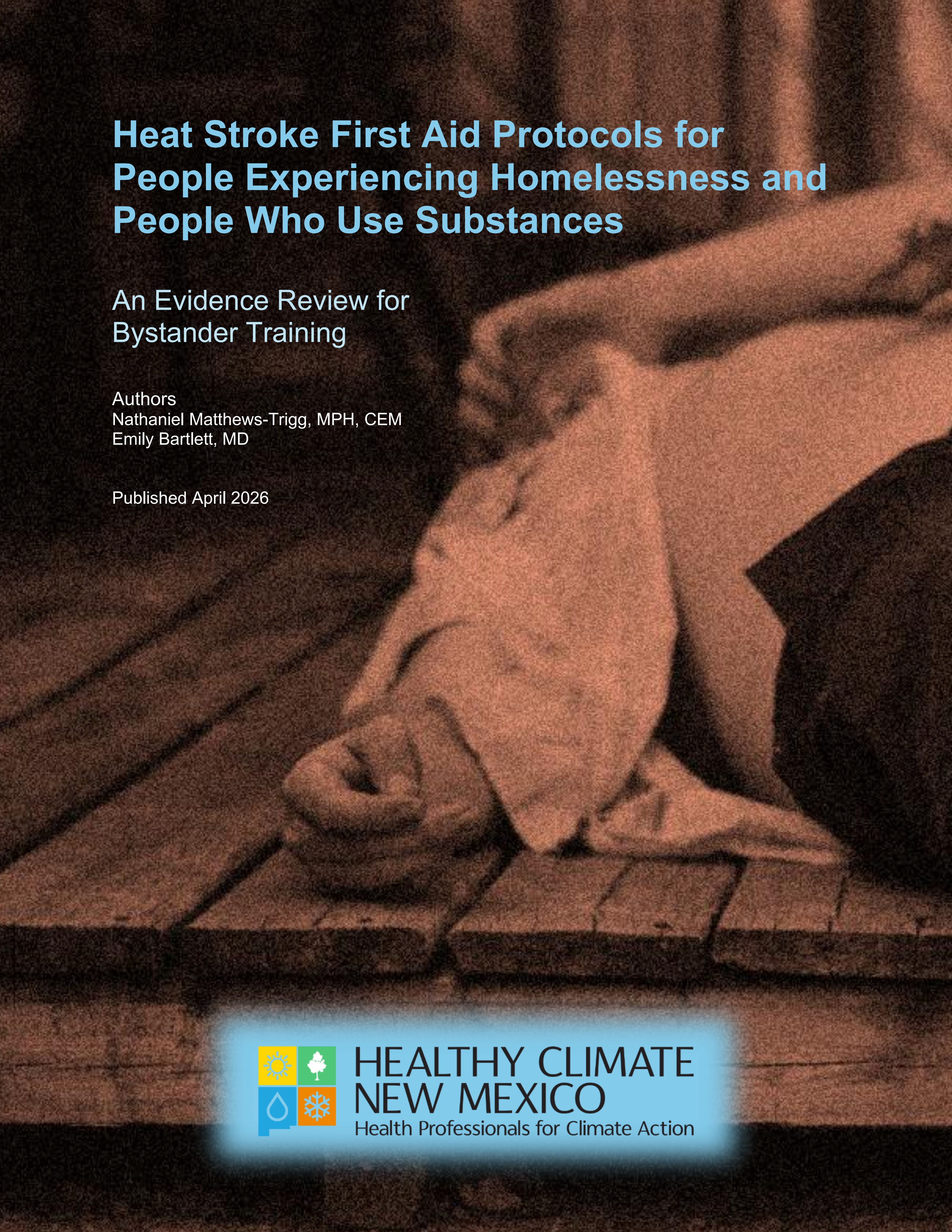

Heat Stroke First Aid Protocols for People Experiencing Homelessness and People Who Use Substances

An Evidence Review for Bystander Training

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Executive Summary

This report provides the evidence base and identifies research gaps for heat stroke first aid protocols demonstrated in a four-video bystander training series targeting people experiencing homelessness (PEH) and individuals using substances (IUS). The protocols emphasize rapid recognition, immediate cooling, and resource-adaptable interventions based on guidelines from the Wilderness Medical Society (WMS),[1] the Society of Critical Care Medicine (SCCM),[2] and the National Athletic Trainers' Association (NATA).[3]

Heat stroke symptom recognition and the three cooling methods demonstrated—cold water immersion, tarp-assisted cooling oscillation (TACO), and evaporative cooling with fanning—have established efficacy in the medical literature. The videos emphasize the "call for help, cool while waiting" paradigm and address the critical differential diagnosis between heat stroke and opioid overdose within the target population.

Significant research and clinical guidance gaps persist in providing heat stroke first aid protocols specific to PEH and substance-using populations. No identified research addresses the management of simultaneous heat stroke and overdose presentations. This is particularly critical given that PEH and substance-using populations face disproportionate risk of heat-related morbidity and mortality.

Introduction: Bystanders Play a Critical Role

Heat stroke is a life-threatening emergency characterized by core body temperature exceeding 104°F (40°C) and central nervous system dysfunction.[1] The condition carries mortality rates of 3–5% for exertional heat stroke (EHS) and 10–65% for classic heat stroke (CHS), with outcomes directly correlated to the speed of cooling intervention.[4] The WMS 2024 updated guidelines establish that survival depends on the speed at which core temperature can be reduced below 104°F; when cooling is achieved within 30 minutes of symptom onset, likelihood of survival is high.[1]

Two forms of heat stroke are clinically recognized. Exertional heat stroke (EHS) occurs during intense physical activity (strenuous work or athletics) and is the form most extensively studied, primarily in athletic and military populations.[5] Classic heat stroke (CHS) – sometimes referred to as non-exertional heat stroke – results from prolonged passive exposure to environmental heat and disproportionately affects older adults, individuals with chronic conditions, and those without access to cooling—profiles that overlap significantly with those of PEH and IUS.[6] CHS is the predominant presentation expected in these populations. While the underlying cooling physiology is the same for both forms, it is important to note that the evidence base for the intervention protocols reviewed in this report is derived primarily from EHS research. The translation of these protocols to CHS in community settings represents an evidence gap addressed later in this report.

PEH and IUS face dramatically elevated heat-related mortality across multiple pathways, including cardiovascular events, renal failure, and respiratory distress exacerbated by heat exposure. Research looking at two urban counties found that overall heat-attributable mortality among PEH is 10–100 times greater than in the general population and in one county nearly half of all deaths among PEH during 2015–2022 were heat-attributable.[7] In Maricopa County, 59% of all heat-related deaths in 2023 were classified as "heat-caused"—meaning environmental heat was directly listed as the cause of death—and at least 45% of all heat-related deaths occurred among PEH.[8]

Among these, cardiovascular events and heat stroke represent the most acute threats with the potential for bystander action. Heat stroke, however, stands out: with prompt treatment with cold water immersion, exertional heat stroke (EHS) can be 100% survivable.[9,10] Recent consensus statements on prehospital care further emphasize cooling by any available means while simultaneously activating EMS for rapid transfer to a center that can provide definitive care.[11] Bystander action therefore has great potential to alter outcomes in heat stroke specifically—making it the appropriate target for community-based training among the populations most at risk. Community training for recognition and rapid response to cardiac arrest and stroke are common; as extreme heat events continue to rise, so too should bystander training in heat stroke first aid.

Population-Specific Considerations: People Using Substances

Medication-Induced Thermoregulatory Dysfunction

PEH and IUS populations carry a disproportionate burden of chronic conditions — including serious mental illness, cardiovascular disease, and diabetes — and are frequently prescribed medications that may increase heat-related risk.[12] The evidence is more limited than public health messaging often suggests, but certain drug classes are well-established concerns. Anticholinergic agents — including certain antipsychotics, the widely accessible antihistamine diphenhydramine, and medications for bladder control and COPD — have the strongest evidence for impairing the body's ability to sweat and cool itself. Non-selective beta-blockers have also been shown to reduce the body's heat dissipation capacity.[13]

Other commonly prescribed medications, including diuretics, may compound risk through dehydration and electrolyte imbalance rather than directly affecting temperature regulation. Lithium, widely used for bipolar disorder, deserves particular attention: because it has a very narrow margin of safety, the dehydration that accompanies heat exposure can quickly push blood levels into a toxic range.[14] When multiple medications from these classes are taken together — as is common in this population — the combined risk is likely significant, though it remains poorly studied.

Illicit Substance-Induced Thermoregulatory Dysfunction

Methamphetamine and other stimulants profoundly impair thermoregulation through multiple mechanisms. Comprehensive reviews establish that methamphetamine causes dose-dependent hyperthermia by increasing metabolic activity, promoting vasoconstriction that prevents heat dissipation, and disrupting hypothalamic temperature control.[5] Brain temperature increases more rapidly and to higher levels than body temperature, with combined drug use and environmental heat producing synergistic effects.[16]

Centers for Disease Control and Prevention (CDC) analysis of occupational heat illness found that among 46 cases of severe hyperthermia, 9 workers who tested positive for amphetamines—including two with legal prescriptions—experienced fatal or near-fatal outcomes.[17] A 2012 study found that drugs impairing thermoregulation were present in 41.9% of patients admitted for heat stroke; these patients experienced longer hospital stays (median 9 days vs. 3 days), though mortality did not differ significantly.[18]

Hyperthermia in this population results from both central dysregulation and peripheral effects, including impaired vasodilation. Drug-induced hyperthermia encompasses five major syndromes, with sympathomimetic poisoning being directly relevant to stimulant-using populations; prompt identification of the provoking agent and immediate supportive care including external cooling are essential to mitigate potentially life-threatening sequelae.[19] Of particular concern is “overamping”—a term used in harm reduction settings to describe the constellation of negative physical and psychological symptoms associated with stimulant intoxication, which can lead to dangerous hyperthermia, seizures, stroke, and cardiac events.[20] Overamping presents a clinical picture that may closely mimic environmental heat stroke or be co-occurring with heat stroke, further complicating bystander assessment in community settings.

Differential Assessment: Heat Stroke, Overdose, and Stimulant Toxicity

For bystanders in the target population, the central diagnostic challenge is distinguishing heat stroke from stimulant intoxication, opioid overdose, and/or alcohol intoxication—conditions with overlapping presentations but different intervention priorities. Stimulant intoxication presents with altered mental status, agitation, hyperthermia, tachycardia, and diaphoresis[21]—symptoms nearly indistinguishable from heat stroke.[6] Conversely, opioid overdose and alcohol intoxication presents with altered mental status, respiratory depression and/or unconsciousness, again, with overlapping presentation to heat stroke —additionally, intoxication and/or overdose may co-occur with heat stroke in individuals exposed to environmental heat or involved in intense exertional activities.

The training videos attempt to address this challenge through a sequential assessment protocol. Because bystanders lack access to clinical tools or medication histories, the videos instruct them to use environmental context and observable signs as proxies: whether the person has been in a hot environment for prolonged periods, and whether the person is hot to the touch. The videos further instruct bystanders to assess respiratory depression first. If the person is choking, gurgling, or not breathing—and opioid overdose is suspected—the bystander is directed to immediately call 911 and administer naloxone. This prioritization reflects the clinical reality that naloxone is pharmacologically benign when administered to non-overdose patients,[22] while hypoxia secondary to opioid-induced respiratory depression causes permanent brain injury or death within minutes. Once overdose has been ruled out or addressed and hyperthermia is suspected, the bystander initiates cooling.

The epidemiologic data supports this dual-suspicion approach. A case-crossover study of over 1.3 million hospital visits in New York State found that higher ambient temperatures were associated with significant increases in substance-related disorder hospital visits.[23] Earlier research in New York City demonstrated that cocaine-related accidental overdose deaths increased significantly during weeks when average temperatures exceeded 24°C (75.2°F).[24] Arizona's heat-related death analysis found that substance use was involved in 87% of heat-related deaths among homeless individuals in 2022 and 89% in 2023, with methamphetamine detected in 93% of drug-involved cases.[25] Because opioid-induced respiratory depression causes irreversible brain injury or death within minutes while the window for heat stroke intervention is comparatively forgiving, suspicion of overdose must be assessed and addressed first — meaning naloxone administration and, when indicated, rescue breathing. This sequencing, however, introduces a practical tension that existing protocols have not resolved: a bystander performing rescue breathing cannot simultaneously initiate cooling, and the two interventions compete directly for time and attention. How bystanders should navigate concurrent overdose and heat stroke — and whether doing so is even feasible without additional responders — remains an open and urgent question.

Critical Evidence Gap: No published research addresses how bystanders should approach cases where heat stroke and intoxication or overdose may be present simultaneously. The videos' sequential approach (rule out overdose first, then initiate cooling) represents pragmatic decision-making but lacks validation. No published protocols exist for managing suspected simultaneous heat stroke and opioid overdose or stimulant overamping—conditions that the epidemiologic data suggest co-occur frequently. Research is urgently needed on recognition algorithms, intervention prioritization, and safety considerations when naloxone administration, rescue breathing, and aggressive cooling may both be indicated.

Recognition and Initial Response Protocols

Heat Stroke Recognition for Laypersons

Heat stroke symptom recognition by bystanders is critical for initiating rapid cooling. However, core body temperature measurement is rarely feasible in community settings. The videos therefore employ accessible assessment strategies: surface skin temperature (“hot to touch”) combined with altered mental status (confusion, slurred speech, stumbling, or unconsciousness). This approach aligns with expert consensus emphasizing immediate recognition without requiring rectal temperature measurement in field settings. The American Academy of Family Physicians (AAFP) clinical guidelines note that hyperthermia with altered mental status should prompt suspicion for heat stroke and that survival depends on prompt field cooling.[26]

The emphasis on altered mental status as the key differentiator is evidence-based. Central nervous system dysfunction distinguishes heat stroke from less severe heat illnesses such as heat exhaustion, which may present with similar physical symptoms but intact mentation. Research consistently identifies neurologic symptoms—including confusion, delirium, agitation, and loss of consciousness—as the hallmark of heat stroke requiring immediate intervention.[6]

Immediate Action: “Call for Help, Cool While Waiting”

Before initiating any intervention, bystanders and responders should confirm the location is safe to approach — assessing for traffic or other hazards that could incapacitate the rescuer. The videos depict a scene in which bystanders and responders have assessed the scene and action is warranted.

The repeated emphasis on immediately calling 911 before/while beginning cooling reflects established best practice across leading clinical protocols.[3] The “cool first, transport second” paradigm is now standard guidance in prehospital heat stroke management. The 2018 consensus statement on prehospital care of EHS specifically recommends that dispatchers and first responders initiate any cooling strategies immediately available to anyone suspected of having EHS, until EMS can arrive.[27] The protocols were adapted for a bystander audience to emphasize “call for help, cool while waiting” ensuring EMS is dispatched before cooling begins. This modification addresses the concern that 'cool first, transport second' could be interpreted by laypersons as an instruction to delay calling 911.

Cooling Method Protocols: Evidence Hierarchy

Cold Water Immersion

The cold-water immersion video demonstrates chest-down immersion with continuous support using a towel or shirt under the arms. This method represents the gold standard for heat stroke treatment, consistently achieving cooling rates of 0.20–0.36°C per minute—faster than any alternative method.[28] A landmark study comparing ice-water immersion (5.15°C) to cold-water immersion (14.03°C) found nearly identical cooling rates, demonstrating that cold water across a range of temperatures is effective.[29]

The SCCM 2025 guidelines provide a strong recommendation that cold-water immersion or ice-water immersion will result in the fastest rate of temperature reduction and shortest time to target temperature.[2] The videos' technique of maintaining the head above water while monitoring breathing aligns with safety recommendations across multiple guidelines.

The instruction to stop cooling when breathing and mental status return to normal and the person feels cool to the touch reflects evidence-based endpoints. The WMS recommends cooling to 38.3–38.8°C (100.9–101.8°F) to prevent hypothermic overshoot, or overcoming to the point of hypothermia.[30] Overshoot prevention is particularly important for PEH and IUS, who may be reluctant to engage EMS due to fear of law enforcement, stigma, or other barriers. Because heat stroke constitutes an acute medical emergency, the videos reiterate the importance of calling 911 regardless of these barriers. Additionally, harm reduction, patient-centric refusal of transport and referral protocols is particularly important for PEH and IUS.

Tarp-Assisted Cooling Oscillation (TACO)

The TACO method involves placing the patient on a tarp, adding cold water and ice, then oscillating the person back and forth to maximize water contact with body surface area. Original research by Miller et al. established that TACO achieves cooling rates of 0.14–0.16°C per minute in exercise-induced hyperthermia.[31] While slower than full immersion, these rates approach the recommended minimum of 0.15°C per minute established by consensus guidelines.[27]

Recent analysis of heat stroke management confirms TACO as a viable alternative when immersion is impractical, citing cooling rates of 0.14–0.16°C/min.[32] The method's portability and lower resource requirements make it particularly relevant for PEH and IUS who may lack access to bathtubs, rivers, or pools.

Evidence Gap: No studies have evaluated TACO effectiveness in field conditions with non-athlete populations. All existing research involves controlled laboratory settings or athletic events with healthy volunteers. The practical challenges of implementing TACO in outdoor environments without trained personnel remain unexamined**.** Notably, the frequent lack of access to ice in field settings underscores the need for research into the comparative effectiveness of warm, room temperature, and cool water

Evaporative Cooling with Fanning

Evaporative cooling involves removing excess clothing, pouring water on exposed skin, and continuous fanning. This method achieves cooling rates of approximately 0.05–0.10°C per minute[34]—substantially slower than immersion-based methods but significantly faster than passive cooling. A comprehensive review found that evaporative plus convective cooling may be augmented by applying crushed ice or ice packs diffusely to the body.[34]

Theoretical modeling demonstrates that in combination with misting, increasing wind speed from 0.5 m/s to 1.0 m/s significantly reduces time to reach target temperature, even at elevated ambient temperatures.[35] The videos' instruction to continuously reapply water and maintain fanning aligns with this evidence base.

A systematic review of 247 patients treated with evaporative cooling techniques confirmed effectiveness, though conductive methods (immersion) demonstrated superior outcomes in younger patients.[36] Evaporative cooling's value lies in its universal availability: water and any makeshift fan—cardboard, clothing, or other improvised materials—can be sourced in most settings.

Resource-Stratified Approach: Evidence and Rationale

The decision to present three distinct cooling methods reflects evidence that "use what you have" approaches are essential for community-acquired heat stroke where medical resources are unavailable.[11] The StatPearls manual on EMS cooling methods emphasizes that the definitive treatment for heat-related illness is total body cooling by whatever means available, with conduction (immersion) and evaporation being the two primary modalities.[37] This tiered approach is particularly critical for PEH and IUS who may lack access to conventional cooling resources.

Population-Specific Considerations: People Experiencing Homelessness

Amplified Risk Factors

PEH face multiple compounding risk factors that dramatically increase heat stroke vulnerability. Research in Maricopa County found that approximately one-third of outdoor heat-associated deaths occurred among homeless individuals, with unsheltered homelessness increasing from 18% to 29% of the homeless population between 2014 and 2016.[38] Analysis by the *Washington Post* found that homeless individuals are 27 times more likely to visit emergency departments for heat illness than the general population.[39]

Heightened vulnerability stems from continuous heat exposure, lack of cooling access, higher rates of chronic medical conditions, substance use, and medications that impair thermoregulation.[40] Urban heat island effects further compound risk, as most heat-related deaths among homeless individuals occur outdoors in densely built environments where surface temperatures exceed those of surrounding areas.[41]

Additional studies document that PEH with heat stroke face complex clinical presentations, prolonged hospitalizations (26 days in one reported case), and substantial economic burden.[42] Yet prevention and early intervention resources remain dramatically under-allocated for this population.

Relevance of Resource-Adaptive Protocols

The video series' emphasis on accessible and outdoor-compatible cooling methods—immersion, TACO, and evaporative cooling—directly addresses the reality that most heat deaths among homeless populations occur outdoors. Traditional cold-water immersion requiring bathtubs is often inaccessible to PEH, making alternative methods essential for this population.

Refusal of Transport and Referral

When an individual experiencing an HRI declines transport to an emergency department, common amongst PEH and IUS due to institutional distrust, fear of legal consequences, or concern about losing belongings—responders and bystanders should continue rapid cooling until mentation returns to normal. In addition to following agency protocols, EMS (and bystanders) should offer alternative options for medical support, including warm referral to low-barrier, trusted medical settings such as Healthcare for the Homeless programs, street medicine teams, mobile outreach units, federally qualified health centers, or free and charitable clinics. These settings are better positioned to provide culturally informed care and monitor for delayed HRI sequelae, including renal injury and neurological recovery.

If no medical options are available and transport is declined, responders should support the individual in reaching a cooling shelter or other cooled location where water is accessible and others are present to intervene if symptoms progress and/or further medical emergency arises. Bystanders and responders should communicate clearly and non-coercively that heat stroke and serious heat exhaustion can cause organ injury that may not be immediately apparent, and that medical follow-up in the hours and days after an HRI event remains important even when the individual feels recovered. This message is more likely to be accepted when delivered by trusted intermediaries such as community health workers, peer navigators, or outreach staff already known to the individual.

Critical Evidence Gap: The guidance on refusal of transport and warm referral is grounded in general principles of trauma-informed, patient-centered care and practical harm reduction rather than in specific clinical evidence or established legal frameworks governing EMS refusal of transport for this population. This gap reflects a broader absence in the literature: no published studies specifically evaluate bystander cooling interventions for heat stroke in homeless populations, and while heat literature consistently identifies PEH as a high-risk group, it provides no tailored guidance on adapting evidence-based protocols for the specific constraints of unsheltered living.

Guidelines developed for athletes and military personnel may not translate effectively to individuals with chronic health conditions, limited social support, and barriers to healthcare access such as stigma and lack of resources. Research is urgently needed to evaluate the outcomes of alternative referral pathways for PEH and IUS following HRI, and findings should inform both evidence-based clinical protocols and the legal or regulatory frameworks that govern EMS refusal of transport for this population.

Implementation Recommendations and Evidence Gaps

Strengths of the Video-Based Approach

The video series attempts to translate complex medical protocols into actionable bystander interventions. Research on reduced-resource methods of emergency instruction for laypersons demonstrates that video self-instruction produces equivalent skill performance to traditional instructor-led classroom training, supporting the use of video as an effective and scalable modality for bystander education.[44] The simplified recognition criteria ("hot to touch" plus altered mental status) balance sensitivity with practical applicability. The resource-stratified approach acknowledging that any available cooling method should be employed is evidence-aligned and appropriate for the target populations.[11]

The "call for help, cool while waiting" messaging directly reflects current expert consensus and addresses the critical reality that delayed cooling correlates with mortality.[11] Emphasizing immediate action by any available means may reduce the adverse outcomes documented in populations with limited healthcare access.

Identified Evidence Gaps Requiring Research

1. **Protocols for People Experiencing Homelessness**. No published studies evaluate heat stroke interventions specifically designed for or tested in homeless populations, despite their dramatically elevated risk. Research is needed on optimal cooling methods for outdoor settings, limited access to cooling tools and resources, barriers to EMS utilization, and the complex medical and social context of homelessness.

2. **Substance Use and Heat Stroke Management**. While substantial literature documents that stimulants increase heat stroke risk, no protocols exist for managing suspected drug-induced hyperthermia in community settings. Key questions include: How should bystanders differentiate stimulant toxicity, opioid, or alcohol toxicity from environmental heat stroke? Should cooling protocols be modified when drug use is suspected?

3. **Simultaneous Overdose and Heat Stroke**. This scenario—highly plausible given the epidemiologic overlap—has received no research attention. Critical questions include: What are the safety implications of naloxone administration in a severely hyperthermic patient? Should cooling be delayed, administered simultaneously, or sequenced with overdose management? What guidance should be provided to 911 dispatchers receiving such calls?

4. **Bystander Cooling Effectiveness in Field Conditions**. Most research on cooling methods involves controlled settings with healthy volunteers, military personnel, or athletic events with medical personnel present. Real-world effectiveness of bystander-initiated cooling in community settings, utilizing realistically available resources, and with medically complex, vulnerable populations remains understudied.

5. **Core Body Temperature Assessment in Community Settings**. Clinical guidelines emphasize rectal temperature as the gold standard for diagnosis,[3] yet the videos appropriately omit this measurement due to practical, ethical, and privacy barriers in public settings. Research validating “hot to touch plus altered mental status” as a bystander diagnostic criterion would strengthen the evidence base for community-based heat stroke identification.

Conclusion

The four-video bystander training series presents evidence-based heat stroke intervention protocols appropriately adapted for layperson use with vulnerable populations. Each demonstrated cooling method—cold water immersion, TACO, and evaporative cooling—has established efficacy in the medical literature, with cooling rates spanning from the gold-standard immersion[29] to the more modest but clinically meaningful evaporative.[33]

The videos’ emphasis on immediate recognition, 911 activation, and “call for help, cool while waiting” aligns with current expert consensus from NATA,[3] the WMS,[1] and SCCM.[2] The inclusion of overdose assessment acknowledges the documented epidemiologic reality that 87–89% of heat deaths among homeless individuals involve substance use.[25]

Critical evidence gaps persist. No published research specifically addresses heat stroke protocols for PEH, despite their 10–100-fold elevated mortality risk.[7] No guidance exists for bystanders managing suspected simultaneous heat stroke and overdose. No studies validate the safety and effectiveness of field cooling interventions in these high-risk populations. These gaps represent urgent research priorities given the accelerating climate crisis, rising stimulant use, and persistent housing instability affecting millions of Americans.

These protocols represent a meaningful step toward community-based heat stroke training for populations at disproportionate risk. The academic and clinical communities must now generate the evidence base to fully support and optimize these interventions. Until such research exists, they reflect the best available translation of heat physiology, athletic medicine, and military medicine evidence to the community context — and may prove lifesaving for populations experiencing some of the highest heat-related mortality in the country.

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