

Heat-related illnesses: too hot to handle

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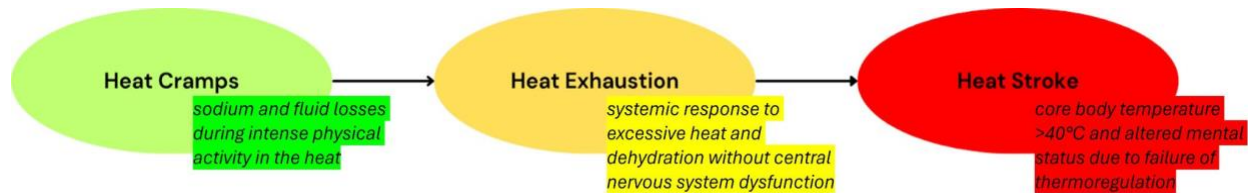


Board Bombs

Recognizing and Treating Heat Cramps, Heat Exhaustion, and Heat Stroke

It's a scorching summer day. The call comes in: "elderly woman found confused in her apartment with no A/C," or maybe it's "marathoner who collapsed at mile 22." These aren't rare cases — heat-related illnesses are increasingly common, preventable, and, when they spiral into heat stroke, lethally time-sensitive. What begins as simple cramps can evolve into a cascade of systemic failure, with mortality rates climbing as high as 80% without immediate intervention. That intervention often starts in the ED.¹ This review will cover ED approaches to common heat-related illnesses.

Overview: Understanding the Spectrum



The clinical challenge lies in recognizing when a patient is about to cross — or has already crossed — the line into dangerous territory. The most important clue? Central nervous system dysfunction. A patient who is confused, disoriented, or seizing in the context of elevated core temperature should be presumed to have heat stroke until proven otherwise.²

Heat Cramps: A Harmless Signal or Ominous Prelude?

Heat cramps typically occur in those engaged in strenuous activity in hot environments. These painful muscle spasms — most commonly affecting the calves, thighs, or abdominal wall — result from sodium and water depletion via sweat, often worsened by rehydration with electrolyte-free fluids.³

Though self-limiting, heat cramps serve as a red flag: an early warning sign of poor hydration and acclimatization. If recognized early, management with rest, shade, and rehydration using sodium-containing fluids can prevent further progression.

Heat Exhaustion: System Struggling to Cope

Heat exhaustion represents a failure of the cardiovascular system to meet the demands of thermoregulation under heat stress. Patients present with generalized weakness, fatigue, dizziness, nausea, vomiting, tachycardia, and profuse sweating. Patients can be irritable, lethargic, or faint, but they remain oriented and follow commands⁴. Importantly, core temperature typically remains below 40°C. These individuals have not yet crossed into the dangerous territory of heat stroke, but they are close.

Treatment: immediately remove patient from the heat source and initiate active cooling with fans, cool compresses, or evaporative techniques, alongside aggressive oral or intravenous fluid resuscitation using isotonic solutions⁵. Continuous reassessment is key — some patients (particularly the elderly, children, or those taking diuretics) may deteriorate rapidly.

Heat Stroke: Thermoregulatory Collapse

Heat stroke is the final and most dangerous stage of heat-related illness. It is defined by a core body temperature exceeding 40°C in the presence of neurologic dysfunction, such as confusion, ataxia, seizures, or coma⁶. While often associated with hot, dry skin, this finding is neither sensitive nor specific; many patients with heat stroke may still be diaphoretic⁷. Again, the core pathology lies in systemic thermoregulatory failure. Prolonged hyperthermia can trigger direct cellular injury, systemic inflammation, coagulopathy, rhabdomyolysis, hepatic necrosis, and acute kidney injury^{2,8}. In classic heat stroke, which primarily affects the elderly and chronically ill during environmental heatwaves, symptoms may develop *gradually*. In exertional heat stroke, often seen in athletes or military personnel, onset is *rapid* and catastrophic.

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Treatment: Cooling as the Cornerstone

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	Strategy	2, 5, 9, 10
Timing	Begin cooling immediately upon diagnosis - labs or imaging should never delay this step!	
Treatment Gold Standard	Cold Water Immersion (CWI): ice water at 1-15°C; lowers temp by 0.15-0.20°C per minute	
Target Temperature	Aim to reduce core temp to <39°C within 30 minutes of presentation	
Alternative Methods	Evaporative cooling (spray + fan) and ice packs to high flow areas (think groin, axillae, and neck); particularly helpful for children/elderly patients	
Think twice!	Antipyretics are ineffective and potentially harmful; they do not address the true pathophysiology!	
Supportive Care	Ensure airway protection, manage seizures, and admit to ICU for organ monitoring as necessary	

Pediatric and Geriatric Pearls

Children and the elderly are particularly vulnerable patient populations. Children have a higher surface area-to-mass ratio and underdeveloped thermoregulatory systems, making them more susceptible to rapid heat gain³. On the other hand, elderly patients often have impaired thirst mechanisms, comorbidities, and medications such as beta blockers, anticholinergics, and diuretics that inhibit compensatory mechanisms like sweating and vasodilation^{6,8}. Rectal temperature remains the gold standard for accurate core body temperature assessment, as oral and tympanic methods may underestimate critical elevations⁴. In an altered patient or young child, go for the rectal temperature!

Disposition Decisions

Disposition should be guided by severity.

Patients with isolated heat cramps or mild heat exhaustion who respond to oral hydration and cooling = discharge with education and follow-up.

Severe heat exhaustion, ongoing vomiting, or hypotension despite fluids = prolonged observation vs admission.

Heat stroke = ICU-level care, not for temperature alone, but for multi-organ surveillance including renal, hepatic, and coagulation parameters^{1,7}.

Conclusion

Heat-related illnesses demand more than just recognition - they demand urgency. From the harmless but cautionary signal of heat cramps to the looming danger of heat exhaustion and the critical, time-sensitive crisis of heat stroke, every stage offers a window for intervention. The unifying thread is thermoregulation: once it fails, systems follow. Core temperature and mental status are your compass and, if either is off, don't wait to act. Cooling is the difference between survival and death. Forget waiting for labs and ditch the acetaminophen! What your patient needs is rapid recognition, aggressive cooling, and critical care monitoring. In the summer heat, the best emergency physician isn't the one who makes the perfect diagnosis; it's the one who cools first and asks questions later!

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