Heat Stroke

EMS Informational Guide

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Recognition • Rapid Cooling • Field Management

KEY MESSAGE

Heat stroke is a time-critical emergency. Definitive treatment is active cooling with adequate cooling rates BEFORE TRANSPORT, with a goal of achieving adequate cooling (temp. of 102.5⁰F) within approximately 30 minutes of onset.

Cold/ice water immersion (CWI) is the gold standard for achieving adequate cooling rates

Critical Numbers at a Glance

Suspect Heat Stroke	Adequate Cooling Rate	Cooling Goal	Preferred Endpoint
Hot skin (wet or dry) + altered LOC + core temp ≈104°F or higher	>0.27°F/min (>0.15°C/min)	Within 30 minutes	Rectal temp 102.5°F

1. Recognize Heat Stroke Early

- **Skin is HOT to the touch.** Skin may be dry or wet.
- **Altered level of consciousness.** May include lethargy, seizure activity, or unconsciousness.
- **Rectal temperature is preferred.** A core temperature around 104°F or higher supports the diagnosis in the appropriate clinical setting.

2. Start Cooling Immediately

Cooling BEGINS BEFORE TRANSPORT. The priority is rapid cooling which preferably begins with bystander involvement prior to EMS arrival, telecommunicator support, and rapid field cooling as early as possible.

- Remove the patient from the hot environment.
- Remove excess clothing.
- Begin cold/ice-water dousing and fanning.
- Use telecommunicators to direct bystanders and request additional resources.
- Request Fire Department assistance and seek additional sources of ice and cold water when needed.

3. Cooling Is the Definitive Treatment

DO NOT ALLOW TRANSPORT PREPARATION TO DELAY ACTIVE COOLING. ABCs are secondary to cooling and should be managed concurrently during cooling whenever possible, rather than stopping the cooling process to complete other interventions first.

COLD/ICE WATER IMMERSION IS THE GOLD STANDARD FOR ACHIEVING ADEQUATE COOLING RATES

4. Why Water Works Best

Water is the optimal cooling medium because of its thermal properties.

- **High thermal conductivity:** Water transfers heat about 24 times more efficiently than air.
- **High specific heat capacity:** It absorbs large amounts of heat with relatively little increase in water temperature.
- **Greater density than air:** This enhances heat absorption.
- **Rapid cooling:** Water cools the body approximately four times faster than air at the same temperature.
- **Extensive contact surface:** Submersion can expose nearly the entire body surface to the cooling medium.

5. Cooling Methods: Adequate vs. Insufficient

Adequate cooling rate: >0.27°F/min (>0.15°C/min). In the study by Filep et al, *adequate cooling rates achieved a 100% survival rate with substantially fewer medical complications*.

METHODS THAT CAN ACHIEVE ADEQUATE COOLING	METHODS LISTED AS INSUFFICIENT
• Ice-water immersion with oscillation/agitation • Cold-water immersion with oscillation/agitation • Cold-water dousing + ice massage + fanning • Tarp-assisted cooling (TACO) • Whole-body rotating ice towels + ice-water dousing	• Ice packs over major vessels (neck, axillae, groin) • Ice sheets • Spray-fan cooling • Cold IV fluids • Cooling blankets • Tepid-water sponging and fanning

Clinical implication: insufficient cooling rates are associated with approximately a 4.5-fold greater risk of medical complications among survivors.

6. Davidson County EMS Field Procedure (See Hyperthermia Protocol TE4)

1. **Remove clothing and begin dousing immediately.** Use a garden hose if available.
2. **Obtain a rectal temperature.** Rectal temperature is the preferred core-temperature measurement.
3. **Request assistance.** Request Fire Department response and seek anyone with access to large amounts of ice or cold water.
4. **Create an immersion setup.** Use a water-tight container such as a bathtub, body bag, tarp, or kiddie pool. Fill with cold water and ice.
5. **Agitate the water.** Mix the ice and water and keep cold water moving across the patient's body.
6. **Maintain ABCs during cooling.** Provide needed airway, breathing, and circulation support without unnecessarily interrupting the cooling process.
7. **Manage shivering as authorized.** benzodiazepines may be used to reduce shivering or control seizures
8. **Monitor rectal temperature.** Continue cooling to a target rectal temperature of 102.5°F.
9. **If rectal temperature is unavailable.** Continue cold-water immersion for at least 10–20 minutes before considering transport.
10. **Transport after cooling goal is reached.** Transport once the temperature reaches 102.5°F or after 20 minutes of cold-water immersion when temperature measurement is unavailable.

7. Field Priorities

- **Recognize heat stroke early.**
- **Move the patient out of the heat and remove excess clothing.**
- **Start active cooling immediately.**
- **Use whole-body water-based cooling whenever feasible.**
- **Agitate/oscillate water during immersion.**
- **Measure rectal temperature when available.**
- **Manage ABCs concurrently without delaying cooling.**
- **Cool to 102.5°F, or use the time-based cooling approach (20 minutes) when temperature is unavailable.**
- **Transport after the cooling objective has been met.**

References

Research and guideline sources supporting this informational guide:

Barletta, J. F., Palmieri, T. L., Toomey, S. A., et al. (2025). Society of Critical Care Medicine guideline for the treatment of heat stroke. Critical Care Medicine, 53(2), e490-e500.

Casa, D. J., DeMartini, J. K., Bergeron, M. F., Csillan, D., Eichner, E. R., Lopez, R. M., Ferrara, M. S., Miller, K. C., O'Connor, F., Sawka, M. N., & Yeargin, S. W. (2015). National Athletic Trainers' Association position statement: Exertional heat illnesses. Journal of Athletic Training, 50(9), 986-1000. https://doi.org/10.4085/1062-6050-50.9.07

Comp, G., Finch, C., Kupanoff, K., Sandoval, M., Lloyd, M., Aldaco, N., ... Stowell, J. R. (2026). Fighting Fire with Ice: A multisite collaboration to evaluate the impact of prehospital cold water immersion on heat stroke patients. Prehospital Emergency Care, 1-11. https://doi.org/10.1080/10903127.2026.2636148

Cong, S., Zheng, G., Liang, X., et al. (2025). Pre-hospital cooling in community-acquired heat stroke (CAHS): Evidence, challenges, and strategies. European Journal of Medical Research, 30, 472. https://doi.org/10.1186/s40001-025-02628-x

DeMartini, J. K., Casa, D. J., Stearns, R., Belval, L., Crago, A., Davis, R., & Jardine, J. (2015). Effectiveness of cold water immersion in the treatment of exertional heat stroke at the Falmouth Road Race. Medicine & Science in Sports & Exercise, 47(2), 240-245.

Douma, M. J., Aves, T., Allan, K. S., Bendall, J. C., Berry, D. C., Chang, W.-T., Epstein, J., Hood, N., Singletary, E. M., Zideman, D., & Lin, S. (2020). First aid cooling techniques for heat stroke and exertional hyperthermia: A systematic review and meta-analysis. Resuscitation, 148, 173-190. https://doi.org/10.1016/j.resuscitation.2020.01.007

Eifling, K. P., Gaudio, F. G., Dumke, C., Lipman, G. S., Otten, E. M., Martin, A. D., & Grissom, C. K. (2024). Wilderness Medical Society clinical practice guidelines for the prevention and treatment of heat illness: 2024 update. Wilderness & Environmental Medicine, 35(1S), 112S-127S. https://doi.org/10.1177/10806032241227924

Filep, E. M., Murata, Y., Endres, B. D., Kim, G., Stearns, R. L., & Casa, D. J. (2020). Exertional heat stroke, modality cooling rate, and survival outcomes: A systematic review. Medicina, 56(11), 589. https://doi.org/10.3390/medicina56110589