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Athletic Trainer Emergency Management Skill Assessment via Low Fidelity Simulation

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Introduction: Athletic training education requires the inclusion of emergency management (EM) best practices; however, the Board of Certification (BOC) does not mandate any continuing education (CE) past Emergency Cardiac Care (ECC). With EM best practices continuing to change there is potential for a large knowledge gap to develop in practicing athletic trainers (ATs) who do not chose to engage in EM CE. This study's purpose was to identify knowledge gaps in practicing ATs' EM skills via low fidelity simulation. **Methods:** A cross-sectional study was conducted in an educational laboratory setting involving twenty-two ATs (age 36.7±10.8 years; 13 males, 9 females, years of experience 13 + 11) attending a simulation-based CE event. A convenience sample of participants who attended the CE event voluntarily participated in data collection. Upon the completion of an educational review session, participants completed four low fidelity simulations (elbow dislocation, femur fracture, heat stroke and external hemorrhage) based on the 2020 Commission on Accreditation of Athletic Training Education (CAATE) standards. Checklists (completed/not completed) were utilized to grade participants simulation specific skill application. Mean overall, critical action, SAMPLE and vital scores were analyzed. Scores were calculated as percentages in order to compare the low fidelity simulation outcomes. A benchmark of 80% skill application was utilized for a successful pass rate. **Results:** The only benchmark achieved was the critical action score within the femur fracture simulation (82.89% ±14.56). A success rate of 9.6% (8/83) was calculated across all simulations. The mean total percent scores were as follows; elbow dislocation 65.0 ± 11.0, femur fracture 55.3 ±10.0, heatstroke 67.7 ±17.5 and external hemorrhage 64.0 ±13.0. All means beyond the critical action femur, were below the benchmark of 80%. **Conclusions:** A knowledge gap exists between practicing clinicians and the 2020 CAATE EM standards. Considering the importance of ATs lifesaving skills, ATs should aim to choose CE to improve their EM skills. While this study only investigates EM, ATs may demonstrate knowledge gaps in other domains and therefore ATs should aim to diversify their CE to stay current with best practices. ***Key Words:*** *emergency management, knowledge gap, continuing education*

INTRODUCTION

The goal of an athletic training program, as stated by the Commission on Accreditation of Athletic Training (CAATE), is to graduate entry level athletic trainers (ATs) that demonstrate a readiness for independent practice.[1] Athletic training education requires accredited programs to include Emergency Management (EM) as part of the curriculum.[1] With a profession as dynamic as athletic training, best practices are constantly changing thus, ATs need to stay abreast of new and updated competencies to maintain their level of proficiency.

When the CAATE standards were updated in 2020, the changes to Standard 70 (Figure 1) included advanced lifesaving skills such as and medications to allow ATs to respond to wider range of emergency situations.[1,2] A previous competency update in 2011 saw oxygen saturation and blood glucose assessment as well as utilizing adjunct airways, rectal temperature, and nebulizers enter the ATs scope of practice.[3] In 2011 Domain 3 was titled Immediate and

Emergency Care, with the 8th Role Delineation Study it underwent a name change to Critical Incident Management to adequately reflect the expanding scope of practice.[1,3,4] Current minimum skills in EM required by the CAATE differ from the minimum Emergency Cardiac Care (ECC) standards held by the Board of Certification (BOC), and ATs graduating as little as five years ago may find their skills no longer meet the minimum CAATE standards when compared to the most recent graduates.[1,5] Adjunct airways, pulse oximetry, blood glucose, nitroglycerin, administration of Epi-Pens, supplementary oxygen, rectal thermometry, wound care and more are required within the 2020 CAATE Standards but are not required within the BOC's ECC requirements.[1,5] As such, the BOC's ECC requirements do not reflect the current depth of minimum EM skills required by CAATE.

With domain specific CE not mandated by the BOC, ATs are free to choose CE that they feel suits their needs.[6] Previous research demonstrates that ATs are poor at self-reflection and determining their own weaknesses or knowledge gaps.[6,7] Without a realized weakness or knowledge gap, ATs are less likely to be motivated to engage in CE that furthers their skills they may be deficient in, and instead continue to pursue topics that they are comfortable with.[7] Research demonstrates that without assessment or simulation ATs often perceive their knowledge to be higher than it is.[6,8,9] This results in a phenomenon, described within the conscious competence model, as unconscious incompetence and is related to the Dunning-Kruger effect that describes a person of low ability who is unable to judge their own level of competence on a given subject.[10] We have found when looking at confidence of EM skills in ATs has demonstrated this effect.[11]

As education and best practice standards continue to advance in both athletic training and emergency care, an inherent gap may form between skills employed by practicing ATs and current educational standards. These gaps may be difficult to assess and address as many clinicians choose CE based on personal choice rather than professional need.[6] While there is limited research on knowledge gaps within practicing clinicians, we know from research involving athletic training students that clinical simulation is an effective way to expose decay of skills and a subsequent knowledge gap.[12] Frank et al[9] demonstrated that both high and low fidelity clinical simulation was effective at exposing knowledge and skill deficits within cardiovascular assessment. High fidelity simulation access and cost may be a limiting factor for practicing clinicians and CE providers. Low fidelity simulation may provide a safe and effective avenue to allow ATs to address their personal practice gaps, providing an avenue of interest in focused CE. Low fidelity simulations are those that provide a level of realism for the learner to practice a skill and gain experience by interacting with training devices or partial models.[13] The purpose of this study was to identify knowledge gaps in practicing ATs' EM skills via low fidelity simulation.

METHODS

Participants

A convenience sample of ATs (n=22, age 36.7±10.8 years, range 23 to 58 years; 13 males, 9 females, years of certification 13 ± 11, range 0 to 36 years) attending a simulation-based CE event at a midwestern health sciences campus participated in the study. Consent was obtained prior to participation and the study received IRB approval.

Instrumentation

Participants completed an online survey with demographic information (Table 1). Four low fidelity simulations were created based on real-world scenarios and included conditions of heatstroke, external hemorrhage (femoral artery laceration), a simple elbow dislocation, and a femur fracture requiring a traction splint. Scenarios were based upon the authors' expertise and the CAATE standards.

The authors co-instruct an emergency management course that meets CAATE standards within an accredited athletic training program. A team of simulation experts (physician, athletic trainer, and simulation specialist) employed by the institution created each simulation based upon standard procedures. Each simulation had previously been delivered a minimum of four times by the institution's clinical simulation center as part of the institutions Master of Athletic Training program. Edits were made by the simulation experts at each delivery to ensure accuracy. Each simulation included Critical Action Checklists (CAC) that was determined by the simulation experts based on the minimum skill set required to ensure a positive outcome. Meaning that if ATs completed the tasks within the CAC, the patient would have experienced a positive outcome. A medical history, SAMPLE (S- subjective, A- allergies, M- medications, P- previous injuries, L- last oral intake, E- events leading) was included in both of the orthopedic injury simulations (elbow dislocation and femur fracture). Vital signs (airway, level of consciousness, respirations, blood pressure, heart rate, skin check and pulse oximetry) were included in both the external hemorrhage and heatstroke simulations. A grading sheet was developed to include all CACs (including appropriate interventions), SAMPLE and vital signs when appropriate. The grading sheet was utilized by the facilitator to assess the participant on a completed or not completed basis.

Procedures

Upon the completion of the demographic survey, participants took part in a 45-minute lecture reviewing primary and secondary surveys, rectal thermometry and traction splinting delivered by the authors. This included both hands-on skill instruction, video presentation and didactic lecture led by the authors.

Variable		Frequency
Gender	Male	13
	Female	9
Did you graduate from an accredited program?	Yes	19
	No	3
Route to Certification	Undergrad	12
	Masters	7
	Internship	3
Clinical Setting	Secondary	13
	College	5
	Orthopedic Clinic	4
How many times have you activated an EAP in the last 5 years?	0	4
	1	5
	2	5
	3	1
	4	1
	5	3
	10	3
Years Certified	< 1 year	3
	2	1
	3	3
	6	1
	9	1
	11	3
	13	1
	14	2
	18	1
	21	1
	23	1
	26	1
	30	1
	33	1
	36	1

Table 1. Demographic Frequencies

This content included all necessary information required to successfully complete the simulation. All content in the didactic and hands-on review was based upon best practice literature and the current CAATE standards. Participants were assigned a schedule to rotate through all four low fidelity simulations at random. When not attempting a simulation, participants were involved in additional hands-on skill activities unrelated to the simulations they were performing in an educational lab setting. Other than the external hemorrhage simulation, which was completed in pairs, all other simulations were

completed individually. For the external hemorrhage participants were randomly assigned a partner to complete the simulation. Participants were given a maximum of 10 minutes to complete each simulation. There was a maximum of five minutes between each simulation rotation based upon how quickly the participant completed the activity. Three simulations (elbow dislocation, femur fracture, heatstroke) were completed with a standardized patient (SP), while the external hemorrhage was completed on a low-fidelity simulation mannequin. The use of SPs within athletic training simulation is relatively new but provides a more realistic and meaningful encounter as SPs are actors trained to emulate the condition they are given to prompt a more realistic response.[14] All SPs and facilitators attended a two-hour training event two days prior to the CE event, where all simulations and outcome measures were reviewed and demonstrated. SPs and facilitators were given the opportunity to ask questions and review any materials required. During the simulations participants were assessed on a completed/not completed grading sheet, and after completion of each simulation the facilitator and SP discussed the outcomes to ensure reliability of results.

Data Analysis

A benchmark of 80% was selected to determine successful completion of the simulation. This was based upon the 2022 BOC pass rate for Domain 3 of 77%, as well as the institutions benchmark for these simulations within its curriculum.[15] Data was consolidated and analyzed with SPSS (version 28.0; PASW Inc, Chicago, IL). Raw scores were tabulated for overall performance in each simulation subcategory (CAC, SAMPLE, vital signs) and percent scores were also calculated. Scores reported are represented as a percent so as to compare across simulations. Overall means and standard deviations (represented as percents) were calculated for all CAC, SAMPLE, vital signs and total scores.

RESULTS

Only eight participants achieved the 80% success rate (elbow=1, heat stroke=6 and external hemorrhage=1), an overall success rate of 9.6%. The mean overall total score for each simulation is as follows; elbow dislocation 65.0 ± 11.0, femur fracture 55.3 ±10.0, heatstroke 67.7 ±17.5 and external hemorrhage 64.0 ±13.0. The full results can be found in Table 2.

	N	Mean	SD
Elbow critical action checklist score	21	77.14	±11.46
Elbow SAMPLE score	21	30.95	±7.97
Elbow total score	21	65.01	±11.04
Femur critical action checklist score	19	82.89	±14.56
Femur SAMPLE score	19	18.42	±9.45
Femur total score	19	55.26	±10.00
Heat critical action checklist score	21	66.67	±13.94
Heat vitals score	21	68.71	±23.74
Heat 2nd vitals score	21	58.50	±27.81
Heat total score	21	67.68	±17.51
External hemorrhage critical action checklist score	22	78.79	±10.52
External hemorrhage vitals score	22	46.97	±20.98
External hemorrhage 2nd vitals score	22	56.36	±31.25
Average external hemorrhage total score	22	64.02	±13.02

Table 2. Mean Percent Scores and SD's±

DISCUSSION

The BOC states that CE requirements are in place to improve competence of current skills but also to increase knowledge, skills and abilities of ATs.[16] ATs are expected to maintain a level of education and proficiency equal to or above that of an entry level AT.[6–9] In a fast-moving profession like athletic training this is difficult if CE in certain

domains are not specifically mandated. The changes to Domain 3 and CAATE Standard 70 in recent years indicate that many clinicians may be lacking up to date knowledge and skills needed to ensure best practice.[1,4] The purpose of this research was to identify knowledge gaps in EM skills via low fidelity simulation testing. Based on the results, there is a significant knowledge gap between the EM abilities of practicing ATs and the 2020 CAATE standards currently being taught in accredited athletic training programs. This is demonstrated by the 9.6% overall simulation success rate of participants. The clinical implications of this are far reaching as no amount of practice will assist being successful at an unlearned skill.

As previously stated, research has demonstrated that ATs are poor at determining their own knowledge gaps through self-reflection.[6,7] This leads to ATs selecting topics that they are most comfortable or confident with instead of topics in which they lack knowledge or skill or both.[7] ATs are more likely to understand if a knowledge gap is present if they are assessed in either a test situation or a simulation.[6,7,9] Adult learning theory supports this and discusses that adult learners are largely self-directed and able to act once they determine a weakness is present.[7] Research has also demonstrated that the relationship between actual and perceived knowledge is poor.[6,8] And that ATs, as well as other healthcare professionals, are not able to objectively identify their own limitations.[6–8] The effect of which is an unconscious incompetence. [10] The goal of an assessment or simulation is to make an AT consciously incompetent, that is to know what they do not know and make them aware of areas for improvement.[10] Most motivated self-directed learners will then attempt to close their knowledge gap with CE which enables the AT to achieve a level of conscious competence, where they are aware that it takes work to maintain their knowledge and skill level.[10]

Limitations of the current study include a small sample size with a lack of diversity in clinical setting. The focus of this study was entirely on EM and therefore results may not translate to other areas of athletic training. Future research is needed to further identify knowledge gaps within all domains. Utilizing actual and perceived knowledge testing as well as skill assessment would be beneficial to identify these gaps.

We found a significant knowledge gap in the EM skills of practicing ATs. This was evidenced by less than 10% of clinicians successfully passing four low fidelity simulations covering various EM skills and techniques. Clinical simulation, didactic learning and hands-on review all help to improve skill usage.[9,12,17] However, if a deficit exists due to a lack of knowledge instead of knowledge decay, no amount of practice will assist in closing the knowledge gap.[18] This can occur as knowledge and skill progresses through advancing standards while learning stagnates.[18] As the scope of practice expands, CE course options in EM need to expand as well. The onus is on the clinician to seek further CE that ensures new, now essential skills and knowledge are met to maintain new practice standards. For clinicians looking to improve their skill and knowledge from past to current standards, the CE courses needed will likely be outside of minimum ECC requirements. The findings of this study should encourage practicing ATs to seek out EM CE beyond that of the minimum ECC requirements.

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