

Enhancing Exertional Heat Stroke Patient Care: Where are We Now and Where do we Need to Go?

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***Note: Table 1 can be found at the end of the article.

Abstract:

Despite progress in prevention, recognition and treatment, exertional heat stroke (EHS) persists across multiple levels of sport and physical activity, and society remains burdened with preventable deaths. In most EHS-related deaths, an absence of appropriate healthcare, failure to properly recognise and diagnose the condition, and either lack of knowledge or resistance to using best practices are contributing factors responsible for catastrophic outcomes. The purpose of this editorial is to discuss the current landscape related to EHS management, followed by strategies to enhance patient outcomes.

Keywords: exertional heat stroke | physical education | sports education | EHS management

Article:

Despite progress in prevention, recognition and treatment, exertional heat stroke (EHS) persists across multiple levels of sport and physical activity, and society remains burdened with preventable deaths. In most EHS-related deaths, an absence of appropriate healthcare, failure to properly recognise and diagnose the condition, and either lack of knowledge or resistance to using best practices are contributing factors responsible for catastrophic outcomes. The purpose of this editorial is to discuss the current landscape related to EHS management, followed by strategies to enhance patient outcomes (box 1).

Where are we now?

Proper management of EHS is predicated on (1) assessment of hyperthermia (>40.5°C) via validated assessments of internal body temperature and (2) rapid, whole-body cooling.^{1–4} EHS treatment is grounded in organ preservation, where prompt diagnosis and treatment optimise patient outcomes.⁵ However, despite the breadth of research related to the various facets of EHS care, inconsistencies within healthcare perpetuate.

The variability in adopting and implementing standards of practice within and across healthcare professions impedes progress. While proper management of EHS is within the training, education and scope of practice among sports medicine,³ emergency medicine¹ and military medical providers,⁶ it is not commonplace among other healthcare professions who may also be involved in the prehospital care of an EHS patient. Myths and misconceptions surrounding the accurate assessment of internal body temperature and rapid body cooling⁷ further contribute to the mismanagement of EHS care within healthcare. Common errors include using methods of body temperature assessment (eg, oral, axillary or tympanic) that differ from rectal thermometry, the decision to transport the patient to a higher level care facility prior to the initiation and completion of onsite treatment, and using cooling modalities that offer insufficient cooling rates to rapidly reduce internal body temperature. Furthermore, among healthcare professions where EHS management is within the respective profession's scope of practice, effective implementation of steps to ensure survival remains concerning.^{8 9}

Time: tissue paradigm

Given the discrepancies observed in healthcare concerning the proper management of EHS, we should look to successes in other aspects of healthcare, such as stroke and sudden cardiac arrest, to mirror their messaging and awareness efforts for improved patient outcomes. The paradigm of time being equivalent to tissue is supported by the successful outcomes associated with rapid onsite treatment of cardiac arrest or EHS initiated at the site of injury. Healthcare professionals treating EHS should apply the same urgency they would apply to a patient suffering from a stroke or cardiac arrest.

Where do we need to go? Standardising EHS care within healthcare

Given the expansive body of literature supporting successful EHS outcomes when properly managed, continued efforts are needed to ensure evidence-based and patient-centred care remains the focus of EHS management. Optimising EHS patient outcomes requires access to trained healthcare providers that are onsite at locations where EHS is likely to occur. The absence of onsite trained healthcare personnel can place individuals exercising in hot environments at risk by delaying proper treatment as care of EHS will be left in the hands of people with limited medical expertise (eg, coaches). Sports coaches and administrators should carefully weigh the risks of potential catastrophic injuries, costs and benefits associated with hosting a sporting event without proper medical coverage trained in the management of sport-related injuries, including EHS.

Further, efforts are needed to address the within and across profession disparities related to the utilisation of EHS care best practices. This is important when considering differences in credentialing, training, qualifications and scope of practice among healthcare providers in different countries. Identification of these issues is paramount to ensure patient care is upheld. There is a critical need for developing strategies around (1) required continuing education that is targeted to provide EHS-specific training for all healthcare providers and (2) adoption and implementation of policies and procedures among governing bodies requiring the utilisation of EHS best practices at all levels of the organisation. Table 1 highlights actionable solutions toward improving equity in the delivery of proper EHS care across healthcare.

Box 1 Key recommendations to enhance patient outcomes from exertional heat stroke (EHS)

Preparedness

- All local, regional, national and international sport organisations should require the adoption and implementation of contemporary, evidence-based best practices for the prevention, management and care of EHS.
- For all sanctioned sporting events (ie, both training and competition) where there is a risk of EHS (eg, hot environmental conditions, intense exercise, equipment laden sports), appropriate healthcare providers trained in the management and care of EHS should provide onsite medical coverage.

Management and care

- When a patient presents with altered mental status during or following physical activity where EHS is suspected, assessment of internal body temperature after confirmation of intact circulation and airway using rectal thermometry is warranted.
- On confirmation of a rectal temperature $>40.5^{\circ}\text{C}$ and accompanying altered mental status, onsite care is required using whole-body cooling methods (eg, cold water immersion, tarp-assisted cooling).
- Following onsite treatment, patients should be transported to a higher-level healthcare facility for further monitoring and testing.

Interprofessional and transprofessional educational programmes and training opportunities may assist in elevating patient-centred EHS management and care across healthcare by having trained providers share their content expertise with others. This is exemplified through the efforts to prepare the medical volunteers on EHS management and care ahead of the Tokyo 2020 Olympic and Paralympic Games. In addition to the release of an International Olympic Committee consensus statement on the prehospital care of EHS,¹⁰ Japanese medical volunteers, many of whom had little knowledge and training in out-of-hospital EHS care,⁹ were provided hands-on training prior to the games to ensure standardisation across all providers, venues and events; training of which proved successful throughout the duration of the games with zero cases of EHS-related hospitalisation due to the expeditious care provided to athletes.

We must implore sporting organisations to take decisive action supporting medical efforts to protect athlete health and safety in a warming world. We should not wait until EHS is viewed as an unsurmountable problem when effective strategies could have been in place a priori. The standardisation and globalisation of EHS-specific education and training, coupled with the implementation of appropriate policies and procedures are actionable and attainable solutions to optimise and save lives today and into the future.

Table 1 Actionable solutions to drive progress in the management and care of exertional heat stroke (EHS)

Barriers	Solutions	Action items
(1) Lack of education and training on EHS best practices.	<p>(1.1) Identify interprofessional and transprofessional gaps in EHS-related education and training.</p> <p>(1.2) Develop targeted educational programming that provides: (A) didactic knowledge on EHS management and care and (B) hands-on training to healthcare professionals to ensure competency of the necessary skills.</p> <p>(1.3) Provide multimodal opportunities for healthcare professionals to obtain necessary EHS education and training.</p>	<p>(1.1) Evaluate gaps in knowledge and if existing gaps in knowledge and training are a result of educational curriculum or continuing education offerings.</p> <p>(1.2a) Educational programming should be designed in a manner that promotes retention of knowledge and empowerment to utilise newly learnt skillsets in one's clinical practice.</p> <p>(1.2b) Healthcare professions should consider implementing interprofessional education into academic degree programmes and/or continuing education requirements that prioritise knowledge dissemination and hands-on training on sport-related injury topics (eg, EHS).</p> <p>(1.3) Identify methods and modes to deliver education and training (eg, learning laboratories conducted in conjunction with professional conferences, workshops delivered to healthcare providers among a specific sport organisation, team, geographical region, sporting event, and use of role-play and scenario-based learning to facilitate the translation of knowledge to clinical practice).</p>
(2) Lack of qualified healthcare professionals to manage and care for EHS in the prehospital setting.	<p>(2.1) Determine healthcare professions where EHS management and care is within scope of practice.</p> <p>(2.2) Expansion of relevant healthcare professionals' scope of practice to include EHS management and care.</p>	<p>(2.1) Geographical and regulatory (eg, licensing) requirements may prohibit the implementation of all aspects of EHS care (eg, rectal thermometry, cold water immersion) among certain healthcare professions that are responsible for providing healthcare services to athletes.</p> <p>(2.2) Identification of strategies and processes to incorporate EHS management and care into healthcare professionals' scope of practice while accounting for differences in accreditation, licensing, and regulatory requirements (ie, between professions, between countries/jurisdictions).</p>
(3) Lack of adoption and implementation of best practice policies.	(3.1) Development of policies and procedures and emergency action plans to facilitate adoption of best practices.	(3.1) Development of templates to facilitate uptake of all best practice information easily by organisations. This strategy is an important step to support organisations to consider these strategies prior to a high risk event and also to ensure all best practices are included in written documents.

(Table 1 continued)

(3.2) Develop proactive emergency planning processes to allow for the implementation of written strategies to prevent and manage EHS events.

(3.2) Promoting emergency planning for EHS as an essential step for a sports medicine programme allows programmes to demonstrate a shared mindset where all key stakeholders are involved in the development and implementation of EHS best practice adoption.

(4) Infrastructure (eg, physical, procedural, personnel) does not support EHS risk reduction best practices.

(4.1) Develop and implement procedures and strategies to mitigate risk associated with EHS (eg, environmental monitoring, implementing strategies to reduce heat stress, protocols providing direction on the triage, prehospital, and post-treatment care of EHS, and coordination of onsite and community-based medical services).

(4.1a) It is imperative that all EHS-related risk mitigation strategies are understandable and implementable by all stakeholders. It is also important to consider development of alternative risk mitigation strategies (eg, alternative cooling strategies, stand-by medical providers) that may serve as a redundant back-up option in the event of an organisational or procedural failure or volume overload.

(4.1b) Organisations vying for selection to host major sporting events (eg, Olympic and Paralympic Games, World Cups, World Championships) should be required to adhere to best practices for the prevention, recognition, and treatment of EHS. Adherence to these best practices should be outlined as part of the selection process.

Ethics statements

Patient consent for publication

Not applicable.

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Footnotes

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