followed by another over an hour, then alternative bottles of 5 % Dextrose water and Normal saline 2 hourly. If hyperthermia is above 39°C or impaired mental status or sustained hypotension occurs, treat as heatstroke and transfer the patient to hospital.
- Recovery is usually rapid (12-24 hours).

(C) Patient with Heat Stroke (at Emergency OPD)

1. Recognize heat stroke if core body temperature > 40'C or> 104̊ F, hot dry skin and central nervous system abnormalities such as confusion, convulsion or coma.

2. **Criteria for admission**

   2.1 Patients diagnosed as heat stroke as above definition

   2.2. Patients with core body temperature > 38·C (100.4' F)with one of the followings

      2.2.1 High risks

      - Elderly people
      - Babies and young children
      - People with a long-term health condition, such as diabetes, a heart or lung condition or mental disorders
      - People who are already ill and dehydrated (for example, from gastroenteritis or on diuretics)
      - People doing strenuous exercise for long periods, such as military soldiers, athletes, hikers and manual workers
      - People with diseases which increased heat production e.g. hyperthyroidism
      - People who are taking anticholinergics, tranquilizers, diuretics
      - Chronic alcoholics

      2.2.2. Features of heat exhaustion (muscle cramps, pale, moist skin, nausea, vomiting, diarrhea, headache, fatigue, weakness, anxiety, and faint feeling)

3. Start Key observations to exclude critically ill and if any one noted, contact on call physician, give Oxygen, do ECG, IV access, stabilize airway and breathing.

4. Stabilize the patient first (reassure and look for vitals/ key observations) while doing the booking and insert IV cannula.
5. Give I.V fluid with cool Normal saline or Normal saline if necessary and ORS (3 sachets WHO new formula with 3 L of water or 2 sachets WHO old formula with 3 L of water) ad libs.
6. Rapid cooling measures must be done as following.
    - 6.1 Remove unnecessary clothing.
    - 6.2 Do sponging with ice water/water.
    - 6.3 Place ice-pack at neck, armpits and groin or warp the patient with wet and cool blanket/towel/clothes
7. Transfer the patient according to admission procedure

(D) Patient with Heat Stroke (at Medical ward)

1. Stabilize the patient first (reassure and look for vitals / key observations) while doing the clerical work and insert IV cannula
2. Give I.V fluid with cool Normal saline or Normal saline if necessary and ORS (3 sachets WHO new formula with 3 L of water or 2 sachets WHO old formula with 3 L of water) ad libs.
3. Keep the patient at heat stroke room (air- conditioning/with fan) for at least 24 hours.
4. Rapid cooling measures must be done up to core body temperature of 38.9 ºC (102 ºF) within one hour.
    - 4.1 Remove unnecessary clothing.
    - 4.2 Do sponging with ice water/water.
    - 4.3 Place ice-pack at neck, armpits and groin or wrap the patient with wet and cool blanket/ towel/ clothes and fanned vigorously.
    - 4.4 Continue I.V fluid with cool Normal saline or Normal saline up to 3 L in 24 hours (500 ml in 1 hr, 500 ml in next 2 hrs and 500 ml in next 3hrs=1.5L in first 6 hrs followed by another 1.5 L in following 18 hrs)
5. Give oxygen
6. Consider sedation with diazepam if delirium presents, avoid paracetamol and chlorpromazine.
7. Replace fluid and electrolytes according to investigation results
8. Monitor and treat the complications (ARF, DIC, Sepsis, Liver damage, arrhythmias, ARDS)
9. Look for causes of secondary heat stroke and co-morbidities
10. Consider IV hydrocortisone if Blood Pressure is still reduced after 24 hrs of corrective treatment with Normal Saline and oral fluid.

11. Investigate the followings

    11.1 RBS, ECG, ABG/pulse oximetry

    11.2 Daily U & E

    11.3 Cr, Urine RE, FBC, PT/INR, LFTs, CXR

    11.4 Blood for MP, ICT for MP

    11.5 Blood C & S, $Ca2^{+}$, Mg_2^{+}, PO_4^{-}, CK, LDH, CT head if necessary.

12. Criteria for discharge (D/C)

    Temperature touch normal for > 48 hours and clinically stable and no complication

(E) Patient with Heat Stroke (critically ill patients at Emergency OPD)

1. Airways

- Look for evidence of airway obstruction such as,

If patient is conscious;

- Respiratory distress as shown by dyspnoea, tachypnoea, ability to speak only in short sentences or single words, agitation and sweating,
- Inspiratory stridor,
- Suprasternal Retraction,
- Abnormal voice; coughing/choking.

If airway obstruction is present in conscious patient,

a) Sit the patient up.

b) Give high -flow oxygen.

c) Call for urgent help from an anesthetist and ENT surgeon.

If patient is unconscious;

- Respiratory arrest
- Inspiratorystridor
- Gurgling; Grunting/ snoring

If airway obstruction is present in unconscious patient,

a) Head tilt and chin lift (Place one hand on the patient's forehead and gently tilt it back; using the fingers of the other hand, gently lift the chin).

b) Remove dentures (if loose) and aspirate the pharynx, larynx and trachea with a suction catheter.

c) Call for urgent help from an anesthetist.

d) Ventilate the patient using a bag-mask device with 100% oxygen.

2. Respiratory rate

Note respirate rate for one full minute whether < 8 or >30/ minute

a) Give oxygen (initially 60-100%) and check arterial oxygen saturation.

b) Maintain patent airway (Head tilt/ chin lift, Jaw thrust, remove foreign bodies in mouth by finger sweep and use wide bore rigid suction and oropharyngeal airway).
c) Increase inspired oxygen concentration if needed to achieve arterial oxygen saturation 90% . (>88% in acute exacerbation of COPD)
d) If feasible, sit the patient up to improve diaphragmatic descent and increase tidal volume.
e) Clear secretions: encourage cough, physiotherapy, aspiration.

3. Arterial oxygen saturation

Use pulse oximetry if oxygen saturation is <90% and have other features of critical illness, initially give 60-100% of oxygen.

4. Heart rate

Note heart rate for full one minute.

a) If heart rate is less than 40 or more than 130/minutes, give oxygen, do 12 leads ECG with long lead II, IV access if it has not done.
b) Inform on call physician immediately if patient unstable.

5. Blood pressure

Monitor Blood Pressure.

If Systolic BP is <90mmHg, or fall in systolic BP by more than 40 mmHg with signs of impaired organ perfusion.

a) Give Oxygen , do 12 lead ECG, IV access.
b) Look for features of acute blood loss, acute fluid loss and sequestration.
   If one or more of those features is present, give normal saline.
c) Look for features of pulmonary oedema. If it is present, start inotropic vasopressor.

6. Perfusion

Note signs of reduced organ perfusion such as cool/ mottled skin with capillary refill time > 2 seconds, agitation/ reduced conscious level; oliguria (urine output < 30 ml/h).

7. Conscious Level

Note the conscious level (unresponsive to voice).

a) Stabilize airway, breathing and circulation.
b) Contact ICU for endotracheal intubation if GCS is 8 or less.
c) Exclude / correct hypoglycemia.
d) Give naloxone if opioid poisoning is possible (respiratory rate < 12/min, pinpoint pupils).

8. Temperature

Note the core temperature < 36ºC or >38ºC, with hypotension, hypoxemia, oliguria or confusional state.

9 Blood glucose

Note blood glucose <3.5 mmol/1 and signs of hypoglycemia (sweating, tachycardia, abnormal behavior, reduced conscious level or fits).

6. Records

SOP is available on EMO's desk, Emergency OPD,Consultants table, ward doctors' desk, Medical Superident office and Divisional director's office.