Recognizing, Managing and Preventing Heat Exhaustion and Heat Stroke

A public health bulletin for physicians from the Cuyahoga County Board of Health

****** Heat-related mortality is entirely preventable with timely and appropriate management ******

PATHOPHYSIOLOGY

- Heat-related illness occurs when normal core temperature cannot be maintained due to excessive heat load and/or decreased ability to dissipate heat.
- Normal thermoregulatory responses to increased body temperature include increased heart rate, increased cardiac output, increased minute ventilation, sweating, and vasodilation. Any condition or drug hindering these mechanisms increases risk.
- Children may be at increased risk given their higher basal metabolic heat production, slower acclimatization to heat, and decreased sweating response compared to adults.

CLASSIFICATION

- **Heat exhaustion** (a precursor of heat stroke) - Core temperature between 37.0°C (98.6°F) and 40.0°C (104.0°F)
- **Heat stroke** - Core temperature > 40.0°C (104.0°F) with CNS dysfunction

RISK FACTORS

Age <4 or >65
Confinement to bed
Non-air-conditioned home
Social isolation
Urban dwelling
Chronic volume depletion

Conditions
- Cardiovascular disorders
- Endocrine disorders
- Respiratory disorders
- Renal disease
- Liver disease
- Neurological disorders
- Certain psychiatric disorders

Drugs
- Alcohol
- Alpha Adrenergics
- Amphetamines
- Anticholinergics
- Antihistamines
- Benzodiazepines
- Beta blockers
- Calcium channel blockers
- Cocaine
- Diuretics
- Laxatives
- Psychotropics
- Thyroid agonsists
- Tricyclic antidepressants

CLINICAL PRESENTATION

Heat Exhaustion:

Signs
- Core temp 37°C - 40°C
- Tachycardia
- Cutaneous flushing
- Emesis
- Oliguria
- Anxiety
- Confusion

Symptoms
- Fatigue/Malaise
- Weakness
- Dizziness
- Thirst
- Nausea/Anorexia
- Headache
- Visual disturbances

Heat Stroke:

Signs
- Core temp >40°C
- CNS dysfunction
- Hyperventilation
- Anhidrosis
- Cardiac arrhythmias
- DIC
- ARDS
- Hepatic failure
- Renal failure
- Pulmonary edema
- Rhabdomyolysis
- Shock

Symptoms
- As with heat exhaustion

MANAGEMENT

Heat stroke is a medical emergency! It should be managed at an appropriate facility.

Maintain **A**irway, **B**reathing,**C**irculation.

Remove patient from hot environment.

Monitor core temperature (rectal, bladder, esophageal, or intravascular probe).

Rapidly reversing hyperthermia is critical.

Heat *exhaustion* symptoms should resolve within 2-3 hours of treatment initiation.

External cooling
- Evaporative (preferred) – Cool water misted onto skin while air is fanned over.
- Immersion – Ice bath or cooling blankets with ice packs to groin, axilla, neck, and head. Causes vasoconstriction and reflex bradycardia; impedes examination.

Internal cooling
- Rectal/gastric/bladder cold lavage

Rehydration
- Isotonic, sodium-containing fluids orally for mild dehydration
- If hyponatremia present
  - AVOID HYPOTONIC FLUIDS!
  - Use IV normal saline at a rate not exceeding 2.5 mEq (2.5 mmol) / L / hour.
  - Manage at an appropriate facility.

PREVENTION DURING HOT AND HUMID WEATHER

- Increase fluid intake without waiting for thirst, reduce outdoor activity, and take frequent rest periods.
- Wear loose-fitting, light-colored clothing
- Do not leave children in cars unattended, and keep cars locked when not in use.
- Vulnerable individuals should stay in an air-conditioned environment when possible. Those unable to care for themselves should be monitored for signs of dehydration and encouraged to drink extra fluids.
- In high heat/humidity environments, cooling with a fan is ineffective.
- See www.ccbh.net for a list of emergency cooling centers. Report clusters of heat-related illness to CCBH: **216-857-1433**

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