HEAT ILLNESSES GUIDELINES

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GUIDELINES FOR PREHOSPITAL MANAGEMENT

1. **Remove the patient from the hot place:**
   1.1. Move the patient to a shaded or air-conditioned area.
   1.2. Remove all excess clothing.

2. **Assessment and Resuscitation of the patient with possible severe heat illness:**
   2.1. Begins by securing ABC and maintaining adequate oxygenation.
   2.2. Fluid and salt replacement: Orally; with chilled water or Salt-containing solutions if the patient is not nauseated, vomiting, or manifesting a depressed mental status.
   2.3. If the patient is not tolerating orally; Check vital signs, if blood pressure is low; Establish an IV line, Give IV bolus of NS 500 ml.
   2.4. Measurements of rectal temperature: Do NOT use alternative methods to determine body’s temperature (e.g., oral, tympanic, axillary, temporal, skin, forehead sticker), even if a rectal thermometer is not available. alternative methods do not provide accurate measurements of core temperature in patients who have been exercising intensely in the heat and can be misleading.
   2.5. Elevated temperature ≥ 40°C, in the setting of altered mental status is consistent with a diagnosis of heat stroke.

3. **Rapid cooling:**
   3.1. Heat stroke and heat exhaustion are treated with rapid cooling as soon as possible.
   3.2. The patient shall be placed supine with raised legs and covered with Ice or Ice packs, mainly to the neck, axillae and groins and hairless areas, Ice should be changed as soon as a moderate degree of melting occurs.
   3.3. Alternative methods; ice/wet towel rotation, Towels should be replaced as soon as they are no longer cool or every two to three minutes otherwise.
   3.4. Other methods; chemical packs cooling or Fans if readily available.
   3.5. No other emergency medical treatment is needed other than rapid lowering of the body temperature.
   3.6. Continue cooling until a rectal temperature just below 39°C or patient starts shivering.

4. **Transportation:**
   4.1. Cooling shall continue during transport to PHC or a hospital till a rectal temperature just below 39°C or patient starts shivering.
   4.2. If the patient in a PHC is not improving despite appropriate treatment, particularly if the patient has seizure or requiring medical intervention, the patient should be transferred immediately to the closest hospital.
   4.3. Monitor and document vital signs (rectal temperature, heart rate, respiratory rate, blood pressure) and mental status continuously.

5. **Maintain patient safety at all times.**
IN-HOSPITAL TRIAGE GUIDELINES

1. **In-hospital Triage:**
   1.1. A rectal thermometer that is accurate at high temperatures must be used in any patient with a suspected heat related illness.
   1.2. If the rectal temperature is equal to or more than 40°C, with history of exposure to a severe environmental heat, the patient shall be shifted to the heat stroke resuscitation unit.
   1.3. If cooling measures were initiated in a patient with a heat related illness who has an altered mental status or seizure prior to his arrival at the hospital, the patient shall be shifted to the heat stroke resuscitation unit.
   1.4. If a rectal temperature is less than 40°C. With normal mental status and no seizure, the patient shall be shifted to cooling or observation rooms.
   1.5. If the patient is walking and temperature is less than 38.5 ºC. Patient can be managed in the OPD.
   1.6. For quick guide to the clinical diagnosis (see table # 1).
# Heat Illnesses Clinical Features and Management

<table>
<thead>
<tr>
<th>ILLNESS</th>
<th>HEAT STROKE</th>
<th>HEAT INJURY</th>
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<th>HEAT CRAMPS</th>
<th>EXERTION ASSOCIATED HYPONATREMIA</th>
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<tr>
<td>ICD 10 code</td>
<td>T 67.0</td>
<td>T 67.9</td>
<td>T 67.3</td>
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<td>L 74.0</td>
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<tr>
<td>Clinical Features</td>
<td>Sever heat related illness characterized by: – Core temp. (rectal) more than 40°C. - CNS abnormalities such as altered mental status, seizures or coma. Resulting from: - Passive exposure to environmental heat. - Strenuous exertion. Other features: - Tachycardia, Hypotension, Tachypnea. - And may have: Diarrhea and aspiration pneumonia. Exertional Heat Injury is defined as a progressive multisystem disorder with hyperthermia less than 40°C. Following vigorous activity that is associated with end-organ damage (eg. Kidney, liver, muscle) and the absence of significant neurologic injury. Mild-to-moderate heat related illness due to loss of salt and water caused by: - Exposure to high environmental heat or strenuous physical exercise. - Intense thirst, weakness, discomfort, anxiety, dizziness, syncope. - Core temp. may be normal or &lt;40°C. - Sweating. Postural hypotension. Heat induced peripheral vasodilatation and pooling of blood with transient loss of consciousness followed by spontaneous return to normal mentation. Dehydration and hypotension. Heat rash caused by obstruction of the sweat ducts. Small, red, itchy lesions on the skin. Results from exposure to the sun. Typically, there is initial redness (erythema) followed by varying degrees of pain, proportional in severity to both the duration and intensity of exposure. Other symptoms may include edema, itching, peeling skin, rash, nausea, fever, chills, and syncope. Exercise associated painful involuntary muscle contractions during or immediately after exertion due to salt depletion. Cramps: involving large muscle groups (legs). Moist skin. Normal body temperature. Minimal distress.</td>
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## INITIAL CARE

**ABC RESUSCITATION**

**INTRAVENOUS NORMAL SALINE**

**COOLING WITH SPRAYING FAN**

**CORRECT ELECTROLYTE IMBALANCE**

**TREAT COMPLICATIONS**

**ORAL HYPERTONIC OR ISOTONIC HYDRATION**

**Color Coding:**

- **Sever**
- **Moderate**
- **Mild**

Source: Pocket guide for clinicians during Hajj – MOH 1437-2016 / ICD 10 code
GUIDELINES FOR HEAT STROKE

1. Assessment:

1.1. History:

1.1.1. History of exposure to severe environmental heat.

1.1.2. Patient is presented with high body temperature

1.1.3. Altered mental status, and if they can respond coherently, patients with heat stroke may complain of weakness, lethargy, nausea, or dizziness.

1.1.4. Patient might have any conditions that impair thermoregulation, prevent removal from a hot environment, or interfere with access to hydration or attempts at cooling (see table # 2).

Table # 2: The predisposing factors to heat illness:

- Extremes of Age
- Obesity
- Low fitness level
- Physical disability
- Lack of heat acclimatization
- Dehydration

- Environment Factors
- Individual Factors

- High ambient temperature
- High humidity
- Lack of air flow
- Lack of shade

- Medication and Drug Use
- Chronic Conditions

- Anticholinergics
- Antidepressants
- Antihistamines
- Antipsychotics
- Benzodiazepines
- β-Blockers
- Calcium channel blockers
- Diuretics
- Laxatives
- Neuroleptics
- Phenothiazines
- Thyroid hormones
- Alcohol
- Amphetamines

1.2. Physical findings:

1.2.1. Elevated core body temperature >40°C., some patients with heat stroke may not exceed 40°C, particularly if cooling measures were initiated prior to the patient's arrival at the hospital,

1.2.2. A thermometer (rectal or esophageal) that is accurate at high temperatures shall be used when assessing heat stroke patients.
1.2.3. Central nervous system dysfunction (e.g., altered mentation, slurred speech, irritability, inappropriate behavior, agitation, ataxia and other signs of poor coordination, delirium, seizures, and coma).

1.2.4. Lack another explanation for their hyperthermia (e.g., infection).

1.2.5. Vital sign abnormalities (e.g., tachycardia, tachypnea, hypotension).

1.2.6. Other physical findings may include flushing (cutaneous vasodilation), diarrhea, crackles due to noncardiogenic pulmonary edema and aspiration pneumonia.

1.2.7. The skin may be moist or dry, depending upon underlying medical conditions.

1.2.8. The differential diagnosis of severe hyperthermia is extensive and includes infectious, endocrine, central nervous system, toxic, and oncologic etiologies, (see table # 3).

Table # 3; The differential diagnosis of heat illness:

<table>
<thead>
<tr>
<th>Infection</th>
<th>Drug or toxin related</th>
<th>Neurologic</th>
<th>Endocrine</th>
<th>Oncologic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sepsis</td>
<td>Malignant hyperthermia</td>
<td>Hypothalamic stroke</td>
<td>Thyroid storm</td>
<td>Lymphoma</td>
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<tr>
<td>Meningitis</td>
<td>Neuroleptic malignant syndrome</td>
<td>Status</td>
<td>Pheochromocytoma</td>
<td>leukemia</td>
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<td>Encephalitis</td>
<td>Withdrawal syndromes</td>
<td>Epileptic</td>
<td>Diabetic ketoacidosis</td>
<td></td>
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<tr>
<td>Brain abscess</td>
<td>Sympathomimetic poisoning</td>
<td>Cerebral hemorrhage</td>
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<td></td>
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<tr>
<td>Tetanus</td>
<td>Anticholinergic poisoning</td>
<td></td>
<td></td>
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<tr>
<td>Typhoid fever</td>
<td>Serotonin syndromes</td>
<td></td>
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<tr>
<td>malaria</td>
<td>Salicylate poisoning</td>
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</tr>
</tbody>
</table>

2. Investigations:

2.1. Chest x-ray,

2.2. ECG

2.3. Lab investigations: Including but not limited to:

2.3.1. Complete blood count.

2.3.2. Serum electrolyte concentrations.

2.3.3. Arterial or venous blood gas.

2.3.4. Serum lactate.

2.3.5. Blood urea nitrogen (BUN).

2.3.6. Creatinine concentrations.

2.3.7. Liver function test.

2.3.8. Cardiac enzymes.

2.3.9. Prothrombin time (PT) and partial thromboplastin time (PTT).

2.3.10. Septic screening.
3. Treatment (see Algorithm # 1):

3.1. Goals:
- 3.1.1. Normal vital signs.
- 3.1.2. Euthydradion state
- 3.1.3. Full consciousness.
- 3.1.4. Normal investigations
- 3.1.5. Avoid / treat complications.

3.2. Establish Airway and maintain Breathing:
- 3.2.1. Tracheal intubation to protect airway and mechanical ventilation to overcome the oxygen demand.

3.3. Circulation:
- 3.3.1. Establish an IV line.
- 3.3.2. Check blood pressure (BP), if low give IV bolus of NS 500 ml then maintenance IVF NS at 125 ml/hour.
- 3.3.3. Central venous pressure (CVP) monitoring may be useful for assessing volume status and determining the need for fluid resuscitation. A target CVP of 8 to 12 mmHg.
- 3.3.4. Cardiac and hemodynamic monitoring.
- 3.3.5. Foley’s catheter (to monitor urine output).
- 3.3.6. Monitor; vital signs, O2 saturation.
- 3.3.7. Input output monitoring and charting.

Algorithm # 1; Management of heat stroke.

- Ensure airway, breathing and circulation
- Mechanical ventilation if indicated
- Initiate resuscitative measures and evaporative cooling method immediately with continuous rectal temp monitoring, No antipyrhetics should be used.
- Chest x-ray, ECG and lab investigations including but not limited to(CBC,chemistry,ABG,lactate,LFTs,RFTs,cardiac enz.,PT,PTT) to rule out other diagnosis and complications.
- Look for complications and treat them accordingly
- Stop cooling measures whenever rectal temp reaches 39C
3.4. Rapid cooling:

3.4.1. For hyperthermia (Rectal temperature > 40º C): Start evaporative Cooling measures (Fan and body water spray).

3.4.2. An alternative method that allows greater access to the patient is water ice therapy, applying cold compresses to the smooth, hairless skin surfaces of the cheeks, palms, and soles or Applying ice packs to the axillae, neck, and groin or using body cooling units.

3.4.3. Continuous core temperature monitoring rectally and cooling measures should be stopped once a rectal temperature is less than 39ºC has been achieved.

3.4.4. There is no role for antipyretic agents such as acetaminophen or aspirin in the management of heat stroke.

3.4.5. Dantrolene is ineffective in patients with severe temperature elevation not caused by malignant hyperthermia.

3.5. Deal with complications accordingly as follows:

3.5.1. Severe hyperthermia may lead to a wide range of complications (see Algorithm # 2). These often resolve as cooling measures take effect, but this depends upon the degree and duration of hyperthermia.

3.5.2. Respiratory dysfunction:

3.5.2.1. Tracheal intubation and mechanical ventilation are often necessary to protect the airway and to address increased metabolic demands (ie, provide supplemental oxygen and increased minute ventilation).

3.5.3. Convulsions:

3.5.3.1. Initial treatment consists of short-acting benzodiazepines such as:

3.5.3.2. Midazolam 0.1-0.2 mg/kg IV, to a maximum dose 4 mg, has an onset of action one to five minutes and duration of action of one to six hours.

3.5.3.3. Lorazepam 0.1 mg/kg IV, to a maximum dose 4 mg, is a second-line option, as the duration of action may be prolonged from 12 to 24 hours.

3.5.3.4. Rapid cooling measures.

3.5.3.5. Barbiturates should be avoided.

3.5.4. Arrhythmia and cardiac dysfunction:

3.5.4.1. Cardiac dysfunction and tachyarrhythmias generally resolve with Rapid cooling.

3.5.4.2. Antiarrhythmics are seldom necessary.

3.5.4.3. Electrical cardioversion should be avoided until cooling is achieved, unless necessary to treat ventricular defibrillation or pulseless ventricular tachycardia.

3.5.5. Hypotension:

3.5.5.1. IV fluid boluses of isotonic crystalloid solution 250 to 500 ml. then monitor according to vital signs and urine output.

3.5.5.2. Given the risk of pulmonary edema, excessive fluid administration should be avoided.

3.5.5.3. If no response, start Dopamine 3-10 µg/Kg/min and increase up to 20 µg/Kg/min according to vital signs and CVP measurement.

3.5.5.4. Avoid Alpha-adrenergic agonists, which impair cooling due to vasoconstriction.
Algorithm # 2; Management of heat stroke complications.
3.5.6. **Bleeding:**
   3.5.6.1. Replacement of Lost blood with Packed RBCs and Clotting factors with fresh frozen plasma and platelets, Cryoprecipitate and fibrinogen may be necessary.

3.5.7. **Acute renal failure:**
   3.5.7.1. Renal function studies and serum electrolytes concentrations should be followed closely over the first few days of illness.
   3.5.7.2. Renal replacement therapy (CRRT/Hemodialysis) for overload, may be needed as indicated.
   3.5.7.3. Correction of acidosis and electrolyte imbalance e.g; hyperkalemia.

3.5.8. **Rhabdomyolysis:**
   3.5.8.1. R/O Rhabdomyolysis by CK and treat with IV fluid.

3.5.9. **Acid base and electrolytes imbalance:**
   3.5.9.1. Correct acidosis and electrolytes imbalance.

3.5.10. **Hepatic injury:**
   3.5.10.1. Rapid cooling.
   3.5.10.2. Avoid hepatotoxic drugs

3.5.11. **Hyperglycemia:**
   3.5.11.1. Monitor RBS and K level.
   3.5.11.2. No insulin initially unless patient is known to be diabetic.

3.5.12. **Sepsis:**
   3.5.12.1. In cases where the etiology of the patient’s hyperthermia is unclear initially and infection remains a possibility, empiric administration of an initial dose of antibiotics, following collection of appropriate cultures, is prudent, while cooling measure is implemented.

3.5.13. **Diarrhea:**
   3.5.13.1. Only fluid replacement.

4. **Discharge criteria:**
   4.1. Normal vital signs.
   4.2. Fully conscious.
   4.3. Well hydrated.
   4.5. Free of complications.

5. **Follow up:**
   5.1. Long-term outpatient therapy may be required when chronic renal failure develops and when irreversible damage to the CNS, heart, and liver occurs.
GUIDELINES FOR HEAT EXHAUSTION

1. **Assessment:**
   1.1. **History:**
      1.1.1. Strenuous physical exertion or environmental heat stress of an unacclimatized patients.
      1.1.2. Body temperature elevation.
      1.1.3. Other features: Headache, Nausea, Vomiting, Dizziness, Weakness, Irritability, Cramps.
   1.2. **Physical findings:**
      1.2.1. Normal or increased core body (rectal) temperature < 40ºc., (milder than heat stroke or heat injury).
      1.2.2. Sweating, postural hypotension.
      1.2.3. The central nervous system is not affected.

2. **Investigations:**
   2.1. If febrile, including but not limited to:
      2.1.1. CBC.
      2.1.2. S. chemistry.
      2.1.3. Septic screening.
      2.1.4. Chest x-ray.
      2.1.5. Common laboratory features: Hypokalemia, Hyponatremia.

3. **Treatment:**
   3.1. **Goals:**
      3.1.1. Normal vital signs.
      3.1.2. Euhdration state.
      3.1.3. Normal investigations.
   3.2. **Initiate resuscitative measures:**
      3.2.1. Fluid and salt replacement: Orally; with chilled water or Salt-containing solutions if the patient is not nauseated, vomiting, or manifesting a depressed mental status.
      3.2.2. If the patient is not tolerating; Check blood pressure (BP), if low; Establish an IV line, Give IV bolus of NS 500 ml then maintenance IVF NS at 125 ml/hour and titrate to response.
      3.2.3. Monitor; vital signs, rectal temperature, O2 saturation.
      3.2.4. Input output monitoring and charting.
   3.3. **Cool the patient:**
      3.3.1. Start any technique used to treat heat stroke may be used; ice packing to axillae and groin, running cool water over him using a shower or hose, or using evaporative cooling measures. (Fan and body water spray).
      3.3.2. Continuous core temperature monitoring rectally and cooling measures should be stopped once a rectal temperature less than 39ºc has been achieved, (The time needed to reach the goal temperature will be much shorter than with heat stroke).
      3.3.3. Avoid using antipyretic for temperature control as it can exacerbate Heat stroke complications.
   4. **Exclude other causes of hyperthermia.**
5. **Discharge criteria from emergency:**
   5.1. Patients who recover completely with the treatments described here within one or two hours of presentation may be discharged with a responsible adult provided that he have:
   5.1.1. Normal vital signs.
   5.1.2. Well hydrated.
   5.1.3. No other symptom or sign of illness.

6. **Admission criteria:**
   6.1. Patients who fail to improve after two hours despite these measures, may be a candidate of developing late complications, consistent with possible heat injury, and should be admitted for observation and diagnostic testing.
HEAT INJURY GUIDELINES

1. Assessment:
   1.1. History:
      1.1.1. Most often Heat injury manifests as physical collapse during or following vigorous activity.
      1.1.2. Body temperature elevation.
      1.1.3. May complain of weakness, lethargy or nausea.
      1.1.4. No significant neurologic manifestation.
   1.2. Physical findings:
      1.2.1. Patient may present with normal or increased body core (rectal) temperature < 40ºC.
      1.2.2. Sweating, postural hypotension.
      1.2.3. The central nervous system is not affected.
      1.2.4. Lack another explanation for hyperthermia (eg, infection).
      1.2.5. Vital signs abnormalities (e.g., tachycardia, tachypnea, hypotension).
      1.2.6. The severity of the heat injury may not be apparent during the initial presentation.
      1.2.7. Signs of multi-organ damage including acute respiratory distress syndrome (ARDS), disseminated intravascular coagulation (DIC), acute kidney injury (i.e., acute renal failure), hepatic injury, hypoglycemia, and rhabdomyolysis.

2. Investigations:
   2.1. Laboratory studies including but not limited to urinalysis, urine myoglobin and creatine kinase. Complete blood count, serum electrolyte concentrations, Arterial or venous blood gas, serum lactate, blood urea nitrogen (BUN) and creatinine concentrations, liver function tests (serum aminotransferases (AST, ALT), cardiac enzymes, Prothrombin time (PT) and partial thromboplastin time (PTT), septic screening, and Exclude other causes of hyperthermia.

3. Treatment:
   3.1. Rapid cooling measures: using any of the methods suitable for heat stroke.
   3.2. Continuous core temperature monitoring rectally and cooling measures should be stopped once a temperature less than 39ºC has been achieved in order to reduce the risk of iatrogenic hypothermia.
   3.3. Monitoring of vital signs and urine output.
   3.4. Initial care is largely supportive.
   3.5. Pharmacologic therapy may exacerbate complications such as hepatic injury or disseminated intravascular coagulation (DIC) e.g; paracetamol or Aspirin.
   3.6. For suspected patients without severe symptoms or signs and no grossly abnormal initial laboratory results, a reasonable approach is to reexamine the patient and recheck the relevant studies after 24 hours to assess organ function. Once symptoms and signs have resolved and two successive sets of normal laboratory values have been obtained, surveillance may be discontinued, and the patient may gradually return to normal activity.

4. Discharge criteria:
   4.1. Normal vital signs.
   4.2. Well hydrated.
COOLING GUIDELINES

1. Cooling In the field:
   1.1. Remove the patient from the hot place to a shaded or air-conditioned area.
   1.2. Remove all excess clothing and raise legs of the patient.
   1.3. Secure the airway, breathing, and circulation, in accordance with standard life support protocols and maintain adequate oxygenation.
   1.4. Measurements of vital signs, including a rectal temperature.
   1.5. If a rectal temperature is more than 39°C start cooling measures.
   1.6. Cover the patient with Ice or Ice packs, mainly to the neck, axillae and groins and hairless areas, Ice should be changed as soon as a moderate degree of melting occurs.
   1.7. Chemical packs cooling or cooling towels can be used in the same way.
   1.8. Alternative method; ice/wet towel rotation, Towels should be replaced as soon as they are no longer cool or every two to three minutes otherwise.
   1.9. Fans can be used if readily available.
   1.10. No other emergency medical treatment is needed other than rapid lowering of the body temperature.
   1.11. Continue cooling measures till a rectal temperature is just below 39°C or the patient starts shivering.

2. Cooling during Transportation:
   2.1. Cooling shall continue during transport to PHC or a hospital.
   2.2. Cover the patient with Ice packs, mainly to the neck, axillae and groins and hairless areas, Ice packs should be replaced every two to three minutes.
   2.3. Chemical packs cooling or cooling towels can be used in the same way.
   2.4. Alternative method; Fans can be used if readily available.
   2.5. Cooling shall continue during transport a rectal temperature is just below 39°C or the patient starts shivering.
   2.6. Monitor and document vital signs (rectal temperature, heart rate, respiratory rate, blood pressure) and mental status continuously.

3. Cooling in the hospital:
   3.1. Keep the patient on a bed with raised bed side rails to maintain safety of patient.
   3.2. Fully expose the patient with closed curtain to maintain privacy.
   3.3. Maintain airway, breathing and circulation in accordance with standard life support protocols and maintain adequate oxygenation.
   3.4. Measurements of vital signs, including a rectal temperature.
   3.5. If the rectal temperature is more than 39° C. Start Cooling measures.
   3.6. Evaporative Cooling (Fan and body water spray; see figure # 1):
       3.6.1. Fill the water container of the fan using plain tab water.
       3.6.2. Ice or cold water should not be used in the fan container.
       3.6.3. Direct the fan towards the patent while fully naked.
3.6.4. Press on Mist button of the fan (see Figure # 2) to spray on the whole body of the patient with a mist of lukewarm water.

3.7. Press on Fan button (see Figure; # 2) to

3.7.1. Blow air over the moist skin.

3.7.2. The Evaporative cooling is the method used most often to treat heat stroke because it is effective, noninvasive, easily performed, and does not interfere with other aspects of patient care. When used to treat elderly patients, evaporative cooling is associated with decreased morbidity and mortality.

3.7.3. Cooling measures shall continue till a rectal temperature reaches just below 39°C or the patient starts shivering, to avoid hypothermia, at this point stop the mist then air of the fan.

3.7.4. Monitor and document vital signs (rectal temperature, heart rate, respiratory rate, blood pressure) and mental status. Continuously.
3.8. **Other effective cooling methods used in patients with heat exhaustion or stroke if fans are over utilized:**

- 3.8.1. Applying cold compresses to the glabrous (smooth, hairless) skin surfaces of the cheeks, palms, and soles.

- 3.8.2. Applying ice packs to the axillae, neck, and groin (areas adjacent to major blood vessels, but may be poorly tolerated by the awake patient.

3.9. **Cautions:**

- 3.9.1. Avoid using alternative methods to determine body temperature (e.g., oral, tympanic, axillary, temporal, skin, forehead sticker), even if a rectal thermometer is not available. Alternative methods do not provide accurate measurements of body core temperature in patients who have been exercising intensely in the heat and can be misleading.

- 3.9.2. Cooling measures should be stopped once a rectal temperature reaches just less than 39°C, to reduce the risk of iatrogenic hypothermia.

- 3.9.3. There is no role for antipyretic agents such as acetaminophen or aspirin in the management of heat stroke.

- 3.9.4. Dantrolene is ineffective in patients with severe temperature elevation not caused by malignant hyperthermia.
HEAT EDEMA GUIDELINES

1. Assessment:
   1.1. History:
      1.1.1. Increased risk among elderly and people from colder climates, especially if they have other medical conditions that affect their circulation.
   1.2. Physical findings:
      1.2.1. Mild swelling of hands and feet.

2. Treatment:
   2.1. Move the patient to a shaded area.
   2.2. Have the patient lay supine in a cool environment.
   2.3. Raise the legs of the patient.
   2.4. Give fluids to drink.
   2.5. Usually heat edema Disappears after acclimatization.

3. Discharge criteria:
   3.1. Normal vital signs.
   3.2. Well hydrated.
HEAT SYNCOPE GUIDELINES

1. Assessment:
   1.1. History:
      1.1.1. Transient loss or near-loss of consciousness due to exposure to high environmental
temperatures, in an unacclimatized patient.
      1.1.2. Most often heat syncope manifests as physical collapse during or after exertion, with
a feeling of heaviness in the legs, Blurred vision, Confusion, Feeling warm or hot,
Lightheadedness, dizziness, a floating feeling, Nausea, Sweating, Vomiting or Yawning.
   1.2. Physical findings:
      1.2.1. There may be a drop in blood pressure and weak pulse.

2. Treatment
   2.1. Move the patient to a shaded area.
   2.2. Have the patient lay supine in a cool environment.
   2.3. Raise the legs of the patient.
   2.4. Give fluids to drink.
   2.5. The patient should avoid sudden or prolonged standing until fully recovered.
   2.6. The patient should recover within 15 to 20 minutes with these maneuvers; failure to improve
should prompt further evaluation, including a rectal temperature. Patients at higher risk for
dangerous causes or adverse outcomes and those who do not completely recover within 20
minutes should be evaluated in the emergency department using the approach for any patient
with syncope

3. Discharge criteria:
   3.1. Normal vital signs.
   3.2. Well hydrated.
HEAT CRAMPS GUIDELINES

1. Assessment
   1.1. Painful involuntary muscle contraction, involving large muscle groups specially legs occur during or after exertion (do not appear to be caused by increased ambient temperature).
   1.2. Moist cool skin, a normal body temperature, and minimal distress.

2. Treatment
   2.1. Relax in cool environment, stretch and massage the involved muscle to reduce acute discomfort.
   2.2. Hydrate the patient and replace sodium losses with oral salt solution, as in rehydration solutions, can be made by adding one fourth to one-half teaspoon of table salt to 1 L of water, to improve taste, add a few teaspoons of sugar and/or orange juice or lemon juice.
   2.3. IV isotonic saline therapy (rarely required). However, oral rehydration has consistently been shown to be as effective as IV rehydration when equal amounts of fluids are given.
   2.4. Persistent or systemic cramping should prompt an assessment of the serum sodium to evaluate for exertional hyponatremia and raise the possibility of sickle cell crisis due to exertion.

3. Prevention
   3.1. Muscle cramps are thought to be prevented best through adequate conditioning, acclimatization, hydration, electrolyte replacement, and appropriate dietary practices.
PRICKLY HEAT GUIDELINES

1. **Assessment:**
   1.1. Manifests as an itchy rash of small raised red spots with a prickling or stinging sensation, develop after a person sweats far more than usual and sweat glands become blocked.
   1.2. Usually affects parts of the body covered by clothes, such as the back, abdomen, neck, upper chest, groin or armpits.

2. **Treatment:**
   2.1. In most cases, heat rash will clear up on its own in a few days if the affected area is kept cool and dry.
   2.2. Advise the patient to avoid excessive heat and humidity and cool off with a fan.
   2.3. Advise the patient to take a cool shower or bath and let skin air dry.
   2.4. Avoid using any type of oil-based product, which might block sweat glands.
   2.5. Calamine lotion and/or hydrocortisone cream can relieve itching and irritation.
   2.6. If prickly heat does not improve within a few days, or if an infection developed give antibiotic (cloxacillin).

3. **Prevention:**
   3.1. It is best prevented by wearing light, loose clothing and avoiding heavy, continuous sweating by using fans and cool showers and baths to stay cool, or air conditioning if available.
SUNBURN GUIDELINES

1. **Assessment**
   1.1. Signs and symptoms of sunburn usually appear within a few hours after sun exposure:
   1.1.1. Pinkness or redness.
   1.1.2. Skin that feels warm or hot to the touch.
   1.1.3. Pain, tenderness or itching.
   1.1.4. Swelling.
   1.1.5. Small fluid-filled blisters, which may break.
   1.1.6. Headache, fever, chills and fatigue if the sunburn is severe.

2. **Treatment**
   2.1. Pain relievers as MEPO or calamine lotion.
   2.2. Skin corticosteroids, combined with pain relievers

3. **Prevention**
   3.1. Advise to avoid sun exposure between 10 a.m. and 4 p.m.
   3.2. Cover up with white clothes and umbrella.
EXERTION-ASSOCIATION HYPONATREMIA GUIDELINES

1. Guiding principle:
1.1. It is important to differentiate Exertion-associated hyponatremia from Heat stroke, because the management is deferent, fluid therapy might kill the patient with Exertion-associated hyponatremia.

2. Field management: (see algorithm # 3)

3. Hospital management:
3.1. Assessment:
3.1.1. History of ingesting water or low-solute beverages beyond sweat and urine losses, or Sweat sodium losses are not adequately replaced.
3.1.2. Might happen during or up to 24 hours after prolonged physical activity (usually occur when activity exceeds 4 hours).
3.1.3. Affected patients present with a combination of disorientation, altered mental status, headache, vomiting, lethargy, and swelling of the extremities (hands and feet), pulmonary edema, cerebral edema, and seizures.

3.1.4. Assessment for clinical signs suggestive of developing cerebral edema.

3.2. Investigations:

3.2.1. Urgent measurement of blood sodium by the most rapidly available means; a serum or plasma sodium concentration below the normal reference range.

3.2.2. Obtain and store specimens if possible for later analysis of blood serum osmolality and urine sodium and osmolality.

3.3. Treatment:

3.3.1. Supplemental oxygen to maintain oxygen saturation above 95% 3.3.2. Restrict fluids (both IV and oral) until onset of urination.

3.3.3. Avoid IV normal saline until sodium correction is initiated.

3.3.4. Thereafter normal saline may be required for hypovolemic shock or in renal protection therapy for rhabdomyolysis.

3.3.5. In severe EAH (signs of cerebral edema or serum sodium less than 125 mmol/L) administer IV 3% hypertonic saline as a 100-mL bolus repeated twice at 10-minute intervals aiming to reverse cerebral edema.

3.3.6. Aim to increase serum sodium by approximately 4 to 5 mmol/L or until neurological symptoms are reversed by active treatment, then allow the remaining correction to occur spontaneously via urinary free water excretion.

4. Prevention of Exertion-associated hyponatremia:

4.1. Exertion-associated hyponatremia can be prevented by matching fluid intake with sweat and urine losses and by rehydrating with fluids that contain sufficient sodium.
REFERENCES:


2. Care of the Wilderness and Adventure Athlete, Riana R. Pryor, PhD, ATC, Department of Kinesiology, California State University, published by Wilderness & Environmental Medicine. 26, S69-S75 (2015).


7. Heatstroke, Robert S Helman, MD; Chief Editor: Joe Alcock, MD, MS, Updated: May 01, 2015.


