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Tactical EMS Zonal Framework for Health Security Operations-An Updated Review

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Abstract

Background: High-threat incidents such as active shooter events, terrorism, hazardous materials exposure, and mass casualty incidents pose significant risks to both patients and responders. Emergency Medical Services (EMS) require structured operational frameworks to balance effective medical care with responder safety. The zonal approach—Hot, Warm, and Cold zones—has emerged as a critical model for organizing tactical medical response in dynamic environments.

Aim: This review aims to examine the Tactical EMS zonal framework and its application in health security operations, highlighting clinical priorities, operational roles, and evidence-based practices across Hot, Warm, and Cold zones.

Methods: A narrative review was conducted of established tactical medicine doctrines, including the National Incident Management System (NIMS), Tactical Combat Casualty Care (TCCC), Tactical Emergency Casualty Care (TECC), and the Hartford Consensus. Zone-specific operational characteristics, medical interventions, and responder safety principles were synthesized.

Results: The Hot Zone is characterized by immediate danger, permitting only essential life-saving interventions such as hemorrhage control and rapid evacuation. The Warm Zone allows expanded but time-limited care guided by the MARCH algorithm, often utilizing Rescue Task Force models and casualty collection points. The Cold Zone provides a secure environment for comprehensive assessment, formal triage, definitive stabilization, documentation, and coordinated transport. Integration of TECC principles aligns zone-based care with civilian EMS practice, improving survival while reducing responder risk.

Conclusion: The Tactical EMS zonal framework provides a structured, adaptable approach to medical management in high-risk incidents. Clear zone designation, adherence to evidence-based protocols, and interagency coordination are essential to optimize patient outcomes and responder safety.

Key Words: Tactical EMS, Zones of Care, Hot Zone, Warm Zone, Cold Zone, TECC, TCCC, MARCH Algorithm, Mass Casualty Incidents.

Introduction

Emergency Medical Services (EMS) zones of care—commonly designated as Hot, Warm, and Cold—are critical frameworks for managing high-risk, dynamic, and tactical incidents in which ongoing or potential threats are present. These zones are applied in various scenarios, including active shooter events where immediate gunfire endangers multiple individuals requiring rapid hemorrhage control and evacuation, terrorist attacks such as bombings or mass stabbings with residual hazards, and hostage situations in which law enforcement secures the environment while medical interventions are staged. Additional applications include incidents involving explosions or structural collapses, where secondary threats such as fire, gas leaks, or unstable infrastructure are present, as well as riots, civil unrest, and mass casualty events necessitating operations within hazardous environments. Hazardous materials (HAZMAT) exposures, including chemical, biological, radiological, or nuclear events, also demand the use of zonal care to ensure responder safety while delivering essential medical treatment. Within the prehospital domain, EMS zones of care establish defined areas differentiated by threat exposure and the level of medical intervention feasible. These zones inform the deployment of personnel, allocation of resources, and

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prioritization of patient care according to environmental risk. While terminology may vary across agencies, standardizing zone definitions enhances interprofessional coordination and operational efficiency. The National Incident Management System (NIMS) categorizes incident scenes into Hot, Warm, and Cold zones, each corresponding to escalating levels of safety and medical capability [1]. The Hot Zone represents areas of immediate danger, where only critical, life-saving interventions—predominantly hemorrhage control—are performed. The Warm Zone denotes areas of reduced but ongoing threat, permitting the implementation of more advanced interventions. The Cold Zone is considered secure, allowing for comprehensive EMS treatment and patient transport.

The development of Tactical Combat Casualty Care (TCCC) in the early 1990s provided an evidence-based approach to trauma management in battlefield environments [2]. Combat experience from 2001 to 2015 in Iraq and Afghanistan significantly informed TCCC guidelines, refining practices for hemorrhage control, airway management, and resuscitation under fire [3][4][5][6]. Recognizing the relevance to civilian law enforcement operations, the Committee for Tactical Emergency Casualty Care (TECC) convened in 2010 to adapt these principles for domestic EMS applications. Published in 2011, TECC guidelines introduced three phases of tactical care—Direct Threat Care, Indirect Threat Care, and Evacuation Care—that align directly with the NIMS Hot, Warm, and Cold zone structure. The Hot Zone corresponds to Direct Threat Care, where immediate danger limits interventions to life-saving measures. The Warm Zone aligns with Indirect Threat Care, permitting controlled interventions while ongoing risk is present. The Cold Zone encompasses Evacuation Care, where patients can safely receive definitive treatment. The Hartford Consensus, developed following the 2012 Sandy Hook shooting and formalized in 2013, further emphasized the operational importance of coordinated medical response during mass casualty incidents. Spearheaded by the American College of Surgeons Committee on Trauma, the Hartford Consensus introduced the THREAT framework, which prioritizes Threat suppression, Hemorrhage control, Rapid extraction to safety, Assessment by medical providers, and Transport to definitive care [7][8][9][10]. The incorporation of these principles into EMS practice underscores the need for structured, zone-based tactical care strategies. Zone designation is influenced by numerous factors, including the type of emergency, presence of hazardous materials, and potential involvement of weapons of mass destruction. The Hot (Red), Warm (Yellow), and Cold (Green) zones each possess specific operational characteristics and treatment protocols. Local, state, and national EMS units often integrate TECC recommendations into their tactical response strategies, ensuring consistent, evidence-based care across a variety of high-threat environments. Understanding and applying EMS zones of care allows for effective risk mitigation for both responders and patients while optimizing clinical outcomes during high-intensity incidents.

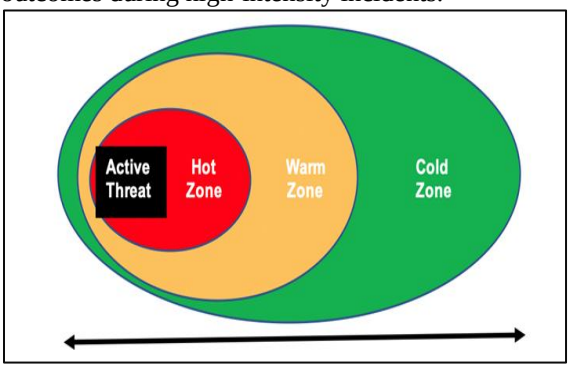

Fig. 1: Zones of Care.

Issues of Concern

The Hot Zone, often referred to as the Red Zone, constitutes the area of greatest danger during tactical or disaster incidents, characterized by the presence of active threats, including gunfire, explosive devices, or hazardous materials (HAZMAT). Within this environment, the operational priority is the preservation of life through rapid threat suppression, prevention of additional casualties, and immediate evacuation of injured individuals to a relatively safer area. The inherent dangers in this zone severely limit the scope of medical intervention, restricting it primarily to life-saving measures such as the control of exsanguinating hemorrhage. Any intervention beyond this is considered secondary to the imperative of rapid extraction due to the substantial risk posed to both responders and patients [11]. Access to the Hot Zone is generally restricted to law enforcement personnel and specialized tactical EMS providers who are trained to operate under extreme threat conditions. Entry into this zone necessitates the use of protective body armor, and in some operations, may require armed escort to ensure responder safety. The limited medical care performed within the Hot Zone is narrowly focused, with immediate hemorrhage control—such as direct pressure or tourniquet application—being the primary permissible intervention [11]. Providers operating in this zone must maintain high mobility, carrying only essential medical supplies to facilitate rapid movement and minimize exposure to active threats. In scenarios involving HAZMAT agents, the Hot Zone expands according to environmental conditions, including wind patterns, topography, and the chemical, biological, or radiological properties of the contaminants. Responders must don the highest level of personal protective equipment, such as Level A suits, to reduce the risk of exposure while performing critical extraction and initial life-saving interventions [12][13]. The overriding medical objective in the Hot

Zone is the swift relocation of both patient and provider to a safer area, where comprehensive medical evaluation and treatment can occur without the constraints imposed by the active threat environment [14][15]. Operational protocols emphasize that delaying evacuation for non-critical interventions in this zone can significantly increase the risk of mortality for both patients and responders. Effective training, situational awareness, and coordination with tactical units are essential to mitigate risks and ensure that life-saving measures are delivered efficiently within the constraints of the Red Zone.

Warm Zone

The Warm Zone, often referred to as the Yellow Zone or Tactical Field Care Zone, represents a transitional operational area in which the risk to both patients and responders is reduced compared with the Hot Zone, yet remains significant. This zone is established in any setting where danger is possible but not immediate, providing an environment in which medical providers can perform interventions beyond the most basic life-saving measures while still maintaining situational awareness and readiness to evacuate if threats escalate (Callaway, 2020). Unlike the Hot Zone, where care is predominantly delivered by law enforcement or tactical EMS units under extreme threat, the Warm Zone allows for the integration of civilian EMS personnel through coordinated tactical strategies, notably the Rescue Task Force (RTF) concept. The RTF model involves a secondary wave of law enforcement securing a path for EMS providers, thereby reducing response times and enabling access to casualties who cannot be safely reached from the Hot Zone alone [16][17][18]. Despite the reduced threat level, time in the Warm Zone should be carefully managed, as hazards may persist, and extended exposure increases risk. Medical care in this environment focuses on immediate life-saving procedures guided by structured protocols, particularly the MARCH algorithm, widely applied in Tactical Combat Casualty Care (TCCC) and Tactical Emergency Casualty Care (TECC) frameworks. The MARCH protocol prioritizes interventions in a systematic sequence: massive hemorrhage control, airway management, respiratory support, circulatory stabilization, hypothermia prevention, and head injury assessment [19]. Massive hemorrhage is addressed through rapid application of tourniquets, direct pressure, wound packing, pressure dressings, or hemostatic agents. Airway interventions may include jaw-thrust and chin-lift maneuvers, nasopharyngeal airway placement, recovery positioning, supraglottic device insertion (King LT™, LMA™, iGel™), orotracheal or nasotracheal intubation, and surgical cricothyroidotomy when necessary. Oxygen supplementation is provided where feasible.

Respiratory assessment and management involve placement of vented chest seals for open pneumothoraces and needle decompression or finger thoracostomy for tension pneumothorax. Circulatory support requires evaluation for shock, establishment of intravenous access, permissive hypotension protocols (maintaining systolic blood pressure >80 mm Hg or >110 mm Hg in cases of suspected or confirmed traumatic brain injury), and administration of tranexamic acid where indicated. Hypothermia prevention in this zone is critical; patients should remain covered, warm, and dry, and intravenous fluids should be warmed to prevent heat loss. Head injury management includes ongoing neurological assessment, ensuring adequate oxygenation and ventilation, maintaining systolic blood pressure targets, elevating the head when feasible, and immobilizing the spine as required. Interventions in the Warm Zone necessitate a balance between providing definitive life-saving care and maintaining operational security. Providers must remain alert to changing threats, optimize patient stabilization, and coordinate evacuation to the Cold Zone or other secure areas for advanced care. By employing the MARCH algorithm and structured tactical strategies, care delivered in the Warm Zone improves survival outcomes while minimizing additional risk to both patients and responders. The success of medical operations in this zone depends on the integration of tactical awareness, rapid assessment skills, and adherence to evidence-based intervention protocols, reflecting a critical interface between EMS capabilities and tactical operations in high-risk scenarios.

Warm Zone Management

In the Warm Zone, medical operations focus primarily on life-threatening injuries, while non-critical interventions are deferred until the patient reaches a secure area. Management of casualties in this transitional environment requires careful coordination between tactical considerations and medical priorities, ensuring patient stabilization while maintaining responder safety. The establishment of a casualty collection point (CCP) is a central component of Warm Zone operations. The CCP functions as a centralized location for patients evacuated from the Hot Zone who require continued assessment and life-saving interventions. Rapid and efficient creation of a CCP enables triage and prioritization of casualties while reducing congestion and preventing delays in care, especially when multiple casualties are involved [20]. Hemorrhage control remains the highest priority in the Warm Zone. Medical personnel must reassess previously applied tourniquets for effectiveness and ensure reinforcement or application of additional tourniquets as necessary. Wound packing with pressure dressings or hemostatic gauze combined with direct pressure is routinely employed for sites not suitable for

tourniquet placement. Reassessment of the patient is crucial to identify any unrecognized or newly emergent hemorrhage, as ongoing bleeding may not be initially apparent during rapid extraction from the Hot Zone [20]. Airway management in the Warm Zone emphasizes expedience and practicality. Basic maneuvers, including chin lifts and jaw thrusts, are used to maintain airway patency, while nasopharyngeal airway insertion may be employed as a rapid adjunct. In cases of severe airway compromise where advanced airway techniques are required, cricothyroidotomy is generally preferred over endotracheal intubation due to its speed, relative safety, and effectiveness in high-threat environments [20]. Respiratory compromise due to tension pneumothorax should be treated promptly with needle decompression, followed by frequent reassessments to confirm resolution. For open chest wounds, vented chest seals are recommended over unvented designs based on evidence from both animal studies and updated international guidelines. Continuous monitoring for secondary tension pneumothorax is essential, with interventions provided as indicated [21][22][23].

Additional supportive care in the Warm Zone includes measures to prevent hypothermia and treat shock. Rewarming techniques and judicious administration of intravenous fluids may be applied when feasible, maintaining physiological stability until patients can be evacuated to the Cold Zone. Non-life-threatening injuries, such as fractures, burns, or minor lacerations, are deferred to ensure that limited time and resources are directed toward interventions with immediate survival benefit. Formal triage is typically not conducted in the Warm Zone; ambulatory patients should be directed to the Cold Zone, bypassing intermediate interventions, while critically injured patients receive focused, time-sensitive care at the CCP. The fluid nature of the Warm Zone necessitates continuous situational awareness and adaptability. Threats may escalate suddenly, requiring rapid cessation of ongoing procedures and immediate evacuation of both patients and providers to safer areas. In cases involving hazardous materials (HAZMAT), enhanced personal protective equipment may be required to ensure provider safety during both medical care and decontamination procedures. Effective Warm Zone management relies on balancing rapid, evidence-based interventions with tactical safety, maintaining a dynamic approach that prioritizes life-saving care while minimizing exposure risk.

Cold Zone

The Cold Zone, also referred to as the Green Zone or Casualty Evacuation Zone, represents the area of highest safety within a tactical or mass casualty incident. In this zone, medical personnel can deliver comprehensive care without the immediate threats present in Hot or Warm Zones. Establishing a structured treatment area within the Cold Zone is essential for the systematic management of casualties, serving both ambulatory patients who self-extricated from the Hot Zone and nonambulatory patients evacuated from Warm Zone casualty collection points (CCPs). The controlled environment allows for organized patient assessment, resuscitation, and stabilization before transport to definitive care facilities [20]. Formal triage is a central activity in the Cold Zone. Ambulatory patients may present with injuries that were initially undetected during self-extraction, whereas nonambulatory patients often require reassessment of interventions initiated under high-stress conditions in previous zones. Standardized triage methods ensure that all patients are evaluated accurately, with resources allocated appropriately to prioritize those with the most critical needs. In mass casualty incidents, this process becomes even more critical, as lower-acuity patients may be transported to more distant facilities to prevent overwhelming local hospitals. Effective triage in the Cold Zone enables optimal use of limited resources while maximizing patient survival [20].

Care delivery in the Cold Zone follows established EMS protocols. Interventions include comprehensive airway management, fluid resuscitation, wound care, and stabilization of fractures or other non-life-threatening injuries. In contrast to the rapid, focused interventions of the Hot and Warm Zones, Cold Zone care allows for detailed monitoring and the application of standard clinical procedures. Continuous reassessment is essential; tourniquet effectiveness must be verified, airway devices checked, and needle decompression sites evaluated for proper function. Staff should document all interventions meticulously to ensure continuity of care during transport, particularly as receiving transport teams may be unfamiliar with tactical medicine procedures [20]. Coordination with regional healthcare systems is vital in the Cold Zone. Patient tracking must span hospitals, EMS units, and first responders to maintain situational awareness and facilitate family reunification. Technology, such as barcode systems or facial recognition, can improve accuracy in patient identification and streamline communication across multiple agencies. Clear, concise communication regarding interventions performed and ongoing patient needs ensures that subsequent medical teams can continue care effectively without delays or errors. Evacuation logistics must be continuously managed, prioritizing rapid transport for critically injured patients while optimizing distribution to prevent overcrowding at receiving facilities [20]. Although the Cold Zone is generally considered safe, responders must remain vigilant for unforeseen operational hazards. Environmental threats, equipment failures, or secondary incidents can occur, and personnel must be prepared to respond appropriately. Overall, the Cold Zone serves as a critical component of tactical EMS

operations, providing a controlled environment for patient stabilization, detailed assessment, and coordination with transport and receiving facilities. By integrating formal triage, structured reassessment, and careful documentation, medical teams can ensure that casualties receive the highest standard of care while maintaining operational efficiency and patient safety [20].

Clinical Significance

The concept of zones of care holds critical importance in tactical and high-threat emergency medical operations, as these zones define the framework for provider safety and patient care. Each zone—Hot, Warm, and Cold—carries unique challenges, risks, and operational requirements. The fluidity of these zones demands continuous situational awareness, as environmental conditions, operational developments, and emergent threats can dynamically shift the boundaries. A location classified as relatively safe may rapidly deteriorate into a Hot Zone, necessitating immediate adaptation in both medical priorities and personnel deployment [20]. Responders must be trained to assess these changes in real-time, evaluating not only patient needs but also the level of risk to themselves and other personnel. In practice, the Hot Zone represents the area of immediate danger where active threats, such as gunfire, explosives, or hazardous materials, are present. Interventions in this zone are deliberately limited to essential life-saving actions, primarily hemorrhage control, while rapid extraction to the Warm Zone is prioritized. The decision to enter or operate within a Hot Zone is guided by a risk–benefit analysis, ensuring that the potential benefit to the patient outweighs the danger to the responder [20]. Personnel deployed into this environment must maintain high mobility, carry only critical equipment, and operate with protective gear appropriate to the threat, such as body armor or specialized chemical protective suits. These measures reduce the likelihood of additional casualties among both providers and patients.

The Warm Zone serves as an intermediate area where the risk is reduced but still present. It functions as the primary area for tactical field care, including life-saving interventions such as airway management, treatment of tension pneumothorax, and advanced hemorrhage control using the MARCH algorithm. The establishment of casualty collection points (CCPs) in this zone allows for centralized triage and monitoring, optimizing care for patients evacuated from the Hot Zone while minimizing exposure for medical personnel. The fluidity of the Warm Zone requires responders to perform rapid assessments, apply critical interventions, and be prepared for immediate evacuation to the Cold Zone should the threat escalate [20]. The Cold Zone represents the safest environment within the incident scene, where comprehensive care, formal triage, and preparation for transport can occur without immediate risk to responders. Here, EMS teams can perform detailed evaluations, reassess prior interventions, and stabilize patients for evacuation to definitive care facilities. Coordination with hospitals, transport services, and first responders is essential, as is the accurate tracking of patient information to facilitate continuity of care and family reunification [20]. The clinical significance of zones of care lies in their structured approach to risk management and patient prioritization. By adhering to zone-specific protocols, responders can maximize patient benefit while minimizing operational hazards. Rapid and efficient transitions from the Hot Zone to the Warm and ultimately the Cold Zone ensure that patients receive timely, appropriate care while preserving responder safety. This structured methodology is particularly vital in mass casualty incidents, active shooter events, and hazardous material exposures, where mismanagement of zones can result in additional casualties or delayed medical intervention. In essence, understanding and operationalizing the principles of zones of care ensures both effective trauma management and the safety of personnel in complex and high-threat environments [20].

Conclusion:

The Tactical EMS zonal framework represents a cornerstone of modern health security and emergency response in high-threat and complex operational environments. By categorizing incident scenes into Hot, Warm, and Cold zones, this model establishes clear boundaries for medical intervention based on risk level, allowing responders to prioritize both patient survival and provider safety. The evidence reviewed demonstrates that limiting care in the Hot Zone to immediate, life-saving actions—primarily hemorrhage control—while emphasizing rapid extraction significantly reduces preventable mortality without increasing responder exposure. The Warm Zone functions as a critical interface between tactical operations and medical care, enabling the application of structured, high-impact interventions guided by the MARCH algorithm. The use of casualty collection points and Rescue Task Force concepts improves casualty access and treatment efficiency while maintaining situational awareness. In contrast, the Cold Zone provides the controlled environment necessary for formal triage, comprehensive reassessment, documentation, and coordination with regional healthcare systems. Ultimately, the effectiveness of zone-based EMS operations depends on continuous training, interagency communication, and adaptability to evolving threats. As incidents remain fluid and unpredictable, consistent application of zonal principles ensures that life-saving care is delivered rapidly, safely, and efficiently. The Tactical EMS zonal framework therefore remains essential for

optimizing outcomes during mass casualty incidents, active threats, and hazardous material emergencies.

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