

HEAT EMERGENCY AWARENESS AND TREATMENT (HEAT) ALGORITHM

TRIAGE

History, Measure temperature (core temperature if possible otherwise oral or axillary using mercury thermometer), BP, Pulse, Respiratory Rate, Oxygen Saturation and mental status using AVPU**

HEAT STROKE

HEAT EXHAUSTION

1. Exposure to excessively hot environment or physical exertion in a hot environment
2. Elevated body temperature
3. Central nervous system dysfunction (delusions, altered mental status, convulsions, coma)*
4. Patient should meet all of the above criteria OR as per clinical judgment

1. Exposure to excessively hot environment or physical exertion in a hot environment
2. Signs and symptoms of dehydration and/or salt depletion (for e.g. cool clammy skin, excessive sweating, delayed capillary refill tachycardia, hypotension, sunken eyes, nausea and headache)
3. Patient meeting both criteria OR high clinical suspicion

Presentation consistent with either Heat Stroke or Heat Exhaustion

YES

NO

CONSIDER ALTERNATIVE CAUSES OF HYPERTHERMIA

Additional test can be ordered as per patient's condition and physician's judgement;
CBC, LFTs, VBG/ABG, CPK, EKG, blood culture, urine culture Troponin I & Coagulations, Urine analysis, CXR

1. Assess and manage airway, breathing and circulation
2. Remove extra clothing (ensuring patient privacy, cultural acceptability)
3. IV access, place on monitor, bedside blood glucose
4. Measure serum BUN, creatinine and electrolytes

1. Sepsis
2. Meningitis/Encephalitis
3. Malignant hyperthermia
4. Cerebrovascular Accident
5. Septic/ metabolic encephalopathy
6. Seizures
7. Thyroid storm
8. Drug/poison ingestion
9. Neuroleptic Malignant Syndrome
10. Serotonin Syndrome

STEPS:

1. Provide active cooling measures when body temperature is greater than or equal to 39°C (102.2°F) with a goal of temperature reduction to 38°C (100.4°F) within 30 minutes
2. Wet the patient's clothes if it not possible to disrobe and place the patient in front of pedestal fan
3. Apply ice packs to axilla, groin and neck when water is not available.

Administer 500 - 1000 cc IV bolus of Normal Saline or Lactated Ringers as per assessment of the patient. Continue fluid resuscitation as per clinical response and urinary output (see below)

MONITOR:

1. Temp every 15 min till temperature less then 38°C (100.4°F) (avoiding hypothermia)
2. Vitals every 30 min
3. Volume status (auscultation chest and JVP) and urinary output measurement through foley catheter to ensure output of 0.5cc/kg/hr
4. Repeat Electrolytes, BUN/Creatinine and other tests as per clinical status

NOTES

- The absence of neurologic symptoms is used to differentiate heat exhaustion from heat stroke
- For seizures: Follow your institutional protocol to treat the condition which often starts with benzodiazepines
- Avoid continuous use of acetaminophen in case of heat illnesses
- **AVPU – Alert, Voice, Pain, Unresponsive (method of testing mental status)
- If not improving then additional treatment methods must be considered

RISK FACTORS FOR HEAT ILLNESSES

- Age (less than 10 or greater than 50 years)
- Individuals working outdoors without shades
- People living in poorly ventilated areas
- High number of family members living in relatively small houses
- Low socio-economic status
- Exertion in days when both the environmental temperature & humidity is on rise
- Individuals who have limited functional status or bed bound
- Comorbidities like diabetes, hypertension, ischemic heart disease, stroke, obesity, chronic respiratory conditions, hematologic/oncologic diseases, psychiatric illnesses.
- Recent acute illness or exertion heat injury
- Lack of acclimatization

MEDICATIONS INCREASING RISK FOR HEAT ILLNESSES

MEDICATION	EFFECT	EXAMPLES
Anticholinergics	Can affect central thermoregulation, reduce cognitive alertness and prevent or reduce sweating	Atropine, Ipratropium, Solifenacin, Benztropine, Trihexylphenidyl
Antipsychotics	Can inhibit the sweating mechanism and reduce systolic blood pressure, central thermoregulation, cognitive alertness and vasodilation	Haloperidol, Quetiapine, Risperidone, Clozapine, Olanzapine, Fluphenazine
Antihistamines	Can inhibit the sweating mechanism and reduce systolic blood pressure	Chlorphenaramine, Diphenhydramine, Cetrizine, Fexofenadine, Loratidine. Desloratidine
Anti-Parkinson's	Can inhibit the sweating mechanism; reduce systolic blood pressure and cause dizziness and confusion.	Sinemet (carbidopa levodopa), Selegiline, Amantadine, Bromocriptine, Benztropine, Trihexylphenidyl
Antidepressants	Reduce sweating; some can decrease centrally induced thermoregulation and cognitive alertness	TCAs (Nortriptyline, Amitriptyline), SSRI(Fluoxetine, Sertraline), Bupropion, Venlafaxine
Anxiolytics & muscle relaxants	Reduce sweating and increase dizziness, decrease cardiac output and therefore reduce cooling by vasodilation, and worsen respiratory symptoms	Benzodiazepines (Diazepam, Alprazolam), Tizanidine, Cyclobenzaprine
Sympatholytics	Can worsen hypotension in vulnerable patients	Beta blockers (Metoprolol, Propranolol, Carvedilol) Alpha blockers (Prazosin, Doxazosin)
Sympathomimetics	Can prevent dilation of the blood vessels in the skin, reducing the capacity to dissipate heat by convection	Epinephrine, Norepinephrine, Dopamine, Dobutamine, Salbutamol, Albuterol
Antihypertensives	Can lead to dehydration and reduce blood pressure; hyponatremia is a common side effect and can be worsened by excess fluid intake	Calcium Channel blockers (Amlodipine, Nifedipine, Verapimil, Diltiazem), Angiotensin receptor blockers (Losartan, Irbesartan, Valsartan), Angiotensin converting enzyme inhibitors (Ramipril, Lisinopril), Diuretics (Furosemide, Hydrochlorothiazide, Spironolactone), Nitrates (Isosorbide mono/di-nitrates) Alpha blockers, Beta blockers
Antiepileptics	can reduce cognitive alertness and increase dizziness	Phenytoin, Levetiracetam, Carbamazepine, Lacosamide, Lamotrigine, Oxycarbamazepine, Valproate, Phenobarbitone

• Other drug classes such as antiemetics, anti-vertigo drugs, gastrointestinal drugs, urinary incontinence drugs also have anticholinergic effects