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Evidence-Based Practice and the Recognition and Treatment of Exertional Heat Stroke, Part I: A Perspective From the Athletic Training Educator

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Context: Athletic trainers (ATs) know to diagnose exertional heat stroke (EHS) via rectal thermometry (T_{re}) and to treat EHS via cold-water immersion (CWI) but do not implement these recommendations in clinical practice.

Objective: To gain an understanding of educational techniques used to deliver content regarding EHS.

Design: Qualitative study.

Setting: In-person focus groups at the National Athletic Trainers' Association (NATA) Annual Meeting in June 2009 and 2 follow-up telephone interviews to confirm emergent themes.

Patients or Other Participants: Thirteen AT educators (11 men, 2 women) from programs accredited by the Commission on Accreditation of Athletic Training Education, with an average of 22 ± 9 years of clinical experience and 16 ± 10 years of experience as educators. Five NATA districts were represented.

Data Collection and Analysis: Data were analyzed using inductive content analysis. Peer review and data source triangulation also were conducted to establish trustworthiness.

Results: Four themes emerged from the analysis: educational techniques, educational competencies, previous educational training, and privacy/public opinion. *Educational techniques* highlighted the lack of hands-on training for T_{re} and CWI. *Educational competencies* referred to the omission of T_{re} and CWI as psychomotor skills. *Previous educational training* addressed educators not having the skills or comfort with the skills necessary to properly educate students. *Privacy/public opinion* comprised external inputs from various groups (parents and coaches), legal considerations, and social bias.

Conclusions: Educators supplied students with the appropriate didactic knowledge about EHS, but their lack of training and misgivings about T_{re} prevented them from allowing students to gain competence with this skill. Until the NATA competencies state the need to teach T_{re} and CWI and until educators are provided with their own learning opportunities, evidence-based practice regarding EHS will be lacking.

Key Words: education, exertion, rectal temperature, cold-water immersion, qualitative research

Key Points

- Previous experiences and training influenced the teaching practices of athletic training educators.
- Hands-on training is necessary for skill competence and confidence with temperature assessment.
- Teaching methods must match course and lesson objectives to be effective.

Exertional heat stroke (EHS) continues to be one of the leading causes of death in sport.[1] Athletes are at greatest risk of dying of EHS during the preseason months of July and August, and overall it is the second leading cause of death in athletics.[1] However, many of these deaths could have been prevented if EHS had been recognized early and treated properly.[2–4] The National Athletic Trainers' Association (NATA)[2] and the American College of Sports Medicine (ACSM)[5] recommend and endorse the use of rectal thermometry (T_{re}) for the assessment and diagnosis of EHS and the rapid cooling of a patient via cold-water immersion (CWI) to reduce the potentially fatal effects of the condition. The success of the combination of these 2 methods has been highlighted by the 100% survival rate of more than 1000 patients with EHS in the last 20 years in events such as the Falmouth Road Race[6,7] and the Marine Corps Marathon[8] and at the Marine Corps Recruit Depot training facilities at Parris Island, South Carolina.[9] Athletic trainers (ATs) are often in a position to implement the aforementioned tools when treating athletes who potentially have EHS; however, researchers have revealed that although they possess the knowledge, ATs do not implement it in clinical practice.[10,11]

The profession of athletic training has begun the shift to evidence-based practice (EBP), which entails the integration of current high-quality research, clinical judgment, and patient values to make decisions.[12] The push toward EBP is a reflection of the NATA's strategic plan, which includes an initiative to secure the profession's stature by increasing its credibility through established practices and techniques.[13] In support of this movement, the NATA educational competencies over several iterations include references to EBP.[14] The current com-

petencies[14] explicitly state that all athletic training education programs (ATEPs) need to use EBP as the foundation for developing curricula and to rely on the NATA position statements for current clinical practice. This shift has various implications (eg, legal, political, educational, and research) for those currently practicing athletic training and those new to the profession. Athletic trainers are critical members of the health care team, so they carry a distinct obligation to ensure that patient care is of the highest caliber.[15] Therefore, current education should reflect the most up-to-date knowledge and skills[14]; however, a gap between knowing and implementing what is considered to be proper care, specifically with the recognition and treatment of EHS, still exists.[10,11] Moreover, this dichotomy does not mirror the standards established by the NATA Code of Ethics,[16] which states, "Members shall be committed to providing competent care" and "Members shall be familiar with and abide by all National Athletic Trainers' Association standards, rules and regulations."

A paucity of literature regarding impediments to implementation of best practices exists, but the literature illustrates the importance of educational preparation and formal training.[10,11] For example, when treating patients who have had strokes, a physical therapist selects an intervention based only on past professional training.[17] Moreover, knowledge and skill or expertise has been found to influence a health care worker's willingness to implement evidence-based health care.[17,18] The literature regarding the barriers to implementation of EBP in reference to the recognition and treatment of EHS must be expanded. Mazerolle et al[11] found that a lack of training and comfort with the skill of T_{re} was the major roadblock to obtaining a core body temperature when ATs were evaluating suspected cases of EHS. Moreover, the same group of ATs often completely avoided core temperature assessment, relying exclusively on clinical symptoms for diagnosis rather than implementing EBP. In addition, because of their lack of understanding, the same group of ATs implemented methods of cooling (ie, ice bags, towels, and fanning) other than CWI to treat EHS.[11] These findings specifically suggested that the lack of formal training with the skill sets related to the recognition and treatment of EHS plays an important role in a clinician's decision to implement those skills.[11] Educational training might be the critical factor in selection and use of a particular modality or treatment method.[17,18] Therefore, the purpose of our exploratory study was to gain an understanding of educational techniques used to deliver content regarding EHS. Our investigation was guided by the following research questions: (1) How are AT educators and programs preparing their students to diagnose and treat a potential case of EHS? (2) What types of realistic learning opportunities are afforded to the athletic training student (ATS) regarding the skills of T_{re} and CWI? and (3) What role does educational preparation play in the implementation of T_{re} and CWI into clinical practice?

METHODS

Creswell[19] suggested that a qualitative design is most appropriate when the research agenda is to investigate human behavior and experiences. The main objective of our research study was to gain an appreciation for the educational techniques used to deliver content regarding EHS. Therefore, we used a combination of in-person focus groups (11 participants) and follow-up telephone interviews (2 participants) to address the research agenda.

Participants

A total of 13 AT educators (11 men, 2 women; age = 46 ± 6 years, Board of Certification certified = 22 ± 9 years, teaching experience = 16 ± 10 years) took part in this study (Table 1). They represented 10 states and 6 NATA districts (Table 2). Of the 13 participants, 12 held terminal degrees (6 PhDs, 5 EdDs, 1 DA; 1 held a master's degree) and were AT educators, and 3 maintained clinical involvement in conjunction with their academic responsibilities.

We created a database of potential participants with information from the Commission on Accreditation of Athletic Training Education (CAATE) Web site (http://www.caate.net/imis15/caate/). We used criterion sampling[19] to recruit the participants randomly via e-mail before the 2009 NATA Annual Meeting in San Antonio, Texas. A recruitment e-mail containing information about the study's purpose, data collection timeline, and methods was sent to all program directors (PDs). Interested

Table 1. Demographic Data of Participants

Characteristic	n (%)
Sex	
Male	11 (85)
Female	2 (15)
Age, y	
31–40	2 (15)
41–50	8 (62)
≥51	3 (23)
Method of certification	
Accredited	5 (38)
Internship	8 (62)
Maintain clinical rotation?	
Yes	3 (23)
No	10 (77)
Aware of the National Athletic Trainers' Association position statement?	
Yes	13 (100)
No	0 (0)
Have read the National Athletic Trainers' Association position statement?	
Yes	11 (85)
No	2 (15)

Table 2. Participant Demographics by National Athletic Trainers' Association District and Experience

			Experience, y	
Name	Position	District	Athletic Trainer	Educator
Doug	Program director	2	25	25
Fred	Program director	9	28	10
Adam	Program director	2	34	21
Raymond	Program director	8	15	9
Lola	Program director	4	14	13
Jake	Program director	2	17	6
Bumble	Program director	9	23	20
Gretta	Program director	6	15	10
Corky	Program director	2	35	35
Lynne	Program director	3	20	17
Francisco	Clinical coordinator	3	20	6
Tom	Program director	9	18	14
Barry	Program director	2	25	19

participants were screened and were included if they indicated serving as the PD or clinical coordinator (CC) within a program accredited by CAATE and if they had a minimum of 5 years of experience in that position (Table 2). We selected PDs and CCs because of their roles in curricular development and management of their programs; we believed they would know when and where information about EHS was being delivered to their students. Moreover, all participants indicated covering material related to EHS at some point during their academic careers, regardless of whether they were responsible for the specific content at the time of the focus group. Because of the exploratory purpose of the study and the participants' stated previous experience with the topic, we were comfortable with the makeup of this participant demographic. Initial recruitment before and onsite at the NATA Annual Meeting in 2009 yielded a total of 11 participants in the focus group sessions. We recruited 2 additional educators who indicated interest onsite but were unable to attend the onsite focus groups because of scheduling conflicts and previous obligations. Therefore, they were included in the follow-up telephone interviews. All participants provided written informed consent, and the study was approved by the University of Connecticut Institutional Review Board.

Instrumentation

Advantages to focus group interviews include interaction among participants, which improves the quality of data; confirmation of emergent or dominant themes; and focused responses to a particular topic or question.[20] Keeping this in mind, we developed a set of open-ended questions based on existing literature, knowledge of the topic, and the research questions established before data collection. A panel of 5 experts that comprised 1 clinical AT, 2 AT educators, and 2 exercise physiology professors with extensive research experience with the topic of thermal regulation (>20 years) reviewed the document for clarity. Minimal changes were made to the guide after the review. A pilot study, which was conducted with a small group of AT educators (n = 3), was implemented to ensure that the structured interview guide was focused and appropriately based on the purpose of the study. None of the data collected during the pilot study were included in our study results because although they did mirror the study results, we wanted to ensure methodologic rigor and to reduce bias during data collection. As a result of the pilot investigation, only minor changes in grammar and order of questions were made to the instrument before data collection (Appendix).

Procedures

Three semistructured, in-person focus group interview sessions were conducted in San Antonio, Texas (focus group 1 comprised 5 participants; focus group 2, 2; and focus group 3, 4). During initial planning and participant recruitment, we had assigned an equal number of participants to each focus group; however, because of unexpected scheduling conflicts and people who did not report for interviews, the sessions had unequal numbers of participants. Upon arrival at the focus group sessions, all participants completed a background questionnaire. A moderator (S.M.M.), who was an experienced qualitative researcher with more than 5 years of experience, led each focus group interview, which lasted about 45 minutes. A second researcher (R.C.R.) participated by recording (both digital voice recording and video) the focus group sessions and taking field notes to aid in data transcription. Upon completion of the focus group, each participant selected a pseudonym, and all sessions were transcribed verbatim for data analysis. Two follow-up telephone interviews were conducted after the 3 focus group sessions. This step of methodologic triangulation[19] was added to strengthen the study's overall findings; confirm the final themes, which we describe; and counterbalance the low number of participants in focus group 2.

All participants were provided copies of their transcripts from the interviews, and they reviewed these transcripts as a form of member checking. Other methods used to establish trustworthiness of the data included data triangulation and multiple-researcher data analysis, which is described in the "Data Analysis" subsection. Data triangulation was ascertained by conducted interviews, analysis of interview transcripts, and follow-up telephone interviews. Because we conducted several small focus group sessions, the crossover among groups also helped to intensify the data triangulation via qualitative inquiry.[20] Follow-up interviews were used to confirm initial findings and support emergent themes.

Data Analysis

Interview transcripts were analyzed with open coding, which is a common tool used in exploratory studies.[20,21] Two researchers (S.M.M., D.J.C.) reviewed the transcripts independently to identify commonalities, which is a step used to ensure accuracy and reduce researcher bias during data interpretation.[19] The researchers thoroughly read the transcriptions, examining the data for key phrases and wordings that participants consistently discussed. After a commonality was identified, a conceptual tag was given to capture its meaning. When initial data analysis was completed, the 2 researchers compared and discussed their findings. Although the conceptual tags assigned by the 2 researchers were different, the contents contained in those themes were analogous. After discussing the assigned conceptual tags (themes) and agreeing on appropriate representation of each emergent theme, the researchers shared their findings with another set of researchers (n = 4) as a final step in ensuring credibility of the findings. All involved with the analysis process agreed about the final presentation of themes even before negotiation. This group of researchers included 3 second-year graduate students (R.C.R., K.D.P., D.E.P.) with previous training in qualitative methodology and data analysis procedures and 1 AT educator and scholar (C.M.M.) who was not involved with the initial data collection procedures but was familiar with the research agenda. All agreed on the findings.

RESULTS

Figure 1 illustrates the 4 themes that emerged from the data and the cyclic relationship among the themes. The first theme, *educational techniques,* addressed how ATEPs provide educational experiences regarding EHS to their students. This theme reflected the classroom and clinical experiences of the ATSs with EHS. The second theme, *educational competencies,* highlighted the lack of specific documentation of T_{re} and CWI in the psychomotor skills of the NATA educational competencies.[14] The third emergent theme, *previous educational training,* related directly to the AT educators' lack of training in the skill sets of T_{re} and CWI, which limits their ability to present the materials to their students and provide the appropriate feedback for skill mastery. The fourth theme, *privacy/public opinion,* was a multifaceted theme that addressed the legal considerations

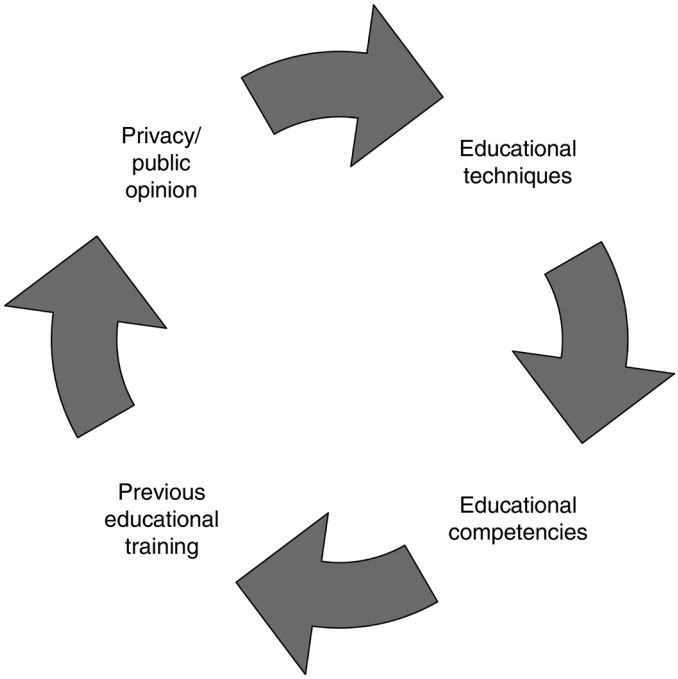

Figure 1. Cyclic nature of emergent themes.

(eg, invasiveness) of the 2 methods and the influence of various sources of external input (eg, parents, legal considerations, social bias) on the use of the devices. The themes directly influence each other, as illustrated in Figure 2. The figure depicts the relationship between the limited time provided to students for development of clinical competence and confidence with T_{re} and CWI. Didactic delivery of best practices for this group of participants did not equal implementation in daily clinical practice or even appreciation for its use and practicality.

Educational Techniques

When discussing teaching methods used for the content related to the recognition and treatment of EHS, the participants acknowledged that although they didactically cover material, they often do not provide laboratory time for the development of skill competence and comfort with the techniques of T_{re} and CWI. All participants discussed the importance of the NATA position statement[2] in the didactic portion of their curricula. Despite the vital role the position statement played in course development, the participants recognized a failure to address the hands-on component in the classroom or clinical setting. When directly asked how information about EHS is introduced to his students, Francisco stated,

> It's hypocritical in that we say it [T_{re} and CWI is criterion standard], but we don't actually have our students do it [T_{re} and CWI], so as far as hands on, it's not even a good term for what we do [for the psychomotor skills of T_{re} and CWI].

A similar sentiment was expressed in a separate focus group session regarding instructional methods and delivery of content related to EHS. Barry commented,

> It is mostly lecture. They are not [practicing T_{re} and CWI] at this time, although since the articles [Mazerolle et al[22–25]] have come out, we have started discussing [as a faculty] how we're currently doing it. But they [the students] don't see it implemented currently or practice the skills [in the classroom or clinical setting].

When asked more about providing students with the opportunity to practice the psychomotor skills associated with EHS, specifically T_{re} and CWI, all participants responded similarly: reliance on case studies, scenarios, or simulations to promote student learning but no use of laboratory time for hands-on instruction or practice of the skill sets. Gretta stated, "We do simulations; basically we provide scenarios [to the students] in the classroom [to provide real-time learning]." The scenarios discussed by the participants were designed to stimulate critical thinking through discourse but lacked actual implementation of the skill sets. All participants agreed about the delivery of content related to EHS: They provide their students with the cognitive knowledge related to recognition and treatment of EHS as outlined in NATA position statements but do not provide them with appropriate practice of those skills.

Educational Competencies

Consistently, the participants discussed the major barrier to implementation of T_{re} and CWI in their curricula: the lack of written documentation in the NATA educational competencies[14] requiring the skill sets of T_{re} and CWI. Lynne simply stated, "It's not a competency, [so] we don't have to teach it." Similarly, Tom stated, "I don't know how to give a good answer [for why we don't allow for practice time]. There has to be a mandate [for us to change our curriculum]." Furthermore, Bumble took a more proactive approach: "If it's going to be a standard of practice, then it should be an educational standard." Francisco agreed that a divide exists between what happens in everyday practice and what has been established as the basic knowledge for an entry-level AT. He highlighted the influence of clinical expertise, practitioner beliefs, and EBP:

> You [and I] know there is a disconnect. You look at the competencies; they are based on the Role Delineation Study, which is based on what the average AT does daily, and we are not doing that. So, the NATA position statement says the standard of care [is to use T_{re} and CWI], but we are basing our competencies on what we are doing, and we are not doing what the research says to do.

All participants agreed that, because of a lack of documentation about T_{re} and CWI in the psychomotor domain of the NATA educational competencies,[14] programs and educators might choose to provide students with only cognitive knowledge instead of a combination of cognitive and psychomotor skills.

Previous Educational Training

Many participants mentioned that their own insecurities or lack of formal training within their academic preparation and continued professional development led them to avoid providing the same formal training to their students. Corky stated,

> I think you know for the most part people [educators and clinical instructors] aren't comfortable with it [skills of T_{re} and CWI]. I think the other thing is that we start treating it as soon as we're suspicious and kind of almost skip that step [because we don't feel comfortable performing it].

Raymond supported Corky's statement:

> I don't believe we are [providing hands-on training], and I think it is [because of] the [lack of] comfort [with the device]

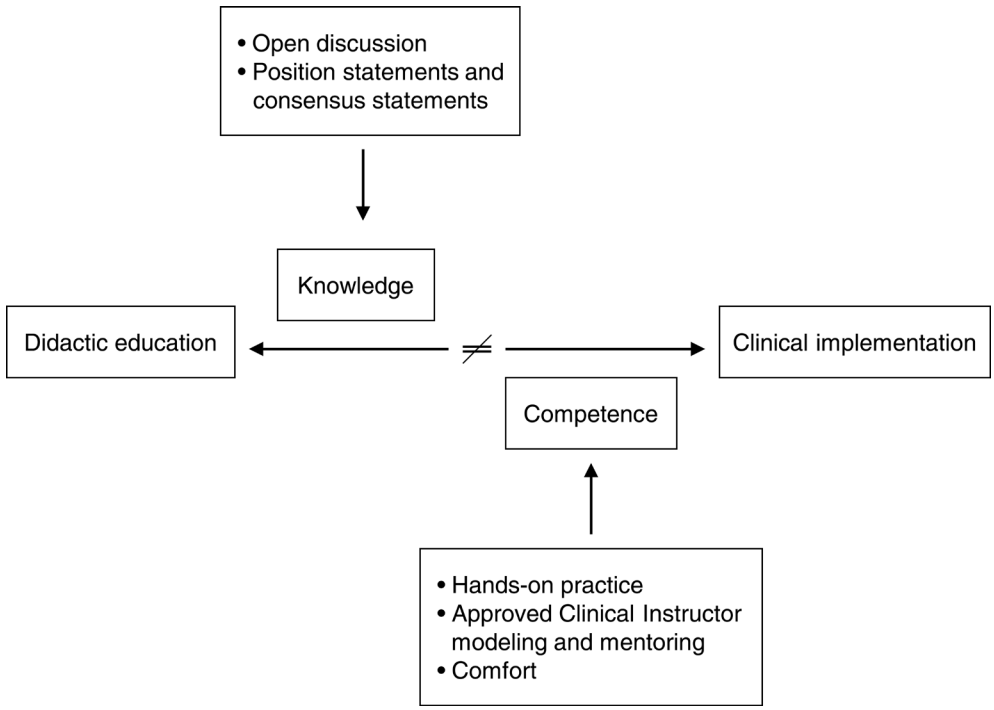

Figure 2. Two-tiered educational model in athletic training education programs.

as well as the barrier regarding the access to the equipment [rectal temperature devices and immersion tubs]; either we don't have it in a classroom setting, or they won't have it in their particular clinic setting.

Tom lacked comfort with the skills but was in favor of having a professional development course to increase his comfort and training with the skill set. He noted, "I think it would be nice to have a course on it, demonstrating the process [correctly] and being able to do that [to help me relay the info on to others]." Lynne reflected on the importance of the integration of didactic materials into the clinical setting:

> Even teaching your clinical staff first. I mean, if I can bring that knowledge back [from a workshop session on implementation] and I can offer that to my clinical staff, just the athletic trainers that work in my university, at least then if I go teach a class, I've got [Approved Clinical Instructors] that are modeling what I'm teaching and are comfortable with it [EBP], then they can reinforce its use with the student. I think that's how it has to be; everyone needs to be on board, including the PD, clinical staff, and the students.

The lack of proper training and continued practice with the skills of T_{re} and CWI appears to leave many educators uncomfortable providing their students with the same training. This same lack of training and confidence might influence clinical instructors' use of T_{re} and CWI and substantially limits a student's opportunity to gain competence in those skills.

Privacy/Public Opinion

Consistently, the participants discussed the sensitive nature of obtaining a rectal temperature as a barrier for its use in clinical practice. Tom responded,

> Probably the public side of it [T_{re}], the public is not familiar [with the accuracy and necessity of the device]. It's one of those comfort things. It's almost at the point of where either you are a medical professional or you are not. This is just like anything else, like being in a hospital or wherever it is you have to do it [T_{re}].

Francisco stated, "We have to remove the taboos from it." With regard to social norms, Barry commented,

> I don't even think it's [T_{re}] an uncomfortable skill thing 'cause . . . we were all that way, using an otoscope and a stethoscope, and we're all teaching that. Even the ones who might not have been comfortable, you just learn how to do it and teach it. So it's more the uncomfortable aspect of the skill [T_{re}] itself. And I still, even massage at some point at some level, we don't want to teach massage for similar reasons, but we have all our students disrobe and get under blankets when they're doing massage.

Francisco also stated,

> I try the best I can; once again, it's lecture based only. The best I can I try to equate it to [is that it's] like going to your physician's office. You have absolutely no problem . . . having a rectal exam or getting a testicular exam or something in a physician's office, but all of a sudden if you're the one doing it to someone in your peer group, then it's a little more, [there is] something taboo about it. We just need to [figure out a way to move around it]. I don't know a good strategy to get rid of that [taboo or stigma].

Doug echoed those concerns:

> I can see it now. . . . We're going to have a lab [session], and we're going to go over [how to properly] insert the rectal ther-

mometer. That wouldn't go over too well [with our school administrators]; we're not ready for that at our school.

Lola added from her own personal discussions with a colleague,

> I don't think this [use of T_{re}] is going to happen in my professional career. It might happen in the group that comes in behind me, but it's not something that there is a school board that's convinced [of the importance] of this for the high school setting.

Discussing the issues of age and how it relates to obtaining a rectal temperature, Fred noted,

> Those folks in traditional high school settings, they're not going to touch it because of liability issues. You take a rectal reading on somebody and they end up having a core temperature of 103, and then you're going to have a mother coming back saying, "Why did you do that on my child? She didn't have heat stroke." Then you're going to have sexual harassment issues.

As discussed by this sample of participants, the influence of privacy and legal issues influenced their decisions to circumvent providing hands-on training for their students.

DISCUSSION

We wanted to gain insight into how ATEPs are preparing their undergraduate students to recognize and treat potential cases of EHS. In addition, we wanted to identify reasons for the failure to implement the NATA position statement[2] regarding the use of T_{re} and CWI because investigators recently have demonstrated an insufficient use of EBP for recognizing and treating the condition.[10,11] Our data suggested that AT educators at minimum are providing their students with the information contained in the NATA position statement[2] and educational competencies,[14] but they are not providing hands-on practice time to gain competence. This finding is comparable with the results of other researchers who reported that ATs described knowing how to appropriately recognize and treat EHS but did not practice what they knew to be recommended.[11] The 4 themes that emerged in our study share one common feature: the education and formal training, or the lack thereof, for ATs limits the implementation of best practices. Unfortunately, our findings highlight the dichotomy that exists between the dynamic nature of medicine and educational training. Clinicians now serving in educational roles (classroom instructors or Approved Clinical Instructors) appear not to have received formal training in the skills needed to measure rectal temperature or even to use CWI. This deficiency in educational training might influence the practitioner's comfort and willingness to teach the information, causing this skill to be overlooked during course planning and delivery of information.

Educational Techniques

Athletic training students have been shown to be diverse learners, valuing a variety of teaching methods for learning; however, they need authentic experiences, including opportunities to implement their skills clinically,[26] for learning and retention. Furthermore, Gould and Caswell[27] revealed that students and educators typically use a concrete, sequential learning style that favors a hands-on approach to learning. After interviewing this group of AT educators, we found most rely heavily on a traditional style of instruction involving lecture and univocal discourse regarding EHS; they rarely implement or provide laboratory opportunities that foster skill development. Our findings are supported by those of Pagnotta et al,[28] who investigated the knowledge, understanding, and experiences of ATSs with EHS and found a predominant use of lecture to deliver course material related to EHS and little or no laboratory time. This is problematic particularly with the T_{re} skill set because considerable comfort and training are needed for proper implementation.[11] Without formal training (eg, feedback leading to skill development and proficiency), the ATS will not have the confidence to use this skill when faced with an actual case of EHS. This theory is confirmed by the results of Pagnotta et al,[28] who recommended more hands-on experiences for increased comfort when addressing cases of EHS.

A common approach educators have taken is the use of scenarios or simulations to promote student learning, critical-thinking abilities, and skill development regarding EHS.[29,30] The use of simulations or scenarios to evaluate student learning and skill proficiency has become increasingly popular among ATEPs[31,32] because real-life opportunities often are limited,[29,30] particularly with medical emergency conditions such as EHS. The simulations discussed by our group of participants were informal and a means to create discussions among peer groups rather than to stimulate critical thinking or skill development because the students were not instructed to implement the skills but rather to speak hypothetically. A plausible solution to address the lack of hands-on training for the ATS involves continuing the mock scenarios and simulations but adding a degree of realism by having the ATS take rectal temperatures with an anatomic model, then cool a partner in a cold-water tub. Athletic training educators are encouraged to use the articles by Mazerolle et al,[24,25] who specifically addressed T_{re} and CWI in regard to lesson planning and course development.

Educational Competencies

The fourth edition of the NATA *Athletic Training Educational Competencies*[14] does not specifically require the ATS to master the skill sets of T_{re} and CWI. It only provides generic guidelines related to the recognition, prevention, and treatment of EHS.[14] This lack of documentation appears to influence many programs to avoid incorporating T_{re} and CWI into classrooms and clinical experiences. Lack of documentation within the educational standards in which educators develop their curricula was the major reason for not including those psychomotor competencies. This is paradoxical because the NATA *Athletic Training Educational Competencies*[14] includes instructions to follow the recommendations of the NATA position statements as the most appropriate and current knowledge and skills required of an AT:

> Program personnel should strive to include content and skills that reflect evidence-based knowledge and practice in all aspects of students' educational program, including students' clinical experiences. Because the knowledge within a profession is dynamic, information of current practice, as represented by appropriate position statements of various professional association/organizations, should be incorporated into the curriculum in a timely and accurate fashion. Current practice particularly applies to position statements issued by the National Athletic Trainers' Association, Inc.[14]

The fifth edition of the *Competencies* will be implemented in 2012. Therefore, AT educators must now incorporate the

content that reflects the most appropriate evidence-based knowledge and the pedagogic techniques to ensure clinical proficiency as it relates to T_{re} and CWI, regardless of the educator's previous training, comfort level, or practice beliefs. As a product of lifelong learning and continuing education, ATs are solely responsible for remaining informed about the most current literature and clinical practice as outlined by the competencies and NATA Code of Ethics.[14,16] In the 2002 NATA position statement on exertional heat illness, Binkley et al[2] clearly stated the importance of temperature assessment (via T_{re}) and the need for rapid cooling (via CWI if possible). The data we and Mazerolle et al[11] have collected highlight the slowness of and resistance to the transition to these evidence-based recommendations. Given the seriousness of the condition in question, it is disappointing and surprising. We are thankful that the fifth edition of the educational competencies will have a much greater emphasis on core temperature assessment and rapid cooling. We are optimistic that this will motivate additional educators to improve training in this discipline.

Previous Educational Training

Athletic training is not the only medical profession concerned with the implementation of EBP. An investigation of physical therapists revealed that clinicians were more likely to use a rehabilitation technique they had learned during professional training rather than implement a recommended or established technique in which they had received no training.[17] Similarly, a review of health care providers and physicians found that a lack of training or expertise and familiarity with a skill or technique was the most influential barrier to implementing optimal clinical care.[18] Our participants discussed at length the notion of previous training as a barrier to classroom instruction and evaluation. Many of the educators did not receive formal training with T_{re} and CWI and therefore felt poorly prepared to demonstrate the skills to their students. Most of the discussions about EBP and EHS centered on T_{re} rather than CWI. Despite this finding, we know that ATs recognize CWI as the most effective cooling method but, for many reasons, do not use it clinically.

Unfortunately, the lack of comfort with performing a rectal temperature measurement also has led clinicians and educators to bypass this skill and begin cooling the athlete immediately. This is evident from the results presented by several researchers evaluating ATs' knowledge,[10,11] understanding,[10,11] and beliefs about EHS[11,33] and from some of the discussions with our sample group of educators. This lack of comfort is problematic because an AT might cool an athlete who does not have EHS, thus delaying appropriate care. For example, although cooling an athlete with exertional sickling (a potentially fatal ischemic response due to the sickle cell trait) might be part of treatment, immediate transport with or without cooling is more important.[34] All participants lacked formal training in rectal temperature assessment, but they were open to the prospect of participating in educational seminars and workshops to help them gain comfort with this skill set. This is an important step as we continue to work toward implementation of best practices despite all practitioners receiving formal training with certain skill sets or techniques.

Privacy/Public Opinion

As Mazerolle et al[11] found, this group of ATs felt that a certain taboo still is associated with obtaining rectal temperature, and this limits the ability of ATs to implement the technique they know to be valid and accurate. Ultimately, 3 problems regarding the teaching of rectal temperature assessment emerged. The educators were not certain about how to present the material accurately and effectively to their students. In addition, their students were unreceptive to learning the skill set because of the invasiveness of the techniques, which was reinforced by their lack of formal classroom training and lack of implementation in their clinical settings. Finally, the lack of public understanding of the use of rectal thermometers greatly influenced the educator's choice not to use the device in the classroom. Justifiably, ATSs practice life-saving skills on mannequins or something else that gives feedback. An anatomic model seems like a viable solution for taboos that exist in the classroom and allows the ATS to develop more comfort; however, it might not help alleviate the concerns or lack of understanding of the general public. The value of clinical experience cannot be dismissed; there is a high correlation between the ATS's clinical observations and the eventual implementation of skills.[17,18]

The lack of public understanding and support maintains the taboo surrounding the use of T_{re}; researchers conducting 2 independent studies examining ATs' practice beliefs regarding EHS have supported this notion.[11,33] These taboos originate with parents, school boards, legislatures, and the like. The term T_{re} has been stigmatized and almost made synonymous with invasion of privacy or sexual harassment instead of being seen as the difference between life and death. Invasion of privacy and sexual harassment have been presented as excuses for why practicing ATs do not use the skill, which has been shown to save lives.[2,3,5,7–9] But would the need to remove a bra stop someone from applying an automated external defibrillator to save the life of a woman with myocardial infarction? Should a 17-year-old girl with EHS receive care that is inferior to that of an 18-year-old woman with EHS because she is a minor? The quality of medical care should not be compromised because of the age of the participant. Certainly, myriad precautions must be established before the use of T_{re}, but none should impede the delivery of optimal care.

To date, researchers have shown that rectal, esophageal, and ingestible thermistors are the only valid instruments to obtain an accurate temperature reading for a hyperthermic athlete.[35,36] The use of an ingestible thermistor or an esophageal thermometer is expensive and impractical for field application when compared with obtaining a rectal temperature.[37] We believe that, despite their misgivings, misconceptions, and lack of comfort, ATs and AT educators must embrace T_{re} and CWI to prevent unnecessary deaths. As noted, some participants expressed concern over the potential for liability if T_{re} is used, especially if it is used with a minor. Although this is a legitimate concern, we believe the extensive civil litigation cases surrounding deaths from EHS offer a stark reminder that a litigation case with a survivor is far preferable to one in which the athlete has died, especially if the death could have been prevented with proper recognition and treatment of EHS. The burden of knowing you could have done more to prevent a death seems to outweigh the risk of occasionally doing more than was necessary.

Limitations and Future Directions

Our sample population of AT educators was small, which limited the generalizability of the results to all educators and ATEPs. In addition, although small sample sizes are sufficient for data triangulation in qualitative studies, the predominantly

Table 3. Barriers to the Use of Evidence-Based Medicine and Possible Solutions

Themes	Common Barriers	Supporting Quotations	Ways to Correct
Educational techniques	No formal hands-on training in class	"We do utilize lecture early in the class, and in the later class we do more hands on [activities related to exertional heat stroke], but once again it's hypocritical in that we say it [rectal thermometry and cold-water immersion is criterion standard] but we don't actually have our students do it [rectal thermometry and cold-water immersion], so as far as hands-on, it's not even a good term for what we do [for the psychomotor skills of rectal thermometry and cold-water immersion]."	Include hands-on time in laboratory class. Mazerolle et al[24,25] presented viable solutions for instruction and practical experience in a classroom setting. Provide as part of Approved Clinical Instructor retraining workshops on evidence-based medicine topics, such as rectal temperature assessment. Increase communication between athletic training education program and Approved Clinical Instructors and clinical instructors to promote connection between classroom learning and clinical application[38]; this can be done by inviting Approved Clinical Instructors and clinical instructors to classroom sessions with the implementation of the skill sets.
	Recognition of appropriate instructional methods to match course objectives	"It is mostly lecture [based]. They are not [practicing rectal thermometry and cold-water immersion] at this time, although since the articles [the Athletic Therapy Educational Series] have come out we have started discussing [as a faculty] how we're currently doing it. But they [the students] don't see it implemented currently or practice the skills [in the classroom or clinical setting]."	
Educational competencies	No specific psychomotor skills listed	"It's not a competency, [so] we don't have to teach it."	Include rectal thermometry and cold-water immersion as skills required for entry-level proficiency. Shift to evidence-based practice needs to be the core of the future editions of the NATA competencies. Educators need to be encouraged to attend workshops for continued professional growth.
	Role delineation study, not evidence-based practice, establishes content	"You [and I] know there is a disconnect. You look at the competencies; they are based on the Role Delineation Study, which is based on what the average AT does daily, and we are not doing that. So the NATA Position Statement says the standard of care [is to use rectal thermometry and cold-water immersion], but we are basing our competencies on what we are doing, and we are not doing what the research says to do."	
Previous educational preparation	Previous training absent with rectal thermometry and cold-water immersion	"I think it would be nice to have a course on it, demonstrating the process [correctly] and being able to do that [to help me relay the information to others]."	Offer workshops on rectal thermometry and cold-water immersion at state, district, and national meetings. The Athletic Training Educators' Conference can be a viable location to start. Have athletic training education program's medical director or another physician provide clinical instruction on the use of rectal thermometry. Require a portion of the continuing education unit compilation annually to be associated with hands-on workshops.
	Low comfort level due to limited opportunities for implementation or previous educational training	"I think you know for the most part people [educators and clinical instructors] aren't comfortable with it [skills of rectal thermometry and cold-water immersion]. I think the other thing is that we start treating it as soon as we're suspicious and kind of almost skip that step [because we don't feel comfortable performing it]."	
Privacy/public opinion	Invasiveness	"Those folks in traditional high school settings, they're not going to touch it because of liability issues. You take a rectal reading on somebody and they end up having a core temperature of 103[°F; 39.48°C] and then you're going to have a mother coming back saying, 'Why did you do that on my child? She didn't have heat stroke.' Then you're going to have sexual harassment issues."	The mentality of athletic training professionals must shift toward acceptance of rectal thermometry to mitigate the taboos and hesitations regarding the use of the device. Preconceived notions and biases need to be eliminated from instructional habits. Athletic trainer educators, regardless of previous training or practice beliefs, must provide students with the appropriate training. Solicit support from team physician when developing standing orders and education of parents, athletes, and coaches regarding the condition.
	Legal considerations	"I can see it now . . . we're going to have a lab [session], and we're going to go over [how to properly] insert the rectal thermometer. That wouldn't go over too well [with our school administrators]; we're not ready for that at our school."	

Abbreviations: AT, athletic trainer; NATA, National Athletic Trainers' Association.

male sample might not accurately reflect the perspectives of female educators. To gain a larger perspective, future researchers should include a more homogeneous sampling rather than a male-dominated, more experienced group of participants. We also recognize that 1 focus group session was small (n = 2); although this was consistent with the other sessions, data saturation did occur, and 2 additional individual interviews were conducted to help reduce bias and add to the data generated. In the future, consistency in the numbers of participants in focus groups should be attained, but the groups should remain small in order to help develop relationships among members and enhance discourse. In addition, not all regions of the United States were sampled, and 5 of the 13 participants represented 1 NATA district; therefore, the data could be biased regionally. However, region should not play a large role in educational training because all accredited programs must follow consistent educational standards. Moreover, we randomly recruited participants with a mass e-mail sent to all PDs. Lastly, most participants had more than 15 years of clinical experience, so the study results might not apply to younger AT educators; this latter group would represent a more current paradigm of instructional preparation. However, based on the results generated by other researchers,[33,38] we believe our results represent the educational climate regarding EHS training in the United States. Furthermore, because ATs practice under the supervision and guidance of physicians, future investigators should examine physicians' beliefs about EHS and the type of formal training they received on T_{re} and CWI and should provide a detailed discussion of the influence these factors have on ATs' use of the devices.

RECOMMENDATIONS AND CONCLUSIONS

The NATA[2] and ACSM[5] position statements on exertional heat illnesses both outlined the importance of taking a rectal temperature, followed by rapid cooling of a patient with EHS. Despite these recommendations by both organizations, sudden death from EHS still occurs, primarily due to misdiagnosis, which results in failure to immediately cool the athlete. According to researchers examining EHS and clinical practice, a lack of comfort with the skill sets necessary to manage a potential case of EHS appears to lead to this improper management.[11] Based on our results, we can conclude that the lack of comfort is overwhelmingly due to not receiving proper training with the methods of T_{re} and CWI. To address this issue and to help ensure that ATs are equipped with the knowledge and skill sets to properly manage EHS, AT educators should consider the following recommendations:

1. Not providing hands-on instruction for the ATS in T_{re} and CWI sustains the current lack of EBP in clinical application. Therefore, more hands-on opportunities should be provided during formal classroom instruction.
2. Educators must gain competency and comfort with the aforementioned skill sets before instructing ATSs in them. This can be accomplished by receiving formal training in T_{re} and CWI.[24,25] State, district, and national organizations can offer workshops or minicourses to help disseminate the knowledge and skills necessary for proper instruction.
3. If the educator is not skilled, he or she should have a more skilled person, such as a team physician, provide clinical instruction on the proper measurement of rectal temperature and CWI.
4. Athletic training educators must demonstrate a proactive attitude regarding T_{re} and CWI. Despite its omission from the educational standards, the position statements support the use of both; therefore, they must be included in formal classroom instruction.

Other recommendations for addressing the barriers to implementation, as highlighted in this study, are included in Table 3.

In summary, educators directly influence their students and how their students act as practicing clinicians. For this reason, educators should be prepared to give proper instruction in all areas of athletic training education, and instructional methods should appropriately reflect the content being presented (eg, psychomotor skills require hands-on practice rather than observations). When addressing the issue of EHS, knowledge of what to do is insufficient without the necessary skills to execute proper care. Exertional heat stroke is a life-threatening emergency, and the current practice, which is based on sound research, shows that both T_{re} and CWI need to be implemented. Therefore, educators not only must teach the skill but also must model it so students can gain comfort with the skill and use it clinically.

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Appendix. Interview Guide

1. Where is the topic of EHS currently covered in your curriculum?
   Probe: How often is it covered? Who teaches and why?
   Probe: Do students get an authentic experience with EHS?
2. Discuss what information is provided to the students regarding EHS?
   Probe: Prevention, recognition, and treatment?
   Probe: What sources are utilized to relay this information to the students?
3. What instructional methods (how is the information delivered [eg, lecture, lab]? are used to disseminate the information regarding the recognition, diagnosis, and treatment of EHS?
4. What do the clinical instructors utilize as their primary tools for recognition and treatment of EHS?
   Probe: Do they use T_{re} and CWI?
   Probe: Speculate why they use the methods they do.
5. Do students have any real-life/real-time experiences with EHS?
6. How can we get more students, educators, and clinicians to start utilizing EBP regarding EHS (T_{re} and CWI)?

Abbreviations: CWI, cold water immersion; EBP, evidence-based practice; EHS, exertional heat stroke; T_{re}, rectal thermometry.

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