Korey Stringer Institute

August 3, 2021

NFL Presents
Exertional Heat Stroke:
The Basics of Prevention & Care

Douglas J. Casa, PhD, ATC, FNAK, FACSM, FNATA
CEO, Korey Stringer Institute
Professor, Department of Kinesiology
University of Connecticut


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Korey Stringer Institute
UNIVERSITY OF CONNECTICUT
Preventing sudden death in sport

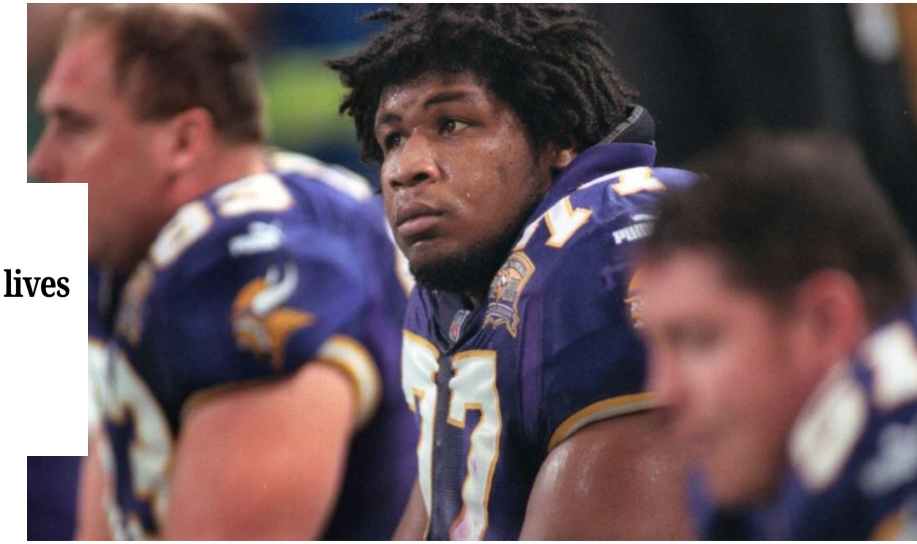

77
Korey Stringer Institute
University of Connecticut
Maximizing Safety & Performance for the Physically Active

DISCLOSURES

Also:

1) **Numerous granting agencies**
2) **Royalties**
3) **Expert witness**
4) **Honorariums**

Korey Stringer's death, 20 years later: The lasting impact and how the NFL changed



JUDY GRIESEDIECK/Star Tribune via Getty Image

Twenty years after death of Vikings tackle Korey Stringer, his legacy lives on

The 27-year-old died from heatstroke complications suffered during a Vikings training camp practice

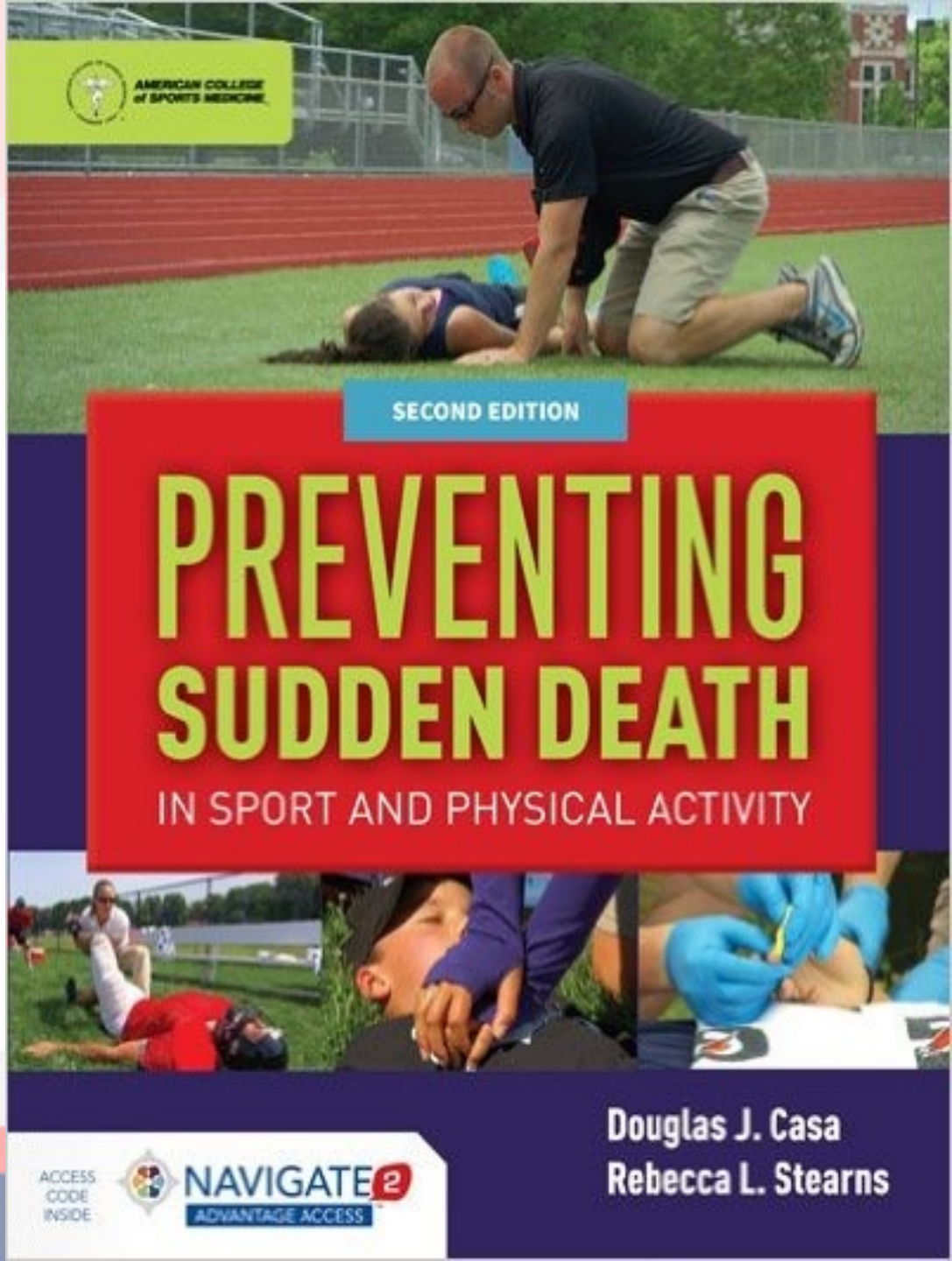
Kevin Seifert
ESPN Staff Writer

Jul 30, 2021

Twenty summers ago, a healthy NFL star died after practice on a scorching day at the Minnesota Vikings' training camp. The words still sting and baffle in equal measure. Korey Stringer's sudden death at age 27 was not from a heart attack, a broken neck or an undetected genetic malady. The offensive tackle succumbed to complications from exertional heatstroke, an avoidable and easily treated condition that sports medicine largely ignored at the time.

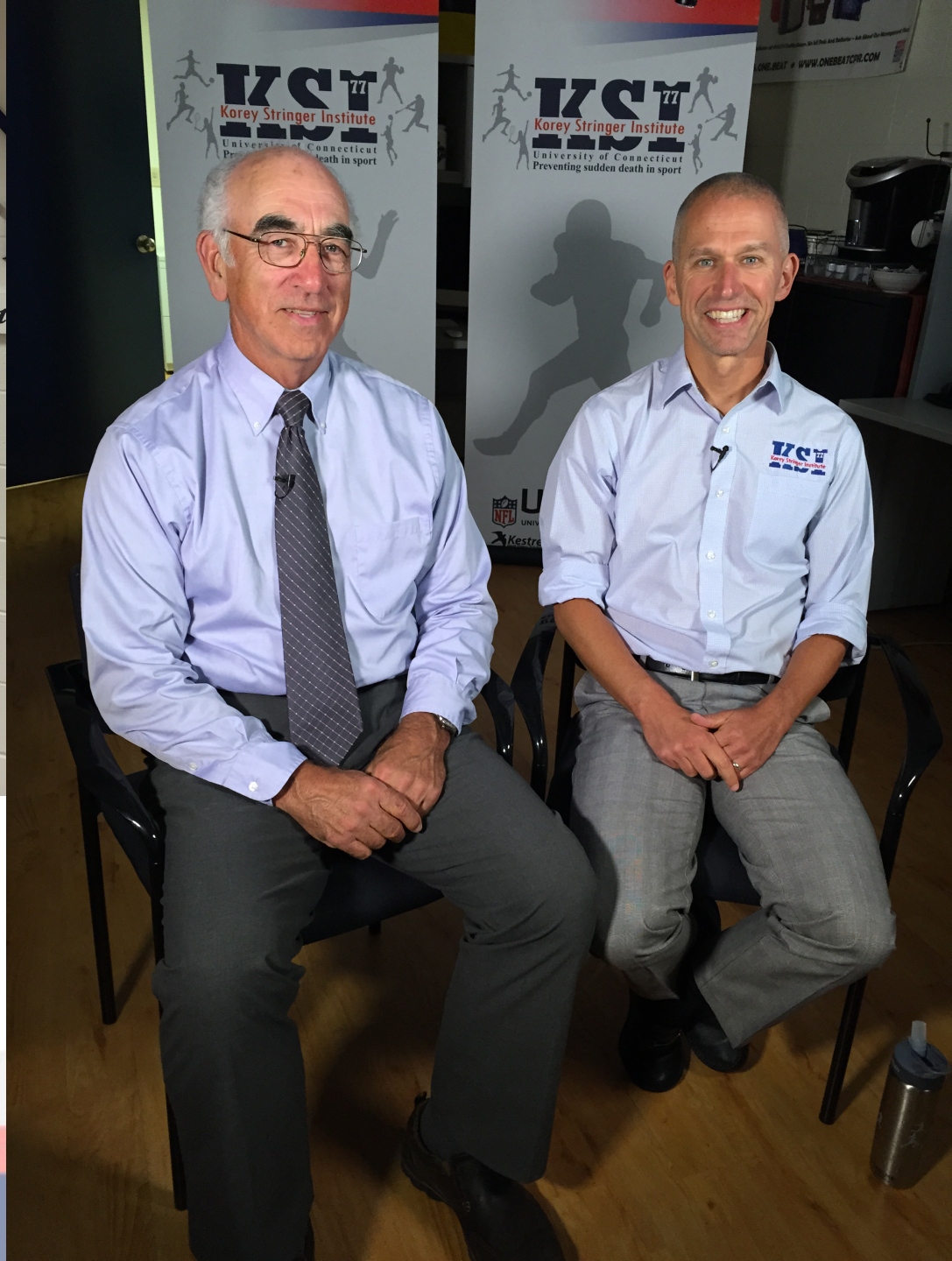
Korey Stringer Institute

The mission of the Korey Stringer Institute is to provide research, advocacy, & consultation to maximize performance, optimize safety, & prevent sudden death for the athlete, warfighter, & laborer.




KOREY STRIN
INSTITUT
"Don't Talk About It; Be About
DOUG
Empire State
Games
TRACK & FIELD
10000 M

Who is this?


Korey Stringer Institute
University of Connecticut
Preventing sudden death in sport


ALL ACCESS
MEDICAL
Troyanos
ATC
MEDICAL
Doug Casa
ATC
August 20, 2017
new balance
FALMOUTH
ROAD RACE
2017
MEDICAL
Rob Davis
MD
August 20, 2017

Mission Heat Lab at UCONN's Korey Stringer Institute Grand Opening 2017

MISSION Heat Lab at Uconn's Korey Stringer Institute

Summer Olympics
Tokyo 2020

- Lack of Best Practices for EHS
- Educating Staff
- The Amazing Yuri
- Soccer Start Times
- Marathon Location
- Many Other Considerations

Athlete 365

BEAT THE HEAT CAMPAIGN

DECEMBER 2019

TOKYO 2020

TOKYO 2020 PARALYMPIC GAMES

TOKYO 2020

TOKYO 2020 Heat Countermeasures For Workforce

INTERNATIONAL OLYMPIC COMMITTEE

TOKYO 2020

For Internal Use
Tokyo2020

PEM Heat Countermeasure team

Planning as of December 2019

Progress Report on Heat Countermeasures

Games Operations Planning Department
Bureau of Games Operations

Summer Olympics Tokyo 2020

TOKYO 2020

DATE

04 DEC 2019

TAGS

OLYMPIC NEWS, IOC NEWS, PRESS RELEASE, TOKYO 2020, ATHLETICS

SHARE

SHARE

THE IOC, WORLD ATHLETICS AND TOKYO 2020 AGREE ON REVISED EVENT SCHEDULE AND A LEGACY-FOCUSED 20KM LOOP COURSE FOR THE FIRST HALF OF THE MARATHON IN SAPPORO ODORI PARK.

The International Olympic Committee (IOC) and the Tokyo Organising Committee of the Olympic and Paralympic Games (Tokyo 2020) today announced that Sapporo Odori Park in Hokkaido was approved by the IOC as the venue for the marathon and race walk events at the IOC Executive Board meeting held today in Lausanne, Switzerland. This followed confirmation from World Athletics.

Sapporo Odori Park has been used in the past as a venue for the Hokkaido Marathon, giving the local authorities considerable experience in operating major events in this area, and it is a popular spot for tourists and local residents, hosting a number of different events throughout the year. It is a large open space of around 7.8 hectares in the centre of Sapporo City, featuring beautiful lawns, flower beds and trees.

TED Ed Video

PROTECTING PLAYERS

Preventing and Treating Exertional Heat Stroke

Published: July 22, 2019

As a heat wave continues across much of the country this week, the NFL continues its work to further prepare clubs to address heat-related illness. Thanks to the University of Connecticut's Korey Stringer Institute, the NFL distributed a video to its clubs that reviews best practices for treating exertional heat stroke.

In the video, Dr. Douglas J. Casa, PhD, CEO of the Korey Stringer Institute (KSI) and Professor of Kinesiology at the University of Connecticut, provides step-by-step guidelines designed by KSI to prevent, identify, assess and treat exertional heat stroke – a severe condition characterized by a body temperature above 105 degrees and signs of central nervous system dysfunction.

"It is imperative that medical personnel and coaching staffs quickly recognize [the signs of heat stroke] and initiate appropriate care," Dr. Casa said.

13 High School Football Deaths in Just 13 Months

June 2020 through July 2021

Sadly-
Almost All
Preventable

	Confirmed Cases
Presumed Sudden Cardiac Arrest	2
Presumed Exertional Heat Stroke	6 or 7
Presumed Traumatic injury	3
Presumed Exertional sickling	1 or 2
Undetermined	1
Total	14

Korey Stringer Institute

Why They Die: Errors In Care

Exertional Heat Stroke: New Concepts Regarding Cause and Care

Douglas J. Casa, PhD, ATC, FACSM, FNATA[1,2]; Lawrence E. Armstrong, PhD, FACSM[1,2]; Glen P. Kenny, PhD[2,3]; Francis G. O'Connor, MD, MPH, FACSM[2,4]; and Robert A. Huggins, MEd, ATC[1,2]

Current Sports Medicine Reports; 11(3):115-123, 2012.

Why They Die: Errors In Care

1. Inaccurate temperature assessment or misdiagnosis
2. No care or treatment delayed
3. Inefficient cooling modality
4. Immediate transport (and/or waiting for transport)

Current Sports Medicine Reports; 11(3):115-123, 2012.

Why They Die: Errors in Training

1. Physical effort unmatched to conditioning level

2. Lack of heat acclimatization

3. Lack of practice modification based on WBGT
    a. Longer rest breaks
    b. More frequent rest breaks

4. Inappropriate conditioning sessions & practice sessions (MOST LIKELY!!!)

Korey Stringer Institute

The Death of Jordan McNair

An Independent Evaluation of Procedures

and Protocols Related to the June 2018 death

of a University of Maryland

Football Student-athlete

September 21, 2018

Prepared by Walters Inc. - Consultant in Sports Medicine

WALTERS INC.
CONSULTANT
IN SPORTS MEDICINE

REPORT OF INDEPENDENT INVESTIGATION

DEATH OF BRAEDEN BRADFORTH

PREPARED BY:

RANDY J. ALIMENT
LEWIS BRISBOIS LLP

ROD WALTERS
WALTERS INC. – CONSULTANT IN SPORTS MEDICINE

Korey Stringer Institute

Current Document

Journal of Athletic Training 2012;47(4):477–480
doi: 10.4085/1062-6050-47.4.08

www.nata.org/journal-of-athletic-training

consensus statement

The Inter-Association Task Force for Preventing Sudden Death in Collegiate Conditioning Sessions: Best Practices Recommendations

Douglas J. Casa, PhD, ATC, FNATA, FACSM (Chair)*; Scott A. Anderson, ATC*; Lindsay Baker, PhD†; Scott Bennett, MS, MSCC, SCCC, CSCS*D‡; Michael F. Bergeron, PhD, FACSM§; Declan Connolly, PhD, FACSM, CSCS*D‡; Ron Courson, PT, ATC, NREMT-I, CSCS*; Jonathan A. Drezner, MD||; E. Randy

Preventing catastrophic injury and death in collegiate athletes: interassociation recommendations endorsed by 13 medical and sports medicine organisations

John T Parsons,[1] Scott A Anderson,[2] Douglas J Casa,[3] Brian Hainline [1]

The following organisations endorsed this document: American Association of Neurological Surgeons, American Medical Society for Sports Medicine, American Orthopaedic Society for Sports Medicine, American Osteopathic Academy of Sports Medicine, College Athletic Trainers' Society, Collegiate Strength and Conditioning Coaches Association, Congress of Neurological Surgeons, Korey Stringer Institute, National Athletic Trainers' Association, National Strength and Conditioning Association, National Operating Committee for Standards on Athletic Equipment, Sports Neuropsychology Society. The following organisation has affirmed the value of this document: American Academy of Neurology.

ABSTRACT

The Second Safety in College Football Summit resulted in interassociation consensus recommendations for three paramount safety issues in collegiate athletics: (1) independent medical care for collegiate athletes; (2) diagnosis and management of sport-related concussion; and (3) year-round football practice contact for collegiate athletes. This document, the fourth arising from the 2016 event, addresses the prevention of catastrophic injury, including traumatic and non-traumatic death, in collegiate athletes. The final recommendations in this document are the result of presentations and discussions on key items that occurred at the summit. After those presentations and discussions, endorsing organisation representatives agreed on 18 foundational statements that became the basis for this consensus paper that has been subsequently reviewed by relevant stakeholders and endorsing organisations. This is the final endorsed

► Additional material is published online only. To view please visit the journal online (http://dx.doi.org/10.1136/bjsports-2019-101090).

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Accepted 17 July 2019

from print media, and more formally in 1931, through the American Football Coaches Association initiation of the Annual Survey of Football Injury Research. Since 1982, the National Center for Catastrophic Sport Injury Research (NCCSIR) at the University of North Carolina, Chapel Hill,[1] has been the nation's premier source of catastrophic injury and death related to participation in organised sports at all levels of competition, including college. The NCCSIR monitors, collects and analyses data on catastrophic injuries, illnesses and death and provides publicly available reports about football and other sports.[1]

In order to create enhanced national surveillance abilities for catastrophic injuries, illness and death, the NCCSIR has partnered with the Consortium for Catastrophic Injury Monitoring in Sport. The consortium includes the division on traumatic injury at the Matthew Gfeller Sport-Related Traumatic Brain Injury Research Center at

QUEST
https://doi.org/10.1080/00336297.2019.1637355

Exertional Heat Stroke of Max Gilpin; A Preventable Death

William M. Adams [a], Luke N. Belval [b], Adam P. Berg[a], Yuri Hosokawa [c], Rebecca L. Stearns [b], and Douglas J. Casa[b]

[a]Department of Kinesiology, University of North Carolina at Greensboro, Greensboro, North Carolina; [b]Department of Kinesiology, University of Connecticut, Storrs, Connecticut; [c]Faculty of Sport Sciences, Waseda University, Tokorozawa, Japan

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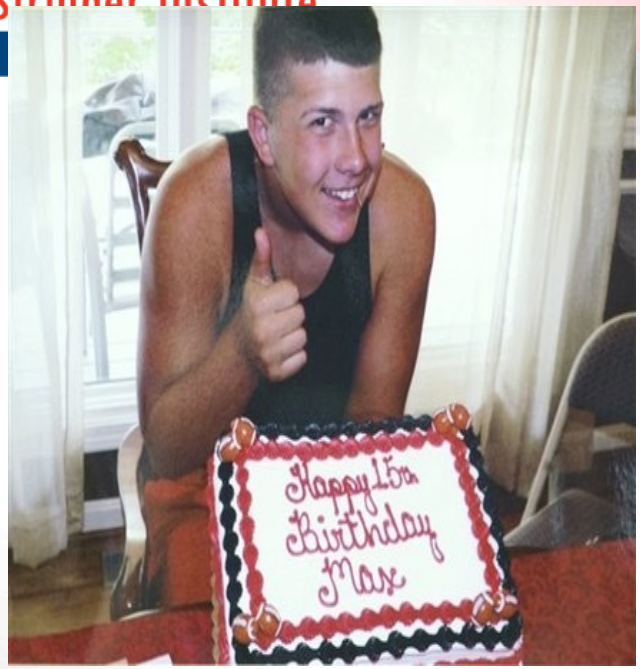

TRIAL OF DAVID JASON STINSON

Expert: Stinson should've given breaks

The trial is resuming following lunch -- you can watch it live

RELATED INFORMATION

- Key figures in the Jason Stinson trial | Court documents from the criminal case
- Audio: 911 call received by Louisville EMS
- Sign up for text alerts | Get our breaking news newsletter
- COMPLETE COVERAGE

LIVE VIDEO

Courtroom video streaming from the Stinson trial. Past coverage also available - click "On Demand."

Table 1. Timeline of events leading to Max Gilpin's exertional heat stroke and subsequent care.

Time	Event
3:00–4:00pm	Gilpin reports for weight lifting and film (air conditioned facility)
4:00–4:30pm	Gilpin required to remove cinder blocks from soccer field prior to girls' soccer game
4:30–4:50pm	Team take offs (team training drill)
4:50–5:00pm	Coach reported water break
5:00–5:20pm	Individual drills [α]
5:20–5:30pm	Coach reported water break
5:30–6:10pm	Conditioning session consisting of a reported 12 "gassers" 8 gassers with full pads 2 gassers without helmets 2 gassers without helmets and pads
6:00–6:15pm	Gilpin collapses following conditioning session
6:18pm	Emergency medical service (EMS) receives call from assistant coach
6:19pm	EMS en-route to scene
6:27pm	EMS arrives to scene
6:30pm	EMS arrives to Gilpin
6:40pm	Gilpin transported to hospital
6:58pm	Gilpin arrives at hospital
7:10pm	First recorded rectal temperature measures at 41.89°C [107.4°F] [β]
7:22pm	Body temperature measured at 40.89°C [105.6°F]
7:36pm	Body temperature measured at 39.24°C [102.9°F][δ]
7:43pm	Body temperature measured at 38.33°C [101.9°F]

Gasser = Bout of sprinting consisting of high intensity running for 4 continuous widths (48 m) of an American football field

[α] Coaches reports indicate water was available during individual sessions for student athletes to consume if they desired

[β] Based on known passive cooling rates of 0.03°C•min^{-1} (McDermott et al., 2009), it can be speculated that Gilpin's body temperature may have been 43.54°C [110.4°F] given that the collapse occurs at 6:15pm

[δ] Roughly 81 minutes elapsed from Gilpin's collapse to a first recorded temperature under the critical threshold for cell damage

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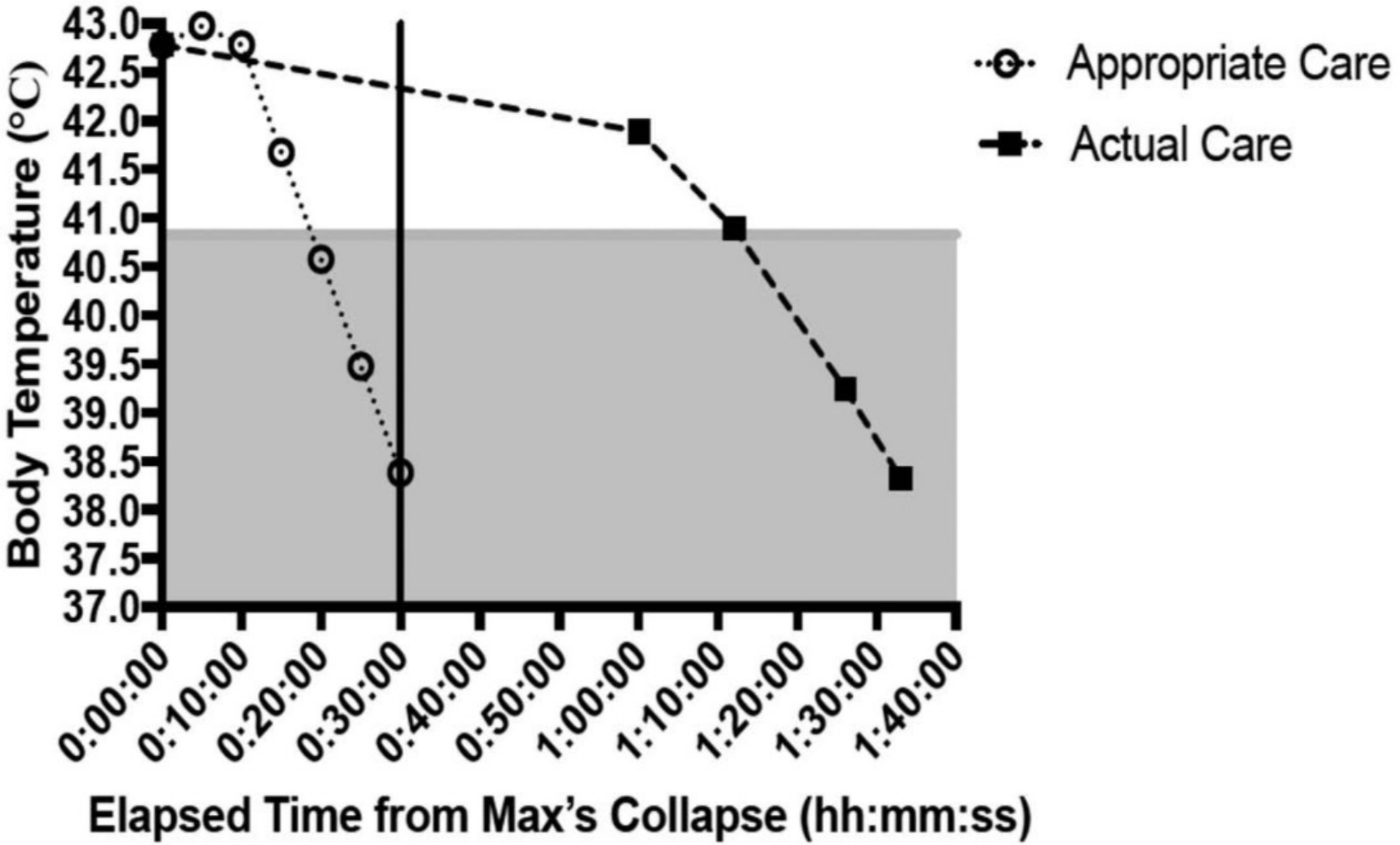
Why it Matters



Important Reminder

GAVIN CLASS

HUNTER KNIGHTON

Korey Stringer Institute

Gavin Class,
Towson State University

Korey Stringer Institute

Hunter Knighton, University of Miami

Fatalities in High School and College Football Players

Barry P. Boden,*† MD, Ilan Breit,† BS, Jason A. Beachler,† BS, Aaron Williams,† DO, and Frederick O. Mueller,‡ PhD
Investigaton performed at The Orthopaedic Center, Rockville, Maryland

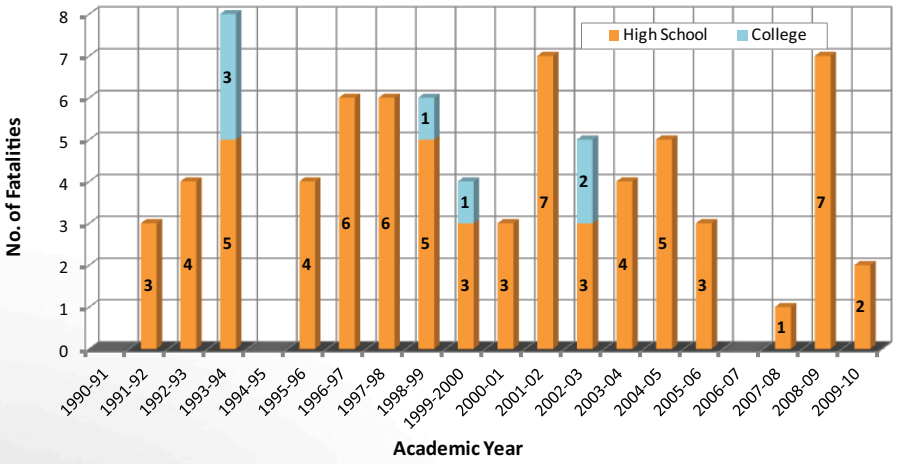


Figure 3. Direct football fatalities annually at the high school and college levels, 1990-1991 through 2009-2010.

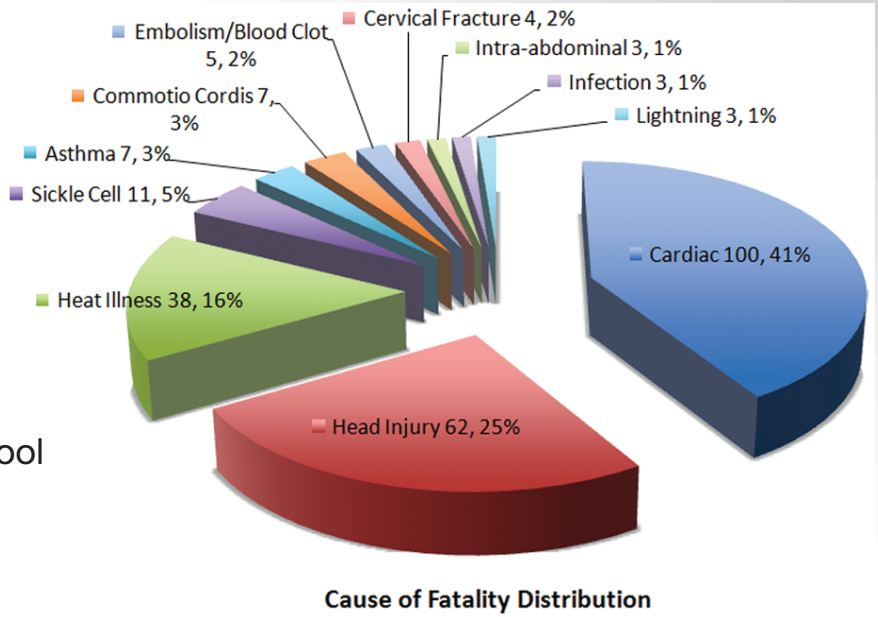


Figure 4. Number and percentage of football fatalities by diagnosis.

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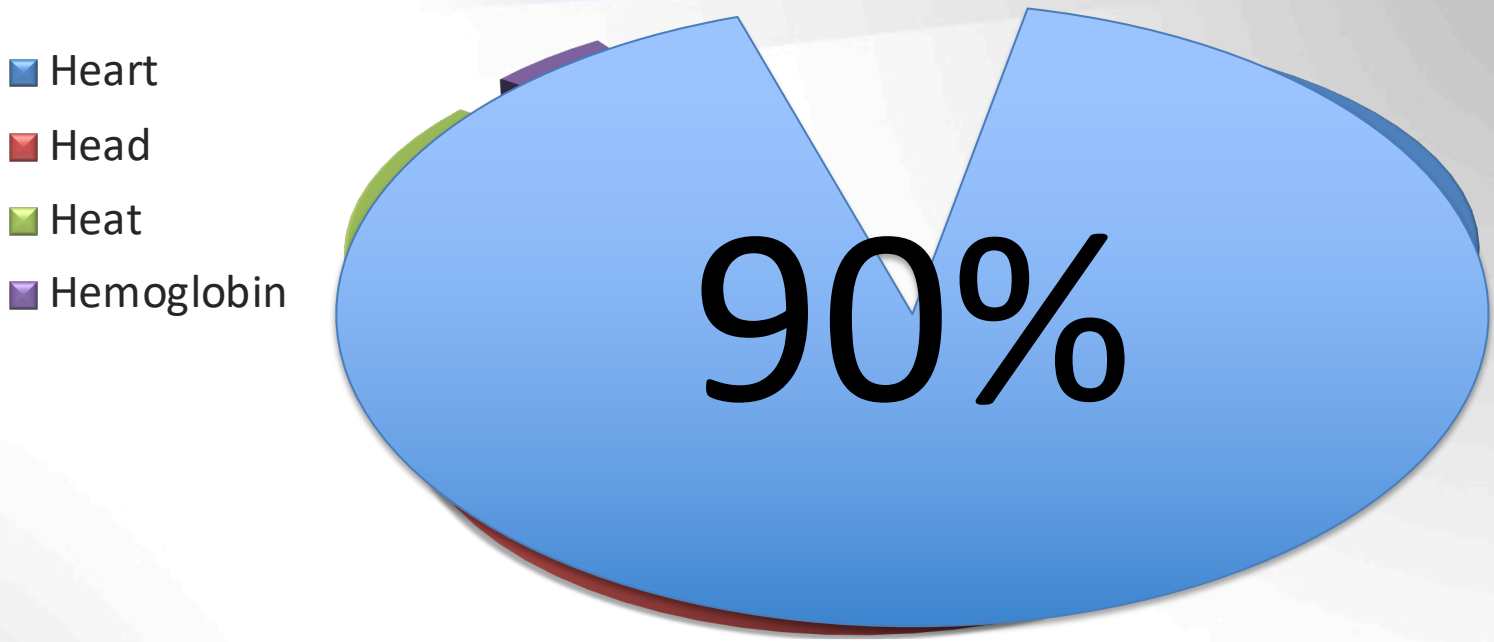
Top Causes of Sport-Related Death



The 4 H's
(5 H's- Hyponatremia)

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Leading Causes of Death in Sport

Nearly all ***Preventable*** with Training, Education, & Preparation

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Journal of Athletic Training 2013;48(4):546–553
doi: 10.4085/1062-6050-48.4.12

www.natajournals.org

consensus statement

The Inter-Association Task Force for Preventing Sudden Death in Secondary School Athletics Programs: Best-Practices Recommendations

Douglas J. Casa, PhD, ATC, FNATA, FACSM (Chair)*†; Jon Almquist, VATL, ATC*; Scott A. Anderson, ATC*; Lindsay Baker, PhD‡; Michael F. Bergeron, PhD, FACSM§; Brian Biagioli, EdD||; Barry Boden, MD¶; Joel S. Brenner, MD, MPH, FAAP#; Michael Carroll, MEd, LAT, ATC*; Bob Colgate**; Larry Cooper, MS, LAT, ATC*; Ron Courson, PT, ATC, NREMT-I, CSCS*; David Csillan, MS, LAT, ATC*; Julie K. DeMartini, MA, ATC†; Jonathan A. Drezner, MD††; Tim Erickson, CAA‡‡; Michael S. Ferrara, PhD, ATC, FNATA*; Steven J. Fleck, PhD, CSCS, FNSCA, FACSM§§; Rob Franks, DO, FAOASM||||; Kevin M. Guskiewicz, PhD, ATC, FNATA, FACSM*; William R. Holcomb, PhD,

Endorsed By

- NFHS
- AMSSM
- AOSSM
- AOASM
- CATA
- GSSI
- KSI
- NATA
- NCCSIR
- NCSF
- ACSM
- NIAAA
- NSCA
- GFELLAR

Journal of Athletic Training 2021;56(4):362–371
doi: 10.4085/1062-6050-0067.20

www.natajournals.org

Roundtable on Preseason Heat Safety in Secondary School Athletics: Environmental Monitoring During Activities in the Heat

Yuri Hosokawa, PhD, ATC*; William M. Adams, PhD, ATC†; Douglas J. Casa, PhD, ATC‡; Jennifer K. Vanos, PhD§; Earl R. Cooper, EdD, ATC, CSCS‖; Andrew J. Grundstein, PhD¶; Ollie Jay, PhD#; Brendon P. McDermott, PhD, ATC; Hidenori Otani, PhD††; Neha P. Raukar, MD, MS‡‡; Rebecca L. Stearns, PhD, ATC‡; Brady L. Tripp, PhD, ATC§§**

Journal of Athletic Training 2021;56(4):372–382
doi: 10.4085/1062-6050-0173.20

www.natajournals.org

Roundtable on Preseason Heat Safety in Secondary School Athletics: Prehospital Care of Patients With Exertional Heat Stroke

Kevin C. Miller, PhD, ATC*; Douglas J. Casa, PhD, ATC†; William M. Adams, PhD, ATC‡; Yuri Hosokawa, PhD, ATC§; Jason Cates, ATC¶; Christina Emrich, MS, ATC‖; Tony Fitzpatrick, MA, ATC#; Michael Hopper, MS, ATC; John F. Jardine, MD†; Michele LaBotz, MD††; Rebecca M. Lopez, PhD, ATC, CSCS‡‡; Francis O'Connor, MD, MPH§§; M. Seth Smith, MD, CAQSM, PharmD¶¶‖**

Journal of Athletic Training 2021;56(4):352–361
doi: 10.4085/1062-6050-596-20

www.natajournals.org

Roundtable on Preseason Heat Safety in Secondary School Athletics: Heat Acclimatization

William M. Adams, PhD, ATC*; Yuri Hosokawa, PhD, ATC†; Douglas J. Casa, PhD, ATC‡; Julien D. Périard, PhD§; Sebastien Racinais, PhD‖; Jonathan E. Wingo, PhD¶; Susan W. Yeargin, PhD, ATC#; Samantha E. Scarneo-Miller, PhD, ATC; Zachary Y. Kerr, PhD, MPH††; Luke N. Belval, PhD, ATC, CSCS‡‡; Denise Alosa, MS, ATC§§‖‖; David Csillan, MS, ATC¶¶‖; Cynthia LaBella, MD##; Lisa Walker, ATC*****

Journal of Athletic Training 2021;56(4):349–351
doi: 10.4085/1062-6050-430-20

www.natajournals.org

Preseason Heat Safety in Secondary School Athletics

William M. Adams, PhD, ATC*; Yuri Hosokawa, PhD, ATC†; Douglas J. Casa, PhD, ATC‡

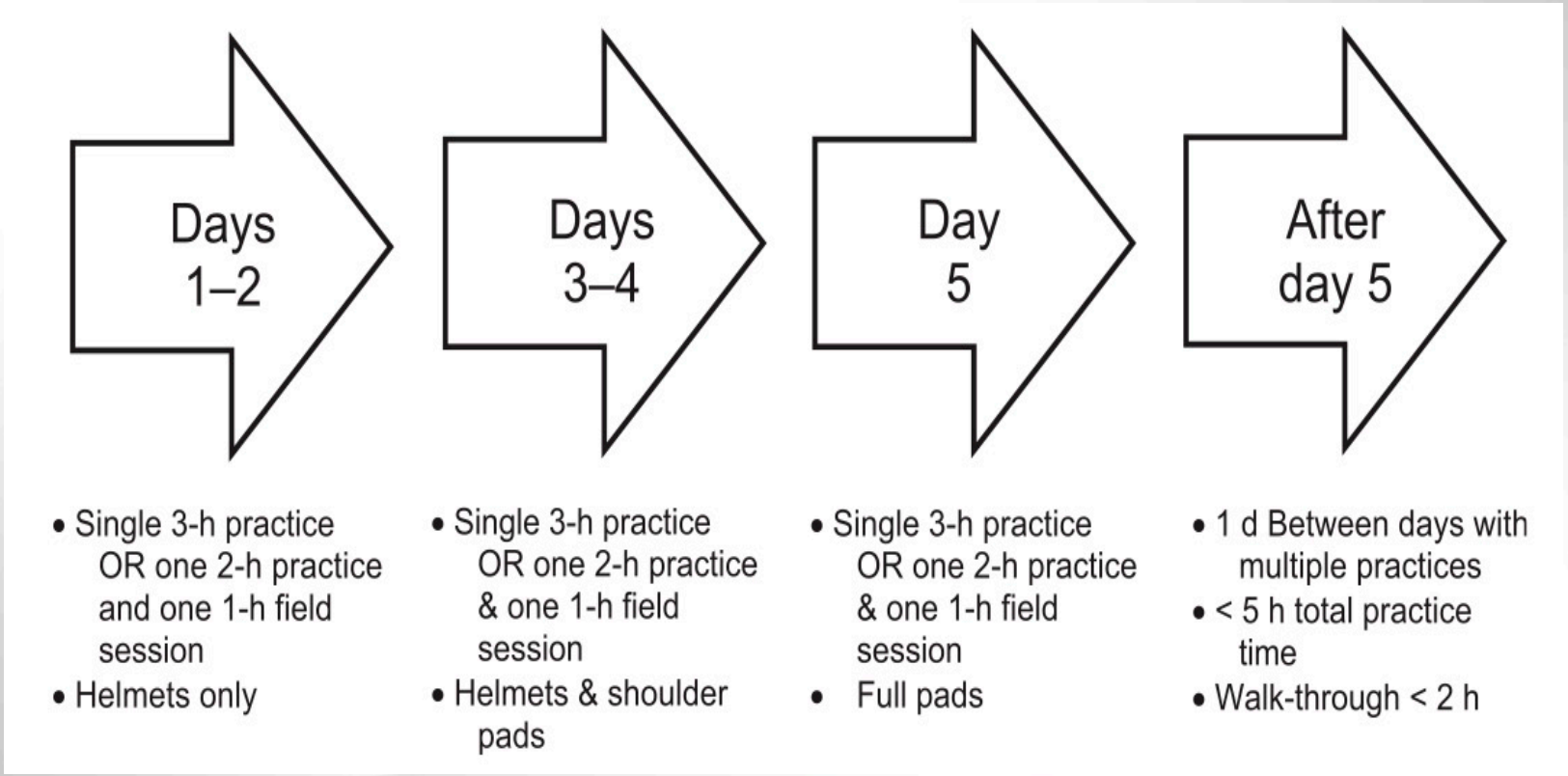
Heat Acclimatization

Recognize success of 2003 NCAA Heat Acclimatization Policy AND the limitations of the policy

The Benefit of Policy Changes

- Kerr, et al., 2019- Heat acclimatization
- Scarneo, et al., 2019- EAP's
- Cooper, et al., 2020- WBGT modifications
- Drezner, et al. 2018- AED's
- NCCSIR 2021- Exertional Sickling Data
- Many others

Heat Acclimatization



Journal of Athletic Training 2009;44(3):332–333

www.nata.org/jat

consensus statement

Preseason Heat-Acclimatization Guidelines for Secondary School Athletics

Douglas J. Casa, PhD, ATC, FNATA, FACSM*; David Csillan, MS, LAT, ATC*

Inter-Association Task Force for Preseason Secondary School Athletics Participants: Lawrence E. Armstrong, PhD, FACSM†; Lindsay B. Baker, PhD‡; Michael F. Bergeron, PhD, FACSM§; Virginia M. Buchanan, JD†; Michael J. Carroll, MEd, LAT, ATC‖; Michelle A. Cleary, PhD, LAT, ATC‖; Edward R. Eichner, MD, FACSM†; Michael S. Ferrara, PhD, ATC, FNATA‖; Tony D. Fitzpatrick, MA, LAT, ATC‖; Jay R. Hoffman, PhD, FACSM, FNSCA¶; Robert W. Kenefick, PhD, FACSM#; David A. Klossner, PhD, ATC‖; J. Chad Knight, MSHA, MESS, ATC, OTC‖; Stephanie A. Lennon, MS, NBCT, LAT, ATC‖; Rebecca M. Lopez, MS, ATC‖; Matthew J. Matava, MD**; Francis G. O'Connor, MD, FACSM††; Bart C. Peterson, MSS, ATC‖; Stephen G. Rice, MD, PhD, FACSM, FAAP‡‡; Brian K. Robinson, MS, LAT, ATC‖; Robert J. Shriner, MS, LAT, ATC‖; Michael S. West, MS, ATC‖; Susan W. Yeargin, PhD, ATC‖

*Co-Chairs; †Individual Representatives; ‡Gatorade Sports Science Institute; §American College of Sports Medicine; ‖National Athletic Trainers' Association; ¶National Strength and Conditioning Association; #United States Army Research Institute of Environmental Medicine; **American Orthopaedic Society for Sports Medicine; ††American Medical Society for Sports Medicine; ‡‡American Academy of Pediatrics

The Association between Mandated Preseason Heat Acclimatization Guidelines and Exertional Heat Illness during Preseason High School American Football Practices

Zachary Y. Kerr,[1] Johna K. Register-Mihalik,[1] Riana R. Pryor,[2] Lauren A. Pierpoint,[3] Samantha E. Scarneo,[4] William M. Adams,[5] Kristen L. Kucera,[1] Douglas J. Casa,[4] and Stephen W. Marshall[6]

[1]Department of Exercise and Sport Science, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, USA
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[4]Korey Stringer Institute, Department of Kinesiology, University of Connecticut, Storrs, Connecticut, USA
[5]Department of Kinesiology, University of North Carolina at Greensboro, Greensboro, North Carolina, USA
[6]Department of Epidemiology, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, USA

Environmental Health Perspectives 047003-1 127(4) April 2019

Conclusions

The risk of heat-related illness and death is likely to increase in many locations as a consequence of climate change (Pachauri et al. 2014), and effective policies are needed to protect populations from adverse effects of excessive heat. The present study, in combination with other biological, epidemiologic, and clinical evidence, supports the effectiveness of NATA-IATF guidelines in reducing EHI rates among American high school football players. State high school athletic association–mandated heat acclimatization guidelines that met the NATA-IATF recommendations were associated with a 55% reduction in the incidence of EHI. Based on our findings, we recommend that state high school athletic associations consider mandating NATA-IATF guidelines for their high

in EHI rates while examining their hypothesized association with NATA-IATF guideline mandates. Evaluative research should also aim to identify factors that facilitate and impede implementation nd adoption of the NATA-IATF guidelines as well as other public ealth guidelines and policies to reduce the adverse health effects f ambient heat.

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WBGT/Work-Rest Ratios

Advocate use of WBGT for practice & game modifications. Alter work-Rest ratios based on WBGT.

Journal of Athletic Training 2020;55(7):673–681
doi: 10.4085/1062-6050-542-18

www.natajournals.org

Heat Policy Revision for Georgia High School Football Practices Based on Data-Driven Research

Earl R. Cooper, EdD, LAT, ATC, CSCS*; Andrew J. Grundstein, PhD†; Jessica D. Miles, PhD, LAT, ATC‡; Michael S. Ferrara, PhD, ATC, FNATA§; Patrick Curry, MS, ATC‖; Douglas J. Casa, PhD, ATC, FNATA, FACSM¶; Yuri Hosokawa, PhD, ATC#

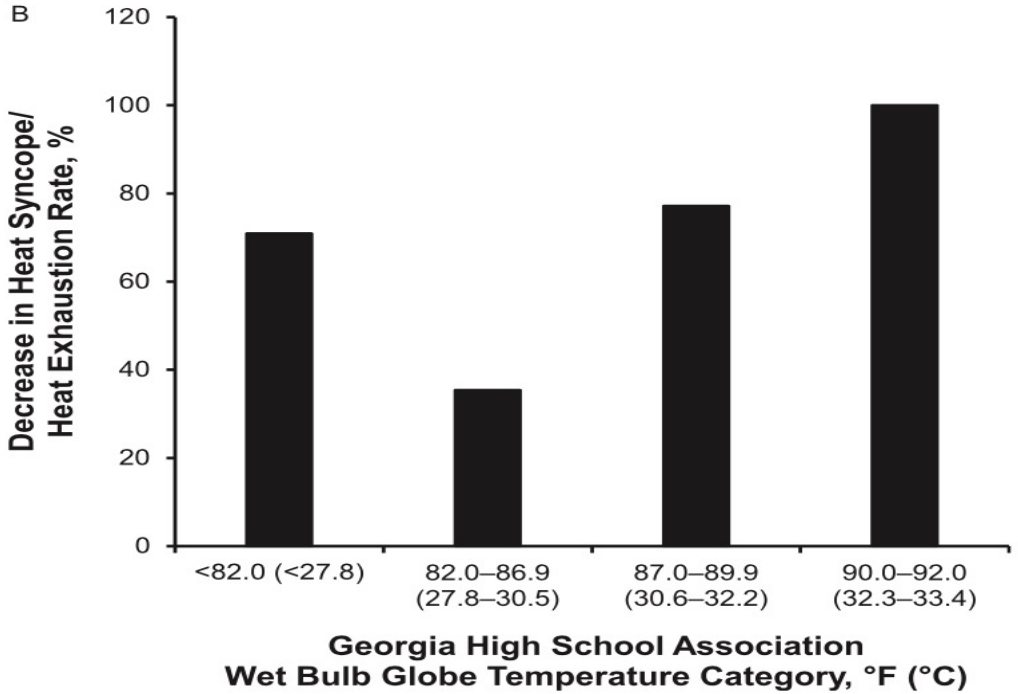

Figure 4. Comparison of, A, overall heat-syncope and heat-exhaustion illness rates in the prepolicy and postpolicy periods and, B, percentage of decrease in heat-syncope and heat-exhaustion illness rates in the postpolicy period relative to the prepolicy period.

Journal of Athletic Training 2020;55(7):673–681
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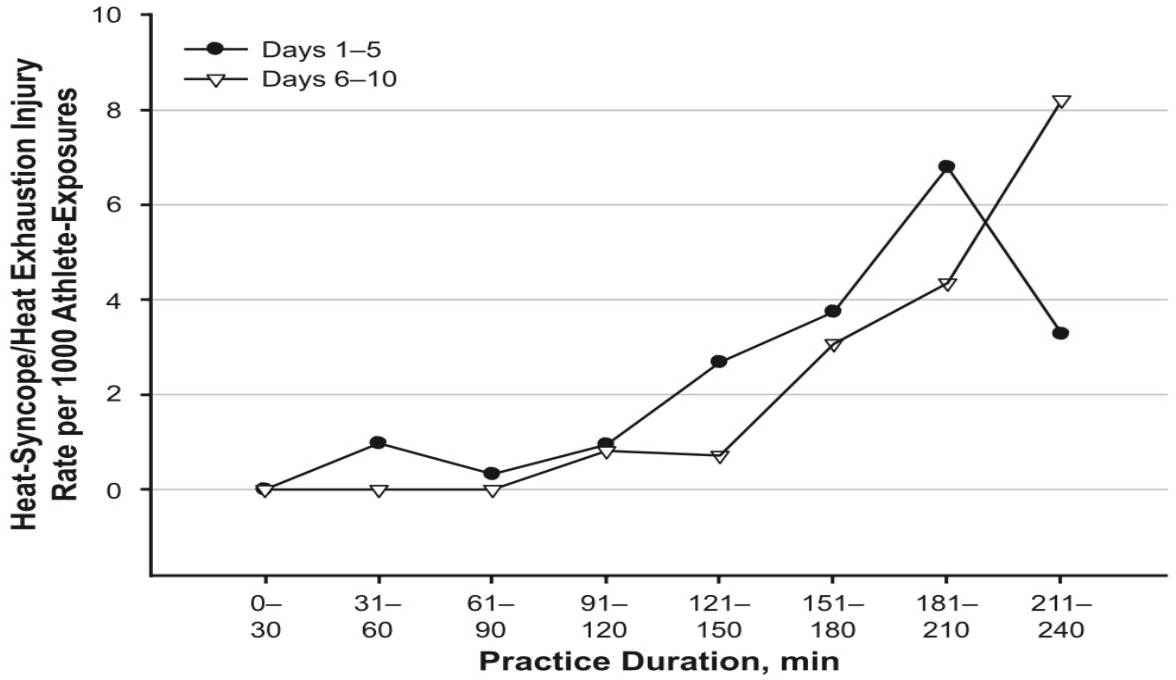

Figure 3. Heat-syncope and heat-exhaustion illness rate per 1000 athlete-exposures (AEs) during practice days 1 to 5 and 6 to 10 in the prepolicy period.

Journal of Athletic Training 2020;55(7):673–681
doi: 10.4085/1062-6050-542-18

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Heat Policy Revision for Georgia High School Football Practices Based on Data-Driven Research

Earl R. Cooper, EdD, LAT, ATC, CSCS*; Andrew J. Grundstein, PhD†; Jessica D. Miles, PhD, LAT, ATC‡; Michael S. Ferrara, PhD, ATC, FNATA§; Patrick Curry, MS, ATC‖; Douglas J. Casa, PhD, ATC, FNATA, FACSM¶; Yuri Hosokawa, PhD, ATC#

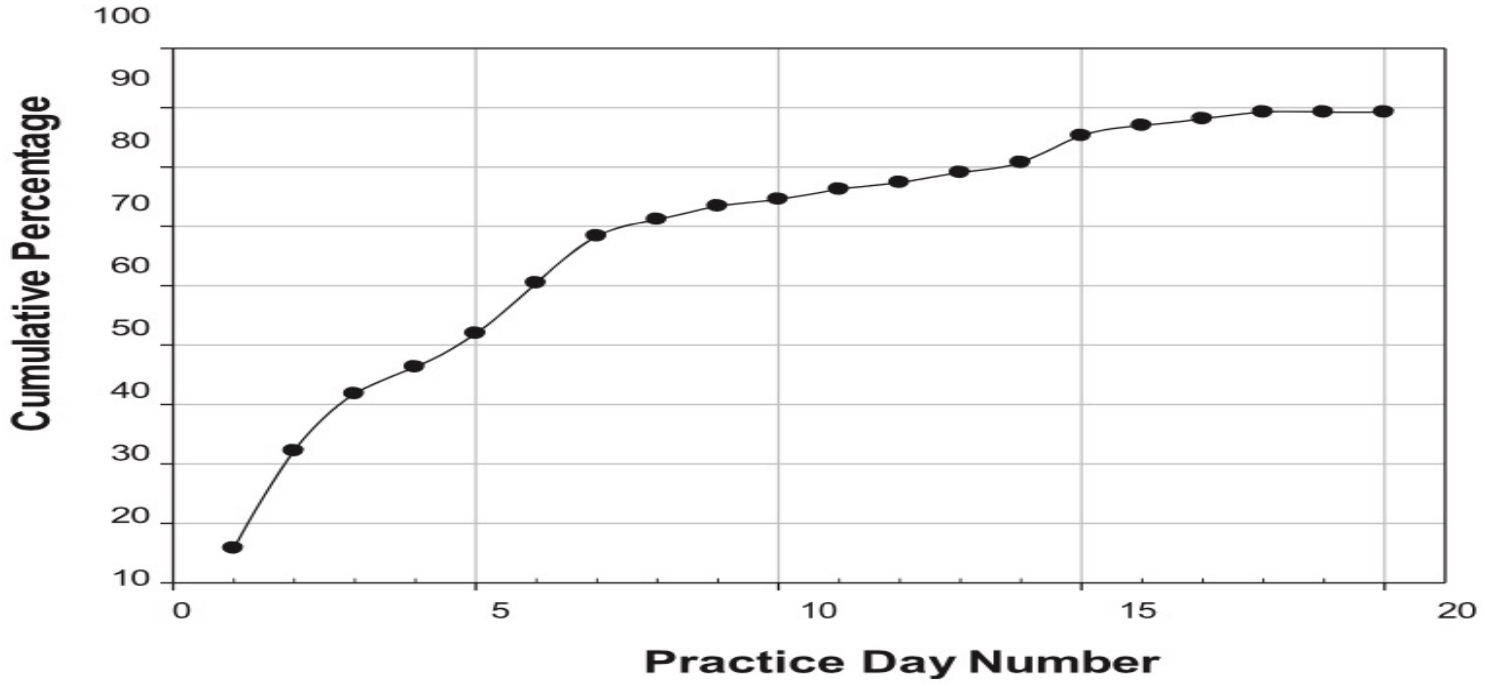


Figure 2. Cumulative heat-syncope and heat-exhaustion incidents (percentages) over the first 20 practice days during the prepolicy period.

Georgia/WBGT

WBGT READING	ACTIVITY GUIDELINES & REST BREAK GUIDELINES
Under 82.0	**Normal activities**: Provide at least three separate rest breaks each hour of minimum duration of 3 minutes each during workout
82.0 - 86.9	Use discretion for intense or prolonged exercise; watch at-risk players carefully; Provide at least three separate rest breaks each hour of a minimum of four minutes duration each
87.0 - 89.9	Maximum practice time is two hours. For Football: players restricted to helmet, shoulder pads, and shorts during practice. All protective equipment must be removed for conditioning activities. For all sports: Provide at least four separate rest breaks each hour of a minimum of four minutes each
90.0 - 92.0	Maximum length of practice is one hour, no protective equipment may be worn during practice and there may be no conditioning activities. There must be 20-minutes of rest breaks provided during the hour of practice
Over 92.1	**No outdoor workouts; Cancel exercise**; delay practices until a cooler WBGT reading occurs

Prevention and Treatment of Exertional Heat Illness

OPPAGA

Office of Program Policy Analysis and Government Accountability

MARCH 19, 2019

Findings

Best Practices

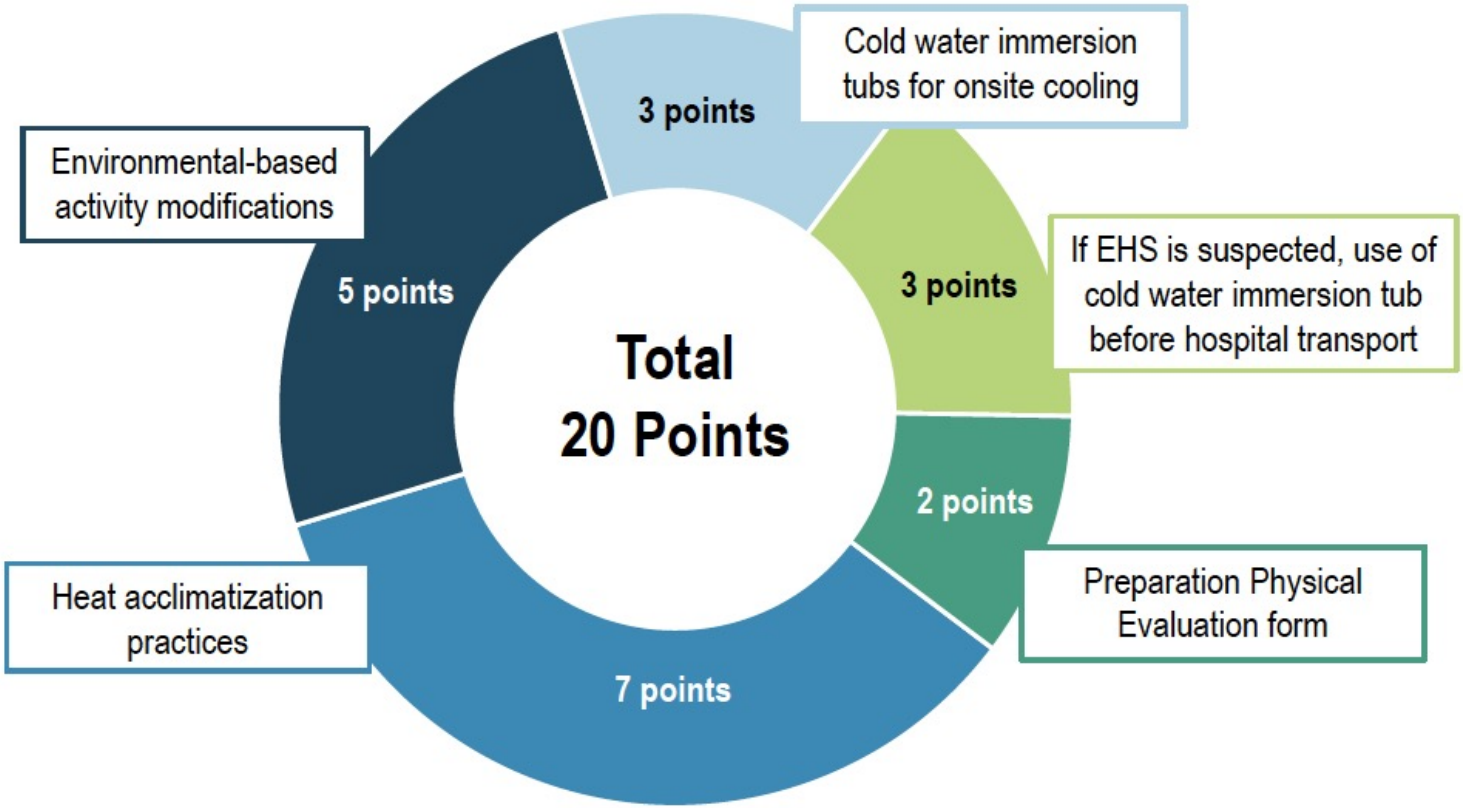
- **Florida ranks 14th** among states based on an independent assessment of its use of **nationally recognized best practices** for the prevention and treatment of EHS
- National experts recommend that schools take proactive steps to prevent exertional heat illness including
  - following a heat acclimatization schedule;
  - frequently measuring student athletes' temperatures;
  - incorporating rest breaks; and
  - encouraging fluid consumption
- National experts explain that **cold water immersion** is **necessary** for **EHS treatment**

Survey Results

- **Over 80%** of Florida schools that responded to OPPAGA's survey **have protocols** that address prevention and treatment of EHI and provide training to sports-related staff regarding the protocols
- **Eighty percent of** schools had one or more **cold water immersion tubs or substitute tubs** and believed that their schools had sufficient supplies and materials needed to prevent and treat EHI
- Nearly one-third of athletic directors reported use of heat acclimatization schedules that did not meet state requirements and 14% did not know the length of their schools' schedules
- Athletic directors from about one-third (95 of 258) of schools that responded to our survey reported treating students for EHI during the 2017-18 school year; **no school reported student fatalities resulting from EHS**

2018 Evaluation of States' EHS Preparedness Practices

The Korey Stringer Institute evaluated states' high schools' use of best practices for preventing and treating EHS in five areas[1, 2]

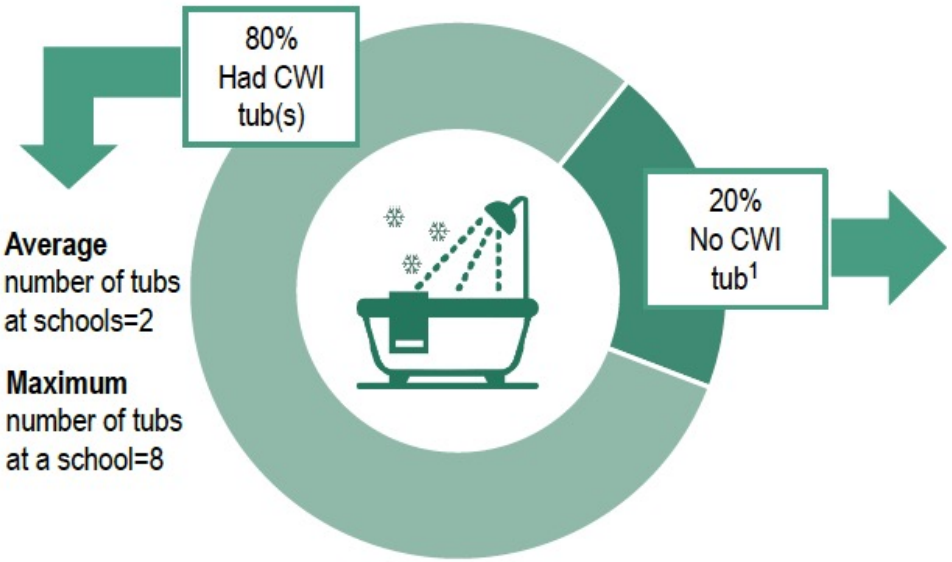


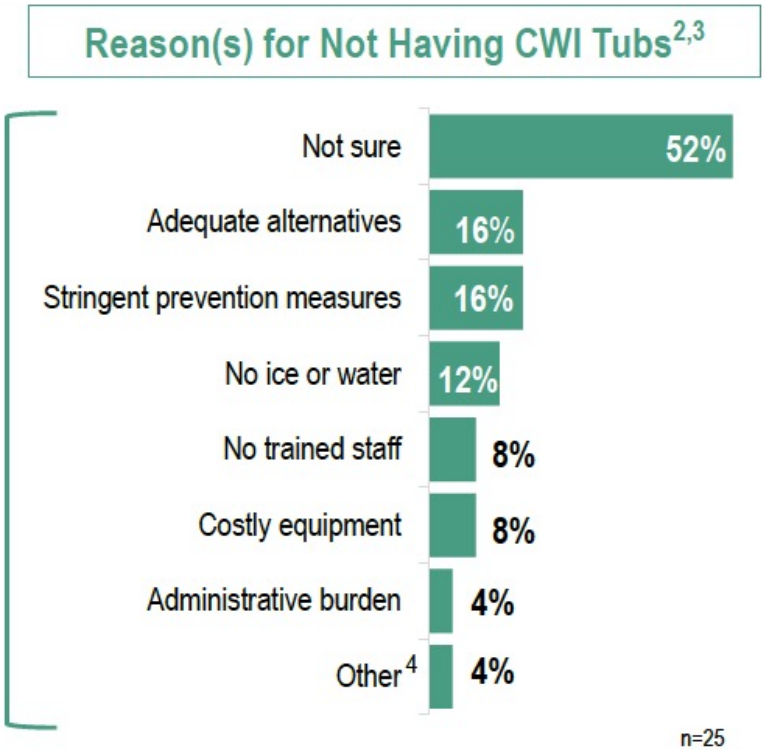
[1] The Korey Stringer Institute at the Department of Kinesiology, University of Connecticut, provides research, education, advocacy, and consultation to optimize safety and prevent sudden death for athletes and others. The institute evaluated state high school practices using the Inter-Association Task Force for Preventing Sudden Death in Secondary School Athletics Programs: Best-Practices Recommendations, Journal of Athletic Training, 2013. States' practices were assessed by reviewing high school athletic association policies, enacted legislation, and state department of education policies.

[2] Source: OPPAGA summary of states' scoring on EHS from the Korey Stringer Institutes' assessment of State High School Sports Safety Policies conducted on all 50 states and the District of Columbia, 2018.

CWI Tub Availability

The vast majority of schools had one or more CWI tubs; others most often reported that they were not sure of the reason they did not have tubs





[1] This percentage includes respondents who answered "I am not sure" when asked if they had cold water immersion tubs, respondents who reported they did not have a cold immersion tub, and respondents who initially reported they had a cold immersion tub but then entered "0" when asked for number of cold immersion tubs.

[2] This figure excludes respondents who provided inconsistent responses about having a cold immersion tub and respondents who reported they were not sure if they had a cold immersion tub.

[3] Responses sum to more than 100% because respondents could select multiple options.

[4] Only one respondent that checked "Other" provided a written reason for their selection. This school said a tub was purchased for 2018-19 and that they offered only one fall sport that practiced before school.

ATLAS

ATHLETIC TRAINING LOCATIONS AND SERVICES

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NATIONAL ATHLETIC TRAINERS' ASSOCIATION

HEALTH CARE FOR LIFE & SPORT

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Preventing sudden death in sport

TEAM UP FOR + SPORTS SAFETY

TUFSS

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BIG KSI PROJECTS WORKING TO ENHANCE PUBLIC HEALTH ISSUES FOR THE SECONDARY SCHOOL ATHLETE


BREAKING NEWS
NEW JERSEY, FLORIDA & LOUISIANA PASS NEW LAWS!
(ALL IN 2020!!!!!!!)
LIVE

Louisiana

…The 2020 & 2021 Changes

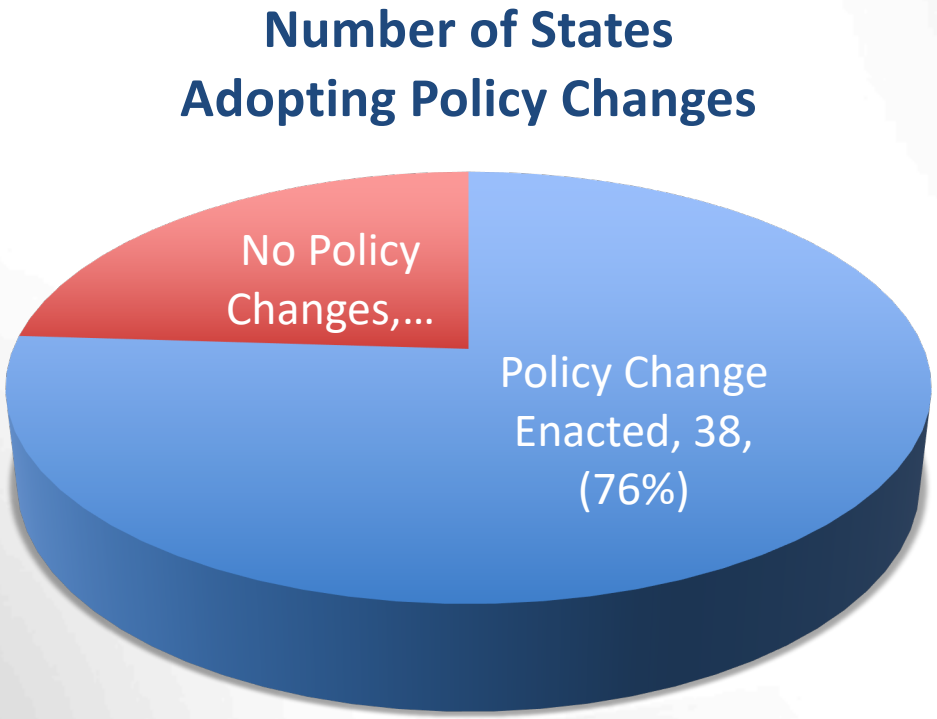
2020

- Comprehensive EAPS
- Specific regulations for removal of student athletes from competition, practice training
- Heat Acclimatization
- WBGT

2021:

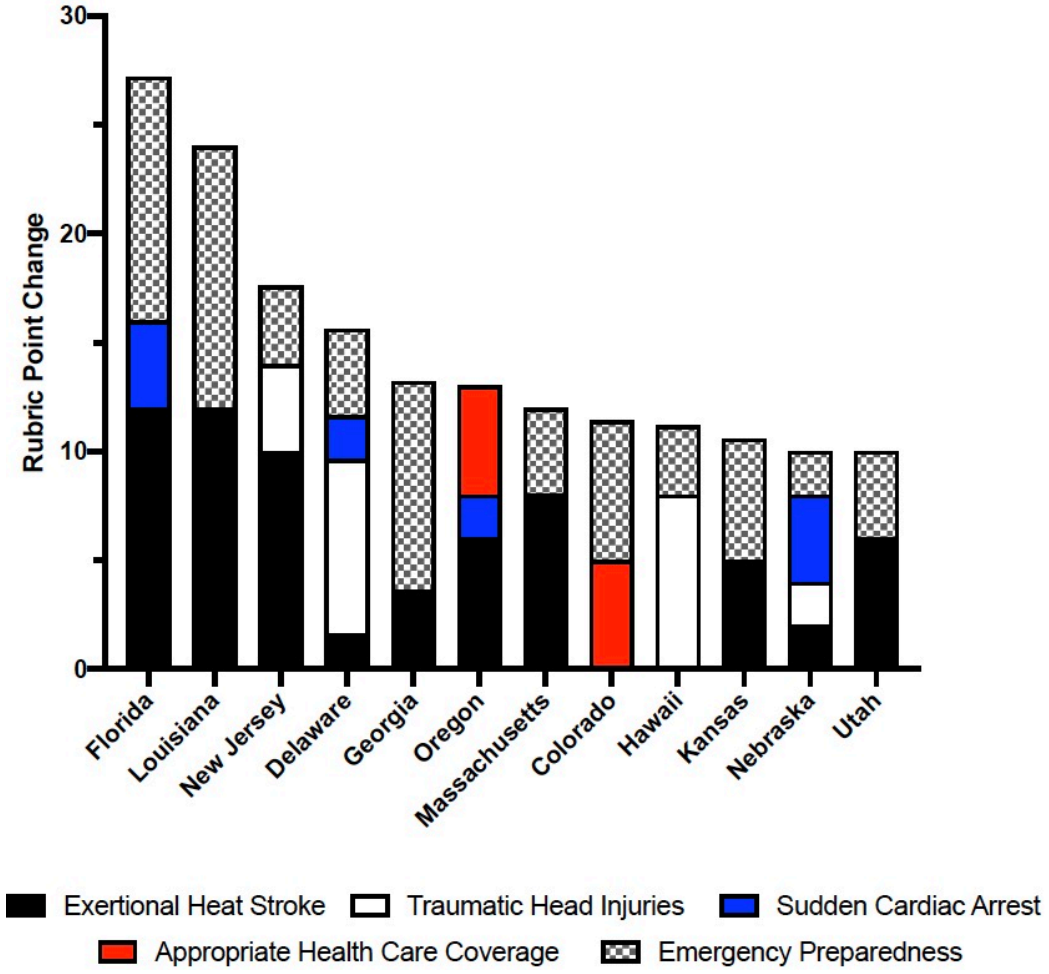
- The BESE Bulletin that was just updated in April adds language for 1,3, and 4 and adds in CWI requirements.

3 Year State Health & Safety Policy Summary (2017 to 2020)

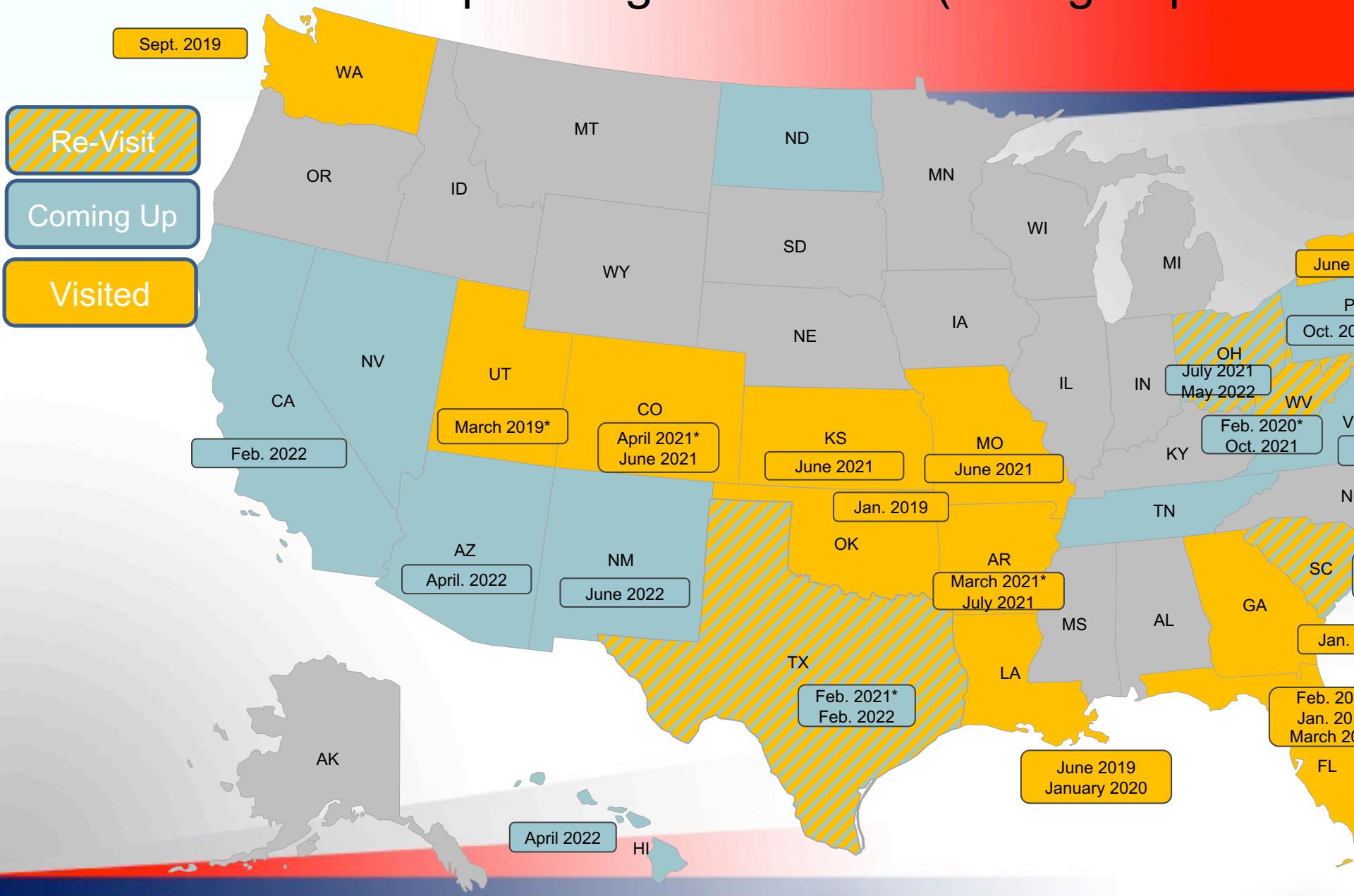


Changes By Component (topic)

- AJSM
- October 2021



Upcoming State Visits (through April 2022



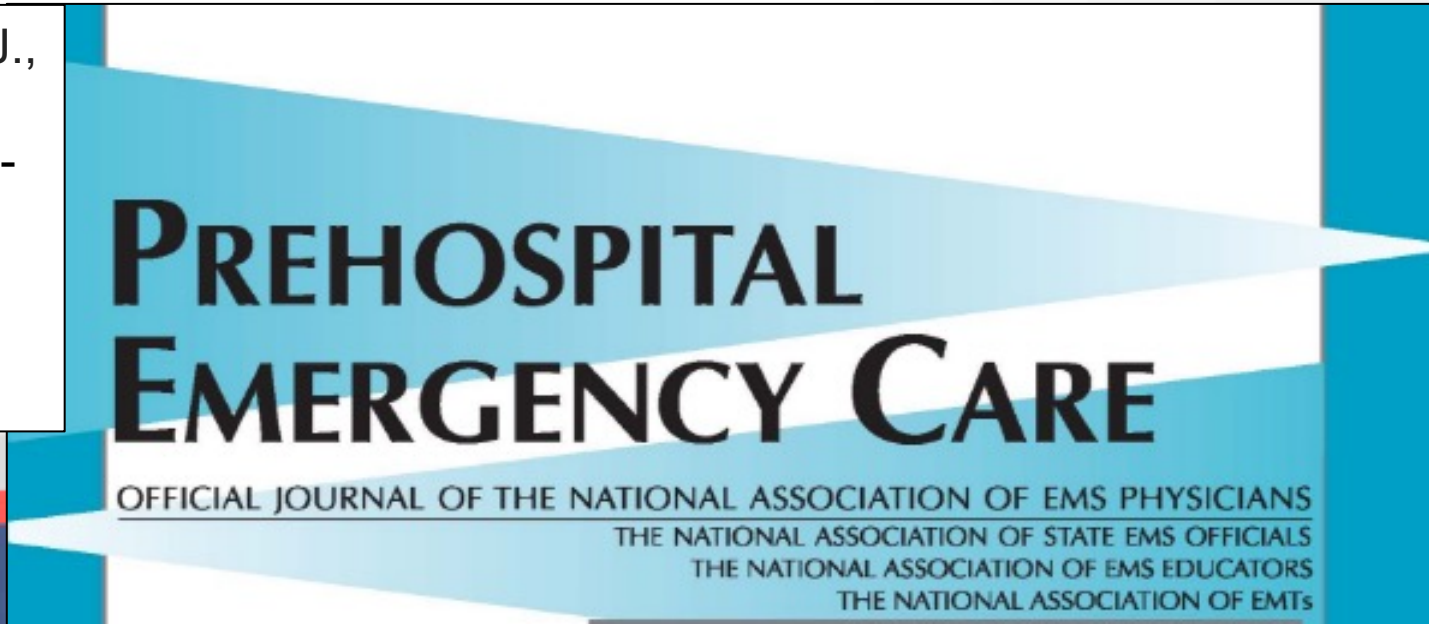
* Indicates an initial call or action or virtual meeting

Korey Stringer Institute

Consensus Statement- Prehospital Care of Exertional Heat Stroke

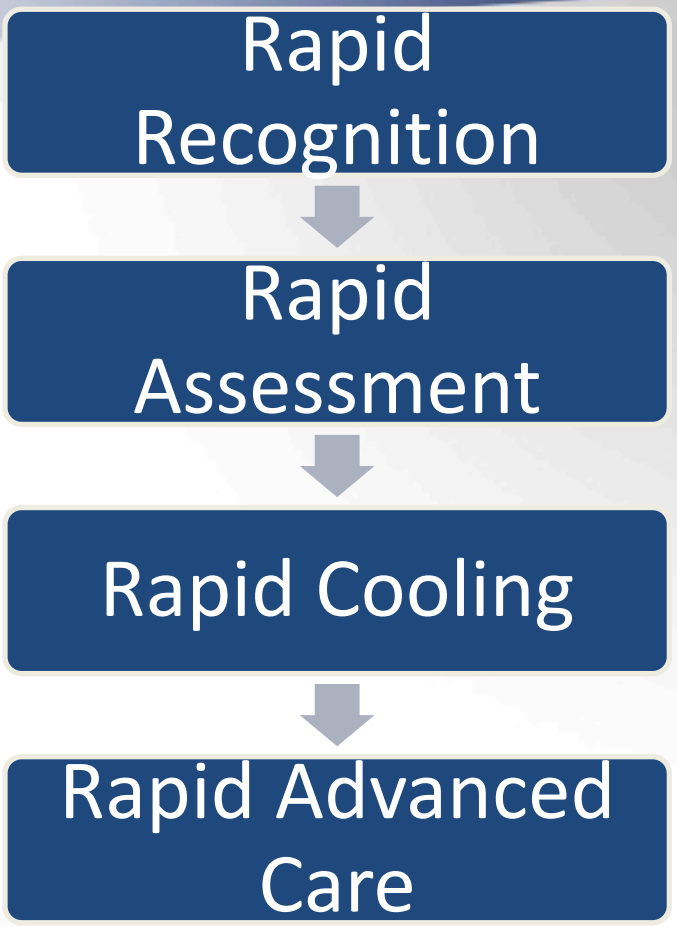
Luke N. Belval, Douglas J. Casa, William M. Adams, George T. Chiampas, Jolie C. Holschen, Yuri Hosokawa, John Jardine, Shawn F. Kane, Michele Labotz, Renée S. Lemieux, Kyle B. McClaine, Nathaniel S. Nye, Francis G. O'Connor, Bryan Prine, Neha P. Raukar, Michael S. Smith & Rebecca L. Stearns

Belval, L.N., Casa, D.J., et al. (2018). Consensus Statement-Prehospital Care of Exertional Heat Stroke. *Prehospital Emergency Care*, 1-6.

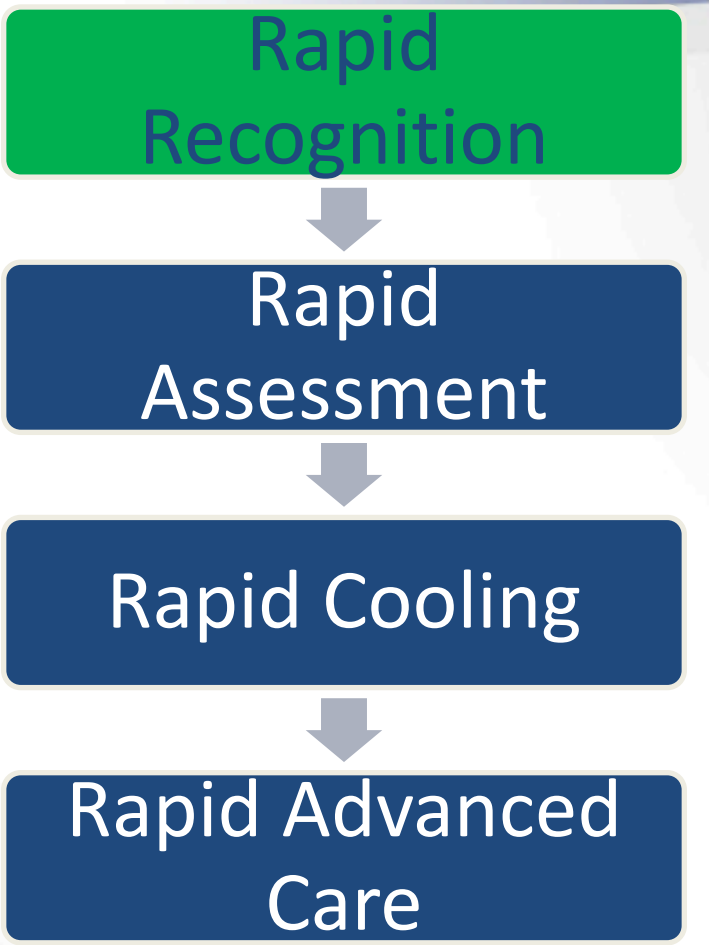


Steps to Survival

Remember- Easiest step to survival is avoid EHS in first place. Not hard to do with common sense training design and monitoring.



Steps to Survival



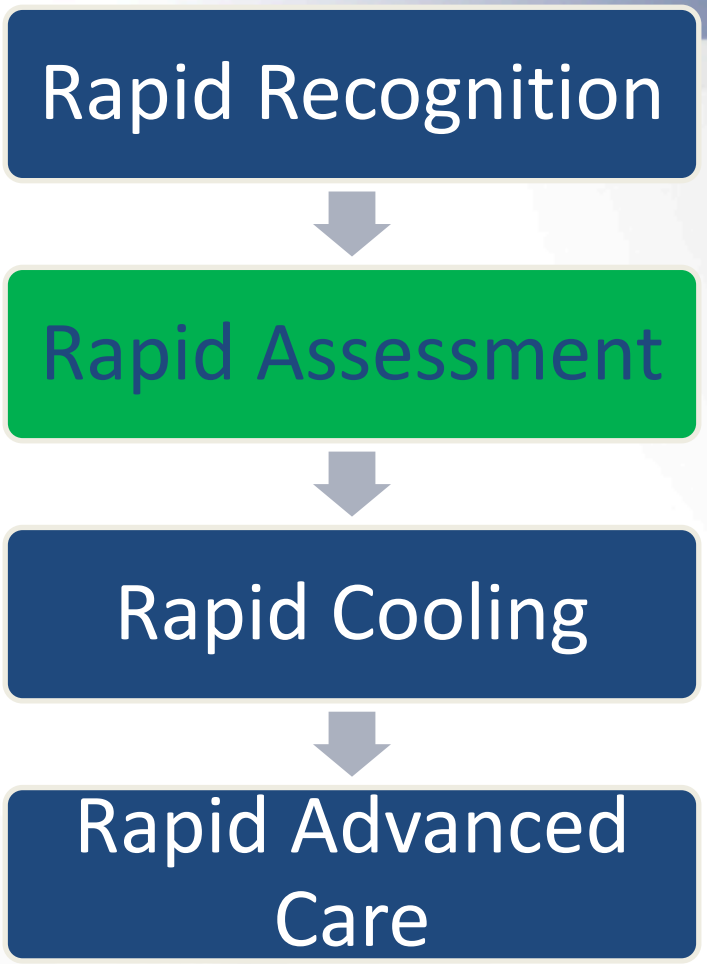
FIND IT FAST

- The coach/medic/supervisor/boss/medical staff/EMT/etc. dispatcher can play a big role in dictating outcomes.

- Situational Awareness
  - Individual exercising in warm environments or intensely.
  - Potential for a lucid interval.

- Dispelling myths
  - ”Hot, dry skin”
  - ”Don’t cool him too quickly”

Steps to Survival



Defining Heat Stroke

1. Severe Hyperthermia (>104.5 ºF)
   A. Typically Warm Environments
   B. Can occur in cooler climates
      a. Impaired heat dissipation
      b. High exertional strain
2. End Organ Dysfunction
   A. Typically CNS Dysfunction

Differential Diagnosis

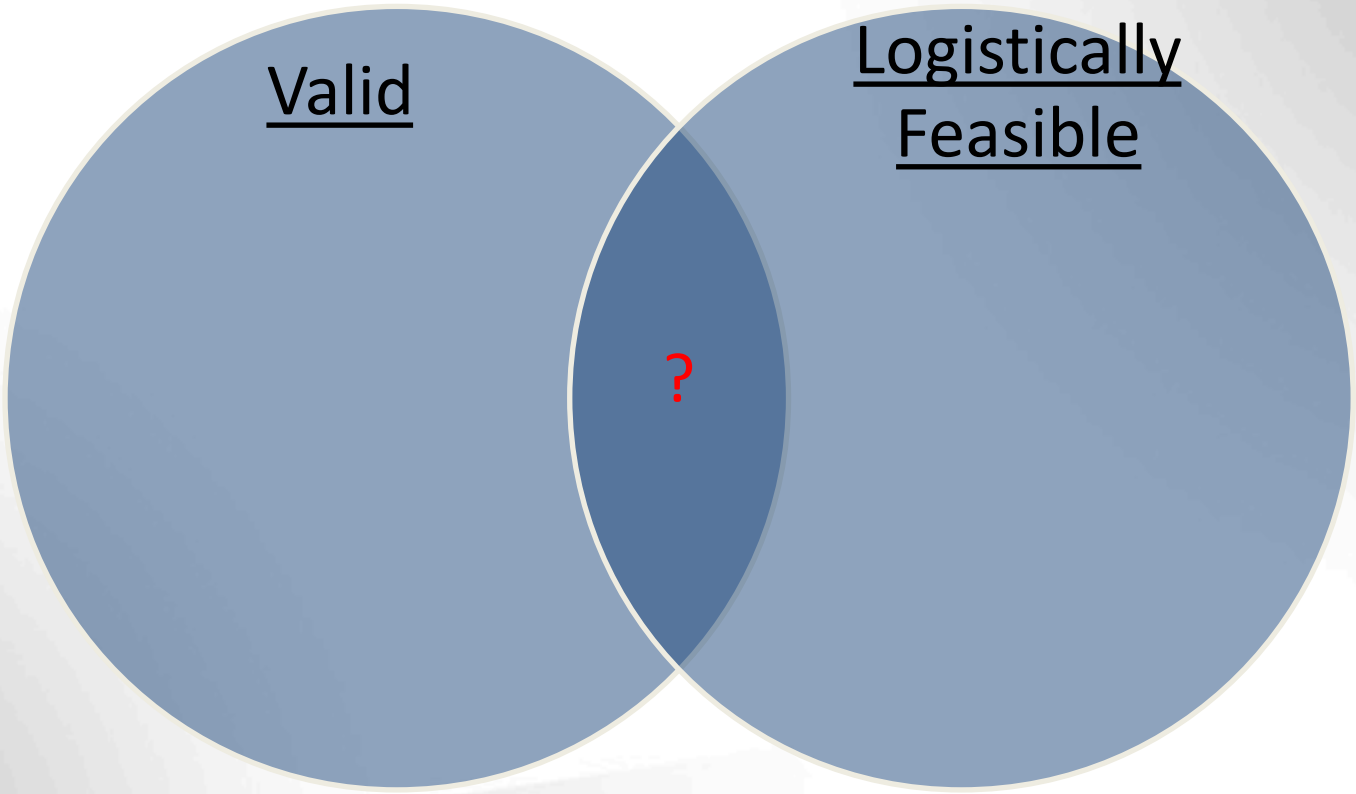
Sign and Symptoms	Heat Exhaustion	Exertional Heat Stroke	Exertional Sickling	Hyponatremia	Cardiac Conditions
Body Temperature <40.5°C	×		×	×	×
Body Temperature ≥40.5°C		×			
Blood Sodium <130 mEq/L				×	
Blood Sodium ≥130 mEq/L	×	×	×		×
CNS Dysfunction	×	×		×	
Loss of Consciousness		×	×	×	×
Diarrhea	×	×		×	
Vomiting	×	×		×	
Nausea	×	×		×	
Peripheral Swelling			×	×	
Seizures		×		×	×
Muscle Cramping	×		×	×	×
Fatigue	×		×		
Inability to catch one's breath			×		

Adapted from Casa DJ & Stearns RL (Eds.), Preventing Sudden Death in Sport and Physical Activity (2nd ed.). Burlington, MA, USA: Jones and Bartlett Learning.

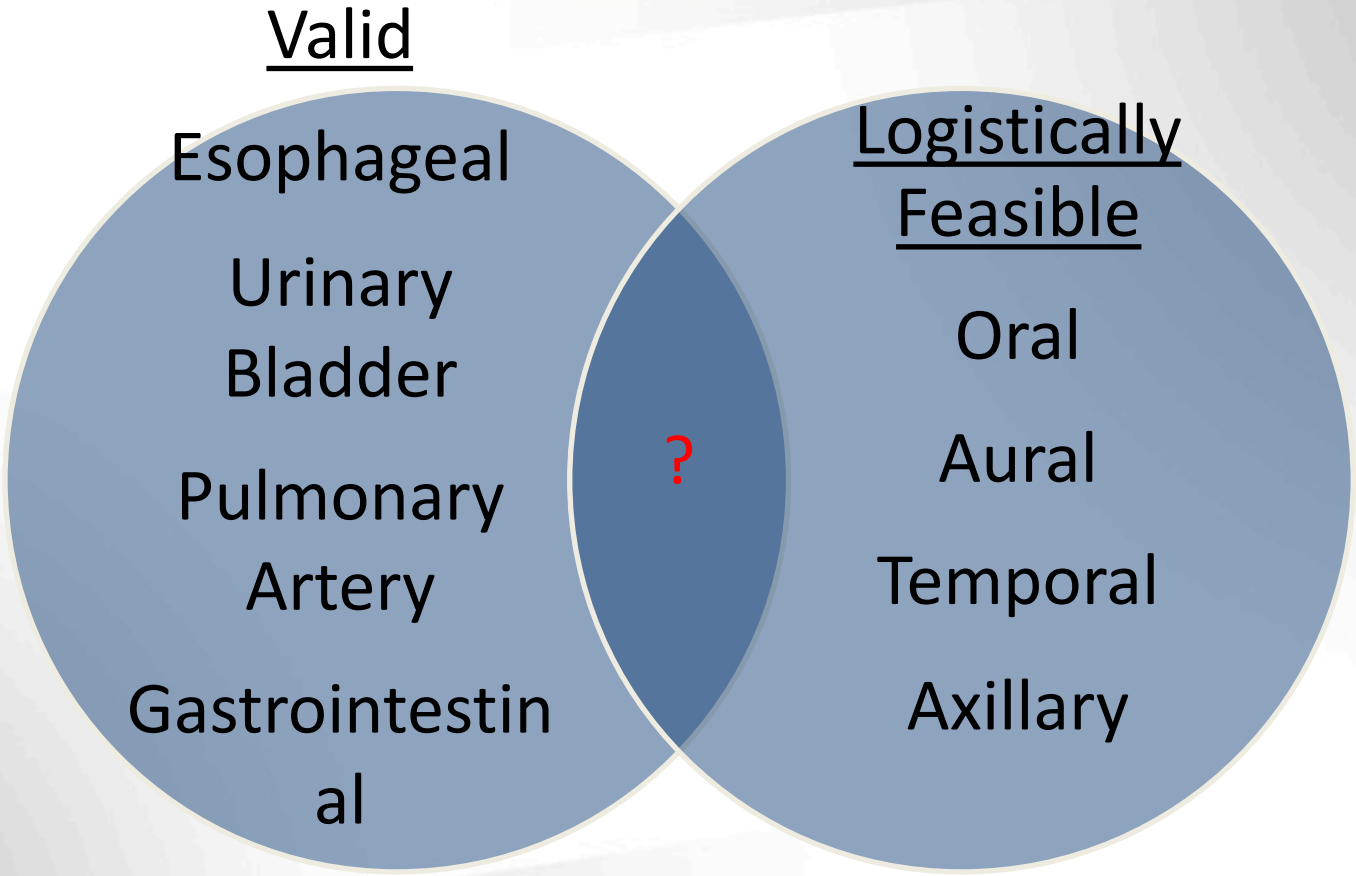
Why Do We Need An Accurate Temperature

- **Determine if it is or is not EHS**
  - Is it *heat exhaustion*?
  - Is it a *head injury?*
  - Is it *hyponatremia*?
  - Is it a *blood glucose issue*?
  - Is it *something else*?
- **Determine when to stop cooling**
- **Determine if EHS occurred**
  - Influence on recovery plans
  - If you just *assume* EHS w/o temperature, *what condition are you treating*?

Body Temperature Assessment

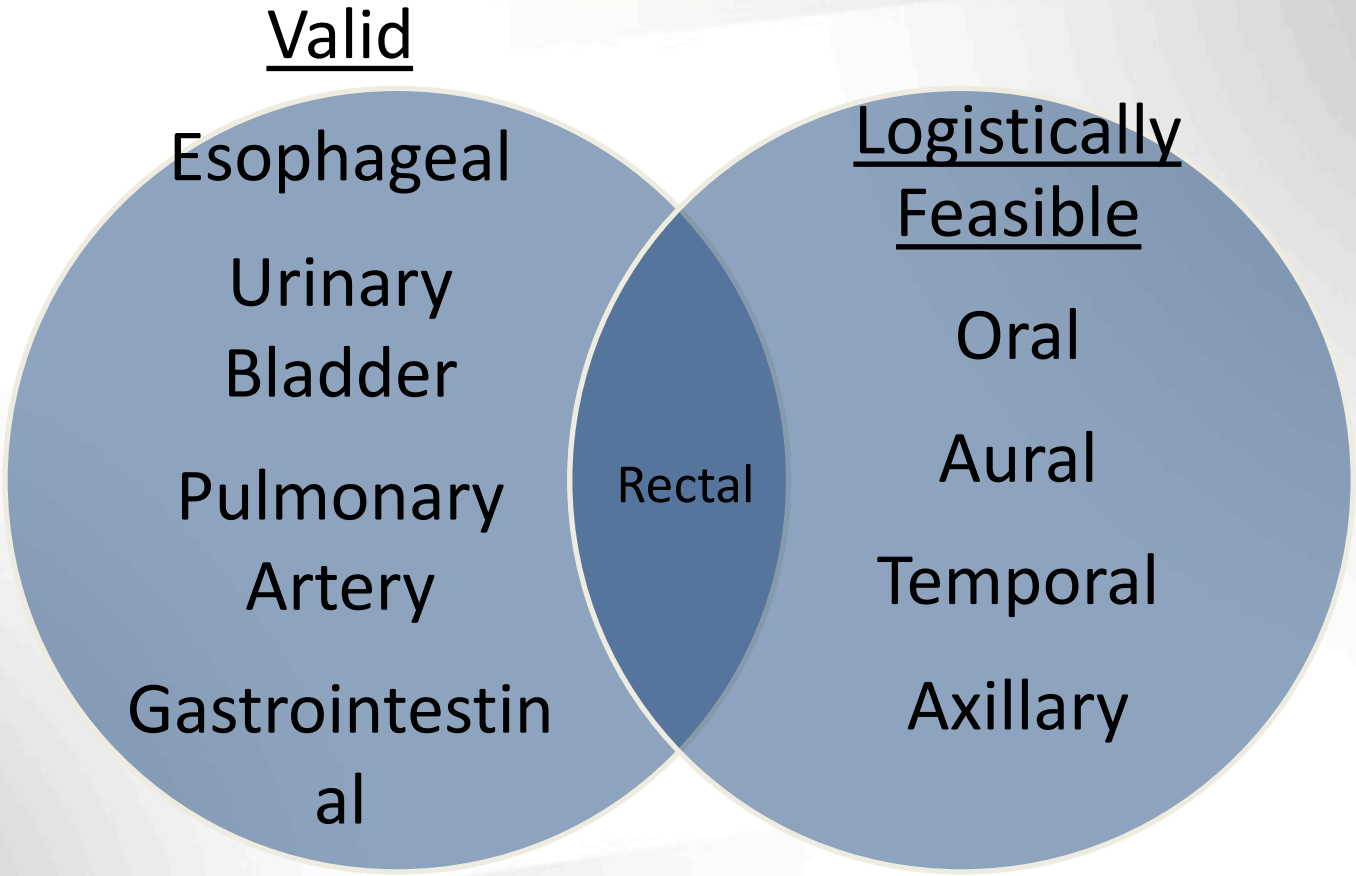


Body Temperature Assessment



Moran & Mendal, *Sports Med,* 2002; Casa et al., *JAT*, 2009.

Body Temperature Assessment



Moran & Mendal, *Sports Med,* 2002; Casa et al., *JAT*, 2009.

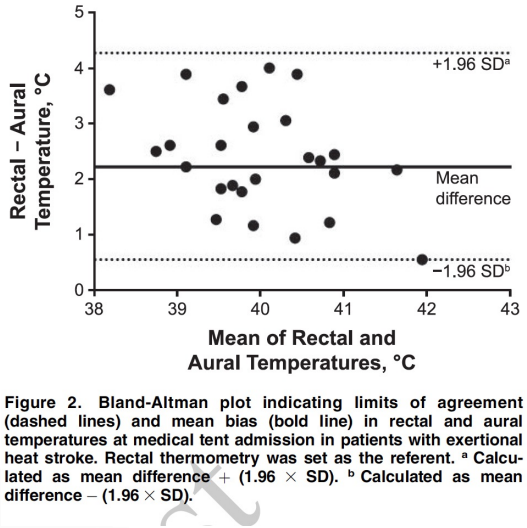


Figure 2. Bland-Altman plot indicating limits of agreement (dashed lines) and mean bias (bold line) in rectal and aural temperatures at medical tent admission in patients with exertional heat stroke. Rectal thermometry was set as the referent. [a] Calculated as mean difference + (1.96 × SD). [b] Calculated as mean difference − (1.96 × SD).

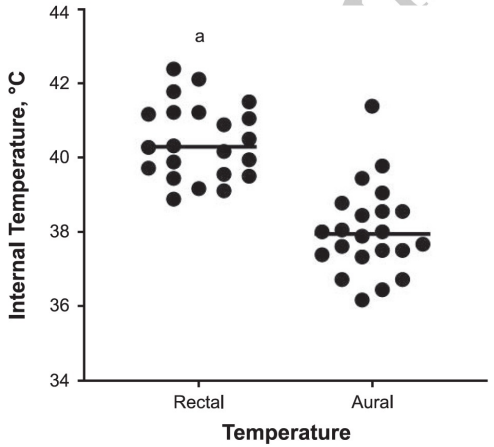
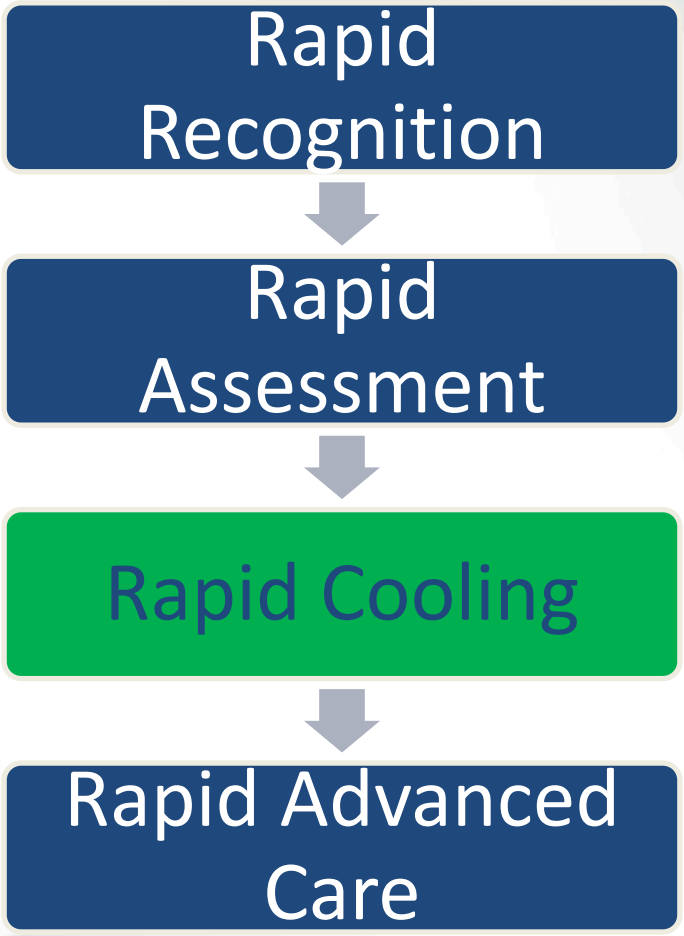


Figure 4. Rectal and aural temperatures in patients with exertional heat stroke during treatment (cold-water immersion). [a] Indicates a difference from aural temperature ($P < .001$).

Aural Tb underestimates whole-body Tb when compared to rectal temperature assessment (Morrissey et al., 2021)

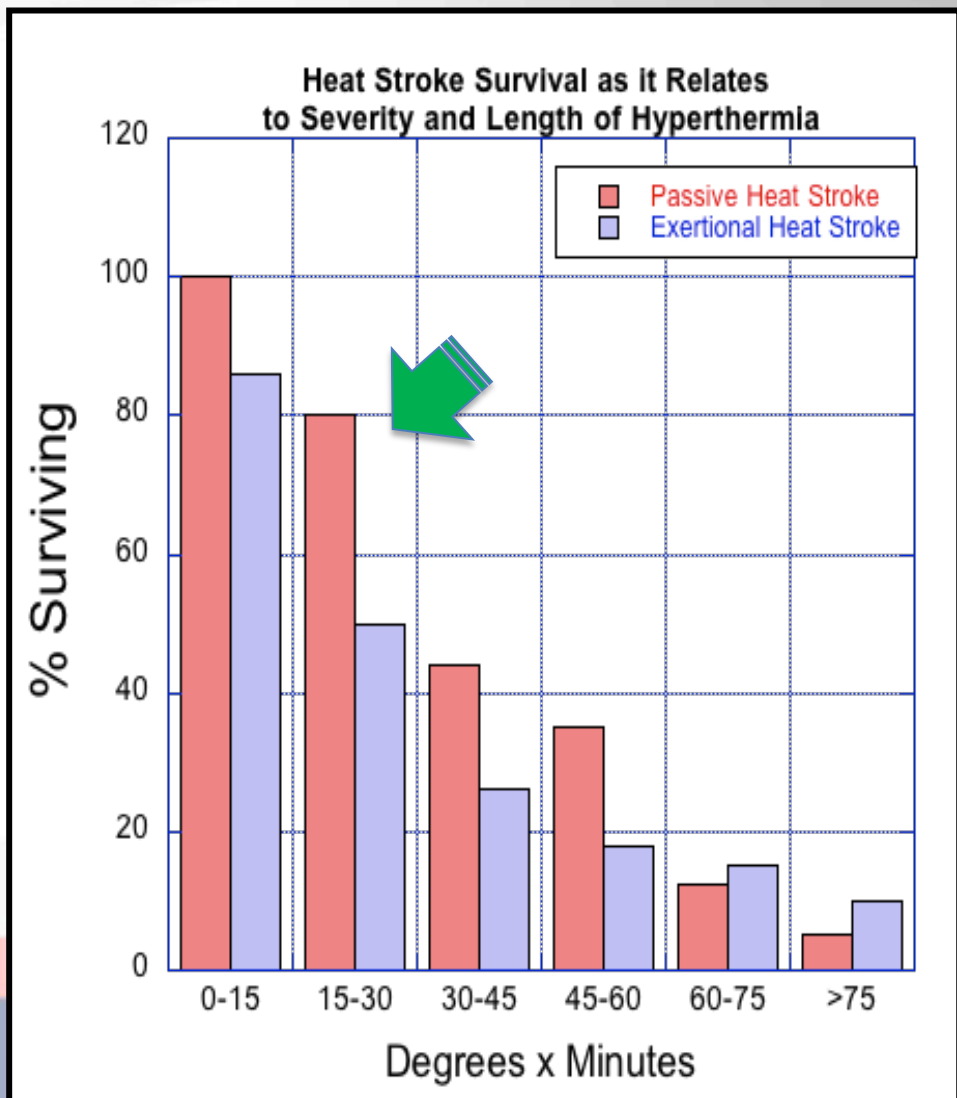
- Morrissey MC, Scarneo-Miller SE, Giersch GEW, Jardine JF, Casa DJ. Assessing the Validity of Aural Thermometry for Measuring Internal Temperature in Patients With Exertional Heat Stroke [published online ahead of print, 2021 Jan 15]. *J Athl Train*. 2021;10.4085/1062-6050-0449.19. doi:10.4085/1062-6050-0449.19

Steps to Survival



PREHOSPITAL CARE

- Survival of EHS drops dramatically in the 15-30 minute window
- Average EMS transport and Emergency Department evaluation is **longer than 30 minutes**
- Increased organ damage, morbidity, and mortality after 30 minutes of hyperthermia



Casa, Kenny, Taylor. *Medicine and Science in Sports and Exercise*, 2010;42(7):1-7.
(redrawn from Hubbard et al, *J Applied Physiology* 42: 809-816, 1977)

Korey Stringer Institute

Why We Need To Change Paradigm

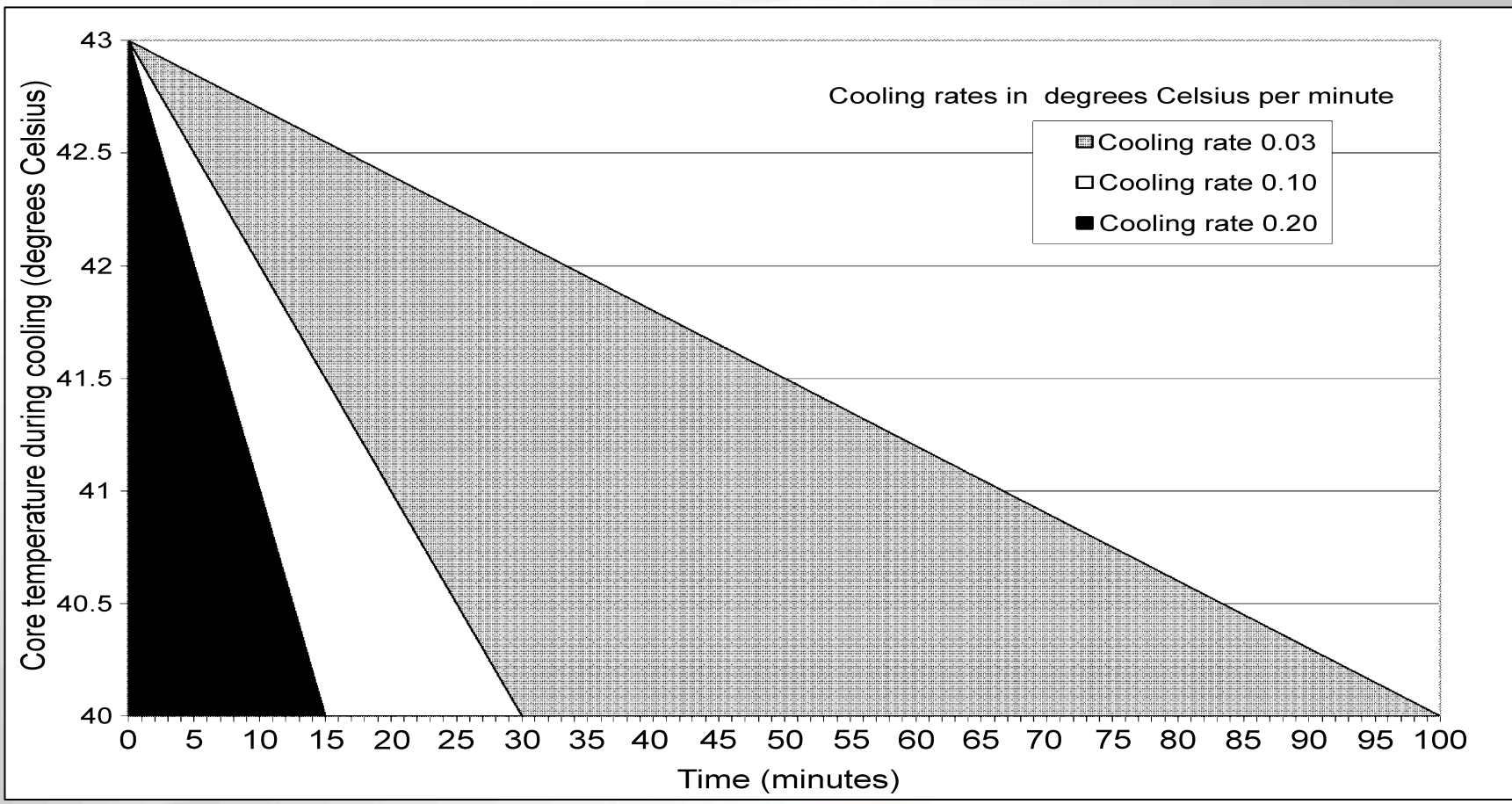
COOL FIRST, TRANSPORT SECOND

Every minute matters

Cold Water Immersion: The Gold Standard for Exertional Heatstroke Treatment

Douglas J. Casa, Brendon P. McDermott, Elaine C. Lee, Susan W. Yeargin, Lawrence E. Armstrong, and Carl M. Maresh

Department of Kinesiology, University of Connecticut, Storrs, CT



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Tarp Assisted Cooling

Hosokawa et al. *MSSE*, 2016

J Appl Physiol 94: 1317–1323, 2003.
First published November 27, 2002; 10.1152/japplphysiol.00541.2002.

Effect of water temperature on cooling efficiency during hyperthermia in humans

C. I. Proulx,[1] M. B. Ducharme,[1,2] and G. P. Kenny[1]
[1]*Faculty of Health Sciences, University of Ottawa, Ottawa K1N 6N5; and* [2]*Defence R&D Canada-Toronto, Toronto, Ontario, Canada M3M 3B9*

Submitted 21 June 2002; accepted in final form 4 November 2002

Avg for first 2 degree drop
.39
.21
.21
.25

Table 3. *Cooling rates at different intervals of core temperature during whole body water immersion*

	Cooling Rates, °C/min		
	1st degree Celsius drop (~40 to 39°C)	2nd degree Celsius drop (~39 to 38°C)	Entire immersion period (until T_{re} = 37.5°C)
2°C	0.28 ± 0.14	0.50 ± 0.20†‡§	0.35 ± 0.14†‡§
8°C	0.17 ± 0.06	0.24 ± 0.11*	0.19 ± 0.07*
14°C	0.23 ± 0.09	0.19 ± 0.12*	0.15 ± 0.06*
20°C	0.26 ± 0.16	0.24 ± 0.12*	0.19 ± 0.10*

Values are means ± SD. The cooling rates are based on rectal temperature (T_{re}). *Significantly different from 2°C ($P < 0.05$); †significantly different from 8°C ($P < 0.05$); ‡significantly different from 14°C ($P < 0.05$); §significantly different from 20°C ($P < 0.05$).

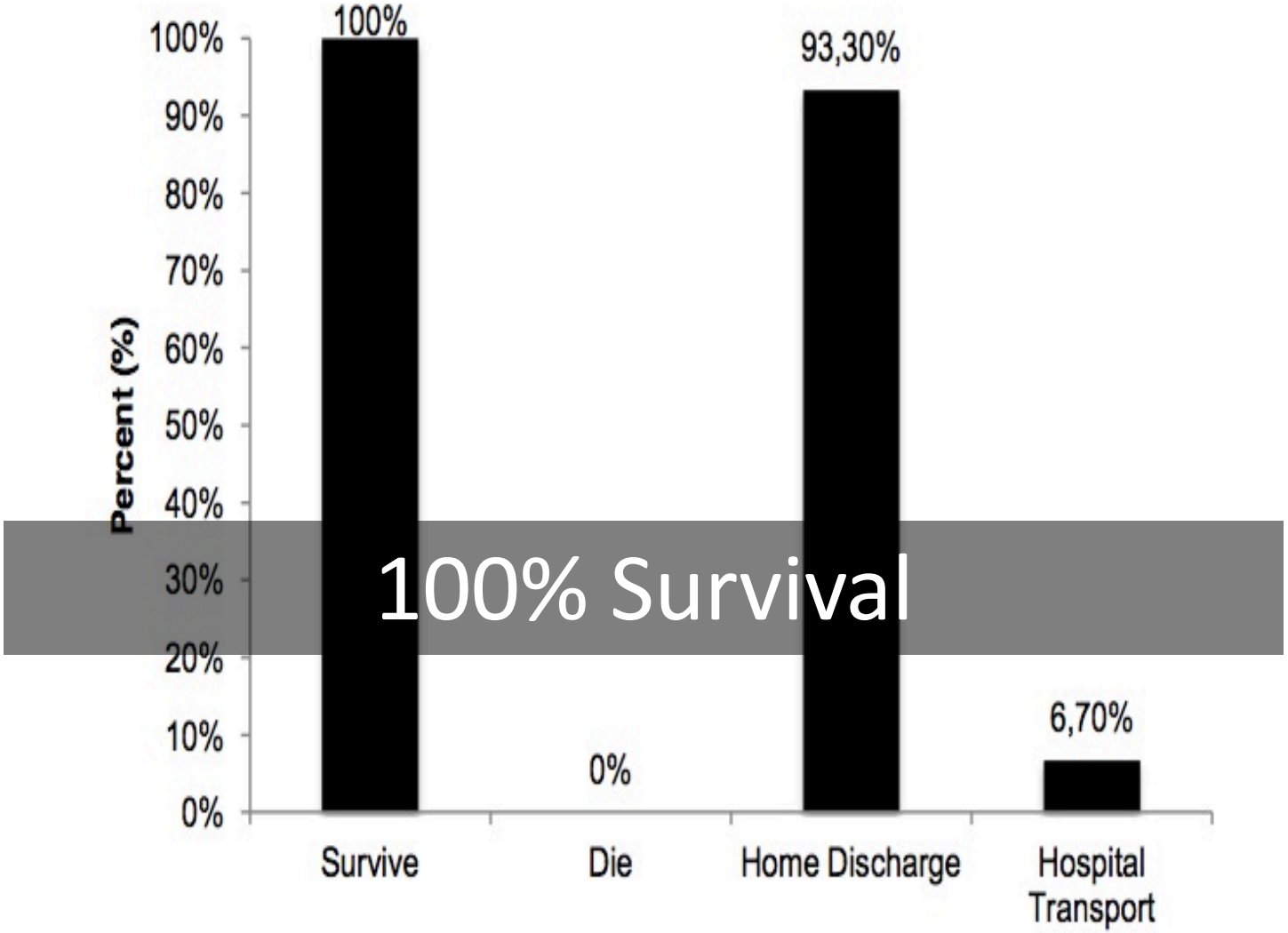
Effectiveness of Cold Water Immersion in the Treatment of Exertional Heat Stroke at the Falmouth Road Race

JULIE K. DEMARTINI[1], DOUGLAS J. CASA[1], REBECCA STEARNS[1], LUKE BELVAL[1], ARTHUR CRAGO[2], ROB DAVIS[2], and JOHN JARDINE[2]

[1]Department of Kinesiology, Korey Stringer Institute, University of Connecticut, Storrs, CT; and [2]Falmouth Hospital, Falmouth, MA

ABSTRACT

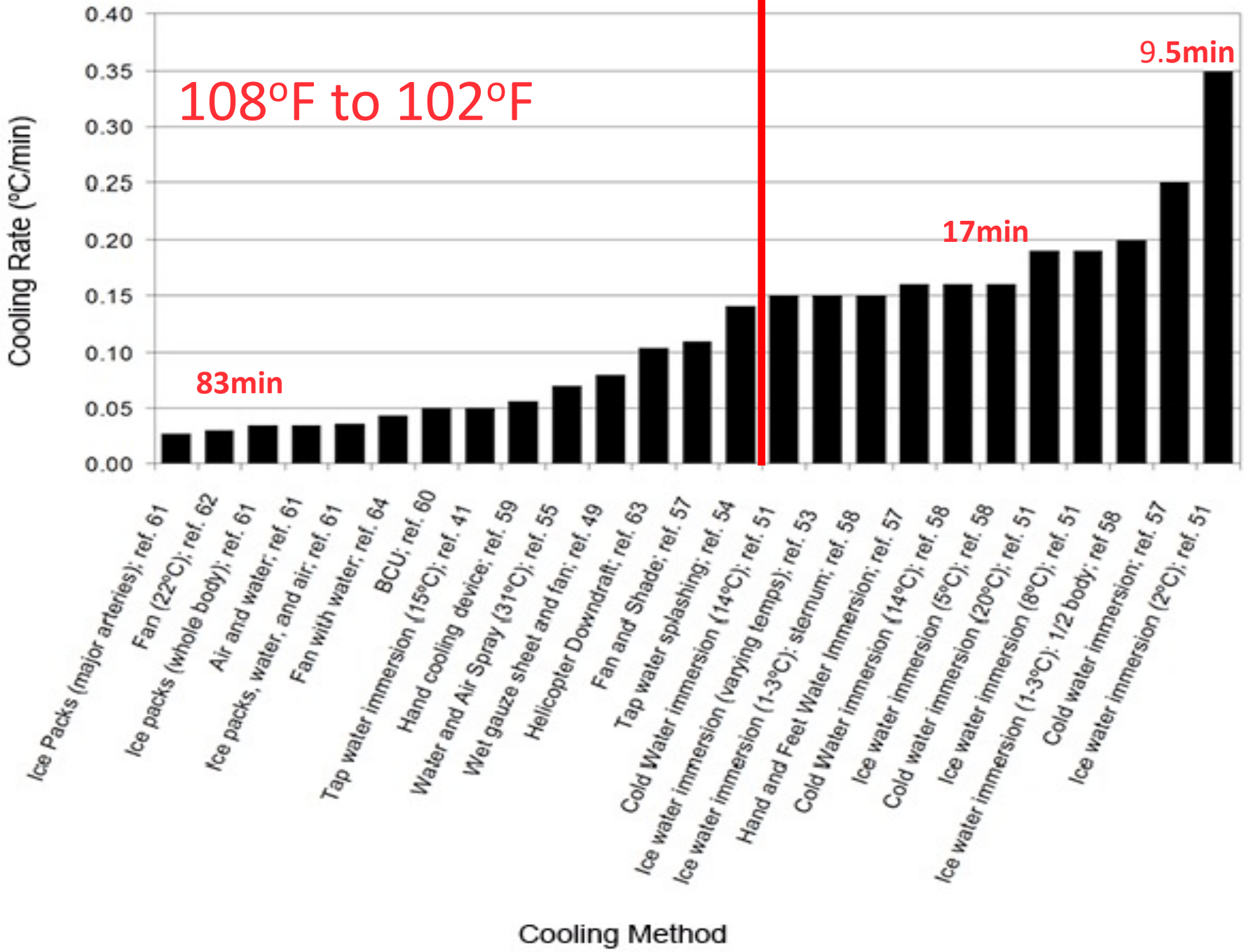
DEMARTINI, J. K., D. J. CASA, R. STEARNS, L. BELVAL, A. CRAGO, R. DAVIS, and J. JARDINE. Effectiveness of Cold Water Immersion in the Treatment of Exertional Heat Stroke at the Falmouth Road Race. *Med. Sci. Sports Exerc.*, Vol. 47, No. 2, pp. 240–245, 2015. **Purpose**: This study aimed to investigate the effectiveness (speed of cooling and survival rates) of cold water immersion (CWI) in the treatment of patients with exertional heat stroke (EHS). Secondly, this study aimed to compare cooling rates on the basis of gender,



100% Survival

Figure 1. Outcomes of 274 EHS with immediate rectal temperature assessment and treatment using CWI at the Falmouth Road Race. Due to immediate treatment and the presence of physicians at the race, there is a high rate of home discharge. In settings where physician clearance is not possible, follow-up at a hospital is recommended after treatment. Adapted from

DeMartini, Casa, et al. MSSE, 2015


108°F to 102°F
9.5min
17min
83min
Cooling Rate (°C/min)
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Ice Packs (major arteries); ref. 61
Fan (22°C); ref. 62
Ice packs (whole body); ref. 61
Air and water; ref. 61
Ice packs, water, and air; ref. 61
Fan with water; ref. 64
BCU; ref. 60
Tap water immersion (15°C); ref. 41
Hand cooling device; ref. 59
Water and Air Spray (31°C); ref. 55
Wet gauze sheet and fan; ref. 49
Helicopter Downdraft; ref. 63
Fan and Shade; ref. 57
Tap water splashing; ref. 54
Cold Water immersion (14°C); ref. 51
Ice water immersion (varying temps); ref. 53
Ice water immersion (1-3°C): sternum; ref. 58
Hand and Feet Water Immersion; ref. 57
Cold Water immersion (14°C); ref. 58
Ice water immersion (5°C); ref. 58
Cold water immersion (20°C); ref. 51
Ice water immersion (8°C); ref. 51
Ice water immersion (1-3°C): 1/2 body; ref 58
Cold water immersion; ref. 57
Ice water immersion (2°C); ref. 51
Cooling Method

Significance of the Study

- Largest data set ever compiled with real-life EHS patients, treatment interventions
- 18 years of EHS patient data synthesized
- Zero deaths from EHS (0/274) with cold-water immersion as the treatment intervention
- 93% of patients were discharged home after treatment in the finish line medical tent

CWI is the Gold Standard of care for EHS patients

- Many studies conducted prior to and after this study continue to show the efficacy of CWI as the treatment of choice for EHS.

Recent publications in EHS diagnosis, treatment, and patient outcomes from our lab

medicina

MDPI

Article

Incidence of Recurrent Exertional Heat Stroke in a Warm-Weather Road Race

Rebecca L. Stearns [1,*], Yuri Hosokawa [1,2], William M. Adams [1,3], Luke N. Belval [1,4], Robert A. Huggins [1], John F. Jardine [1], Rachel K. Katch [1], Robert J. Davis [5] and Douglas J. Casa [1]

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Received: 29 October 2020; Accepted: 17 December 2020; Published: 21 December 2020

check for updates

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MDPI

Review

Exertional Heat Stroke, Modality Cooling Rate, and Survival Outcomes: A Systematic Review

Erica M. Filep [1,*], Yuki Murata [2], Brad D. Endres [1], Gyujin Kim [1], Rebecca L. Stearns [1] and Douglas J. Casa [1]

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check for updates

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doi: 10.4085/1062-6050-0449.19

www.natajournals.org

Assessing the Validity of Aural Thermometry for Measuring Internal Temperature in Patients With Exertional Heat Stroke

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Korey Stringer Institute, Department of Kinesiology, University of Connecticut, Storrs

Age- and Sex-Based Differences in Exertional Heat Stroke Incidence in a 7-Mile Road Race

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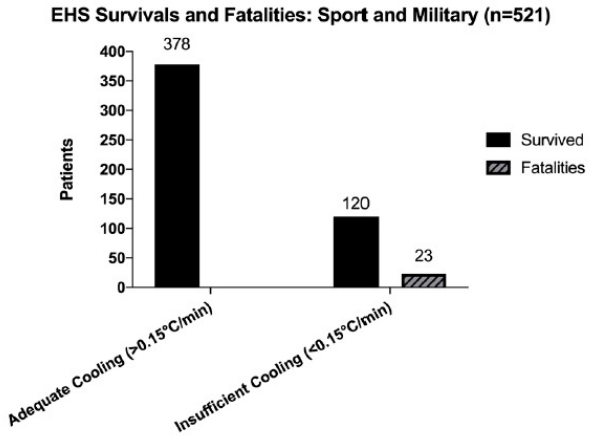


(a)

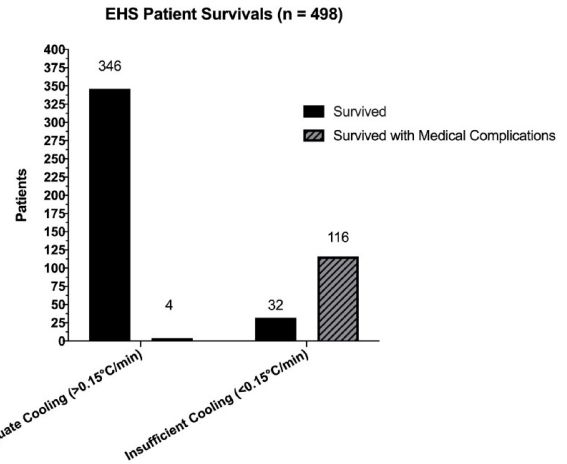
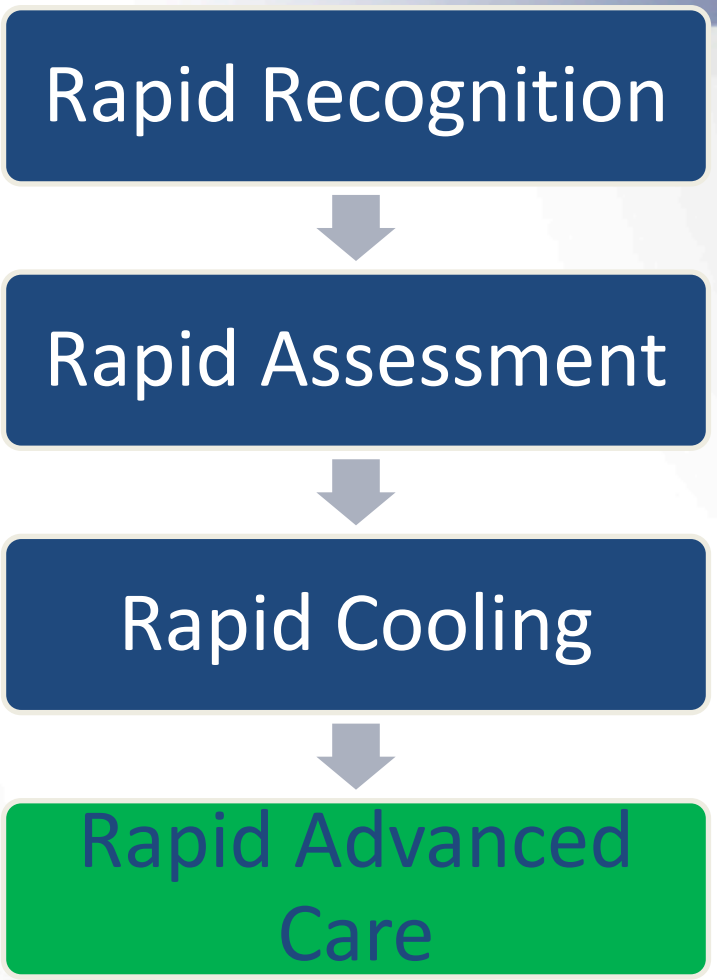


Figure 3. EHS Survived and Survived with Medical Complications from Sport and the Military.

EHS survival outcomes when adequate cooling rates are utilized (Filep et al., 2020)

- Filep EM, Murata Y, Endres BD, Kim G, Stearns RL, Casa DJ. Exertional Heat Stroke, Modality Cooling Rate, and Survival Outcomes: A Systematic Review. *Medicina (Kaunas)*. 2020;56(11):589. Published 2020 Nov 5. doi:10.3390/medicina56110589

Steps to Survival




150 Gallon
568 Liter
Rubbermaid

Korey Stringer Institute

By: Racinais S, O'Connor F, Nye N, Casa D.
Date: August 2018

EPHYSIOL

HOW TO MANAGE
Exertional Heat Illness

Assess — Require CPR?
- Yes → **Refer** — Cardiac algorithm
- No → **Assess** — Rectal temperature > 40.5ºC (104.9ºF)
  - Yes → **Do** — Rapid external cooling (cold water immerssion)
  - No → **Assess** — Rectal temp. > 39.8ºC (103.6ºF) & confused/ desoriented
    - Yes → **Do** — Rapid external cooling (cold water immerssion)
    - No → **Assess** — Blood sodium ≤ 130 mEq/L?
      - Yes → **Do** — Initiate 100ml IV bolus of 3% saline → **Do** — Allert Emergency Medical Services → **Refer** — Hyponatremia algorithm
      - No → **Assess** — Severely dehydrated?
        - Yes → **Do** — IV (normal saline or lactated ringers)
        - No → **Assess** — Other symptoms
          - Yes → **Refer** — Appropriate algorithm
          - No → **Refer** — Release with exercise restrictions

Use a rectal probe

Have multiple staff to deal with combative patients

Cool on site if possible (cool-first, transport second)

Bathtub, ½ to ¾ filled water & ice, 5 to 15ºC, stirred or circulated

Do — Allert Emergency Medical Services → **Do** — Stop cooling at rectal temperature 39.4ºC (103ºF) → **Assess/Treat** — Continuous core temperature monitoring at least 30 minutes post cooling (rewarm if yemperature < 35ºC/95ºF)

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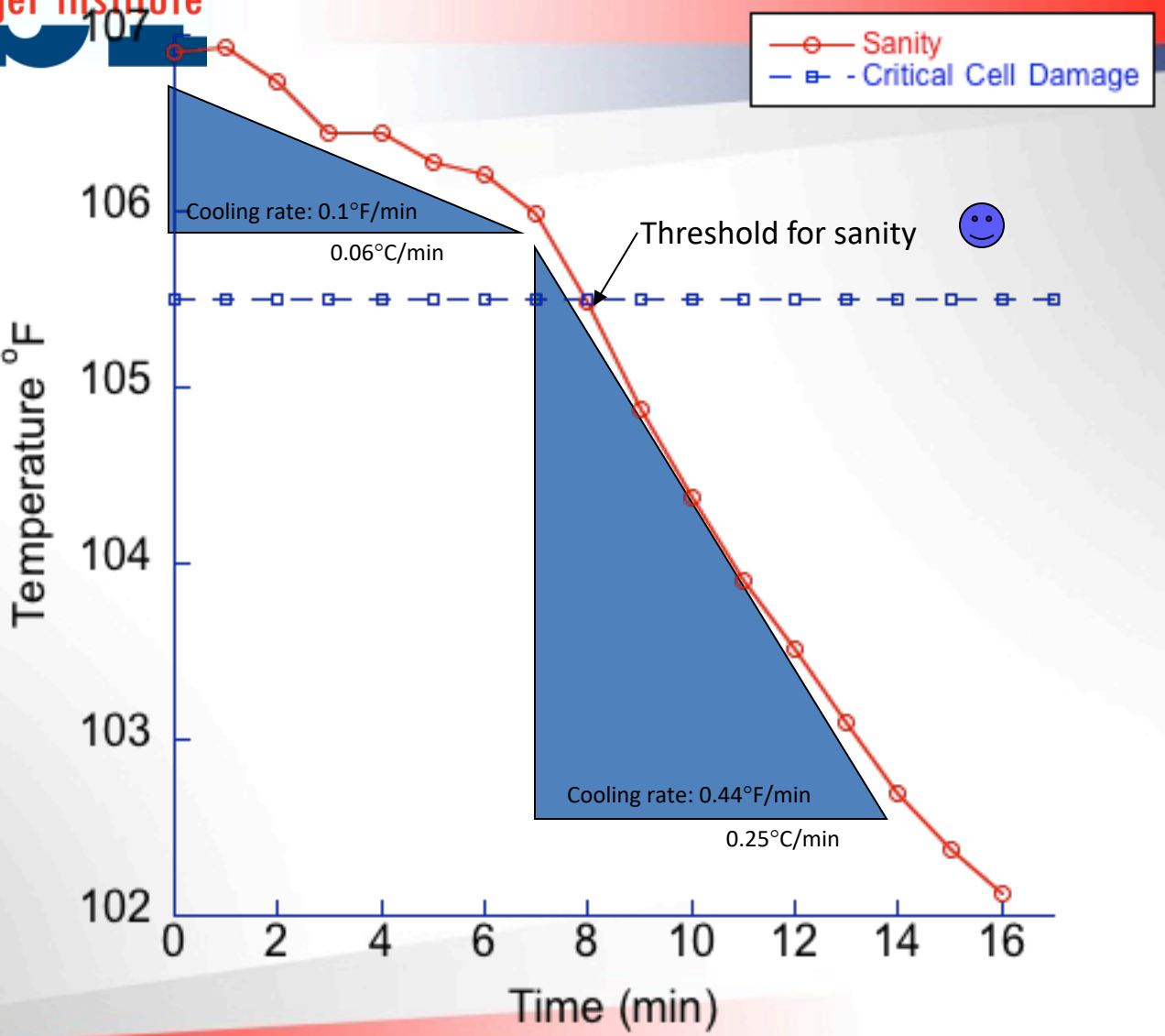

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Table 1. Initial 12-min of whole-body cooling by Cold-Water Ice Massage.

Initial Rectal Temperature	Initial 6-min cooling	6-12 minute cooling	Overall initial 12-minute cooling
41.49 ± 0.76°C	0.07 ± 0.03°C·min^{-1}	0.18 ± 0.06°C·min^{-1}	0.12 ± 0.03°C·min^{-1}

The second 6-min of cooling was significantly faster (p=0.01) than the initial 6-min of cooling.

McDermott BP, Casa DJ, O'Connor FG, Adams WB, Armstrong LE, Brennan AH, Lopez RM, Stearns RL, Troyanos C, Yeargin SW. *Cold-water dousing with ice massage to treat exertional heat stroke: a case series.* Aviat Space Environ Med 2009; 80:720–2.

A MASSIVE STEP FORWARD

Connecticut
June 2019

EXERTIONAL HEAT STROKE PROTOCOL

EMT/ ADVANCED EMT / PARAMEDIC STANDING ORDERS

E/A/P

Exertional heat stroke (EHS) is a unique and emergent hyperthermic condition that occurs in individuals performing intense physical activity, typically but not limited to, warm environments.

INDICATION:
Consider EHS in any intensely exercising athlete, laborer, fire or EMS personnel with altered mental status.

PROTOCOL:

1. Perform Rapid Routine Assessment (<5 min). Assess for other causes of AMS including but not limited to hypoxia, hypoglycemia, inadequate perfusion or head injury.
2. Consider EHS in any intensely exercising athlete, laborer, fire, police or EMS personnel with altered mental status.
3. If EHS has been confirmed and appropriate cooling has been initiated by an appropriate onsite medical team, athletic trainer, coach, or instructor, DO NOT interrupt cooling for assessment or transport.
4. If care not already initiated and EHS is suspected, immediately perform a rectal temperature (T_{REC}) assessment at an insertion depth of 15 cm.
5. If T_{REC} is at or above 40°C (104°F), initiate immediate rapid cooling to a temperature less than 40°C within 30 minutes of collapse. The recommended minimum cooling rate is 0.15° C per minute.
    a. Best practice for cooling an EHS patient is whole-body cold water immersion from the neck down (0.2-0.3°C per minute)
    b. Immersion in ice water filled body bag or tarp may also yield acceptable cooling rates (0.15°-0.17C per minute).
    c. Ice packs, fans, cold water dousing or shower do not achieve acceptable cooling rates. Rotating ice water towels covering as much of body surface area as possible should be considered a minimum cooling modality en route.
6. Discontinue cooling at 39°C (102°F). If a T_{REC} is not available, cooling should not be interrupted or delayed in cases of suspected EHS. Cool for a minimum of 20 minutes / clinical improvement if resources available on scene, or transport with best available active cooling method (Body bag with ice water or rotating ice water soaked towels)
7. Do not interrupt cooling for diarrhea, emesis, combativeness, or seizures. IV/IM medications are rarely needed.
8. Transport, with full notification to closest receiving facility that EHS is suspected, request T_{REC} be reassessed on turnover.

- For events with medical personnel and cooling means on-site, the only appropriate standard is to cool the EHS patient in place. Transportation of an EHS patient should only be done if it is impossible to adequately cool the patient, or after adequate cooling has been verified by a rectal temperature.
- The only accurate or acceptable body temperature measurement in exercising individuals is a rectal temperature (T_{REC}).
- EMS must ensure early pre-notification of hospitals if they will be receiving an inadequately cooled EHS patient, or suspect EHS in a scenario where treatment has not been initiated

Most Important Statement of Talk

- You can avoid a lot of hassle & suffering & grief & lawsuits & long-term medical problems & deaths & horrible memories & lost siblings/children/grandkids/teammates/parents/spouses if you prevent the exertional heat stroke in the first place.
- Preventing an EHS within the confines of sport is not hard to do, in fact it is pretty easy.
- Implement best practices for PREVENTION & CARE

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